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The Sense and the Meaning of Taste Through Artificial Intelligence

Le sens et la signification du goût par l'intelligence artificielle

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Abstract

This thesis aims to understand the meaning and significance of the possibility of creating a new taste experience through the use of artificial intelligence.

To this end, we critically examine various existing studies on taste, with a particular focus on its synesthetic aspect. We then discuss the necessity of defining a taste experience, considering all the elements that can alter the meaning of a tasting. A key element consists in transitioning from a conception of taste as a sense to a conception of taste intended as a taste experience, as according to the definitions used in this thesis, this notion provides more insights into the meaning and significance of food practices shaped by the use of artificial intelligence. If we consider taste as synesthetic, it is essential to analyze everything that happens during a tasting, across all senses: sight, smell, touch, hearing and taste itself. This approach recognizes taste as an all-encompassing sense, one involving all other senses within a holistic perception. To analyze these dynamics and better understand the meaning of the act of tasting, thus allowing for the aforementioned transition, we draw on various disciplines. The primary disciplines we rely on include semiotics as well as information and communication sciences. Regarding semiotics, we focus on the triadic semiotics of Charles Sanders Peirce (1839–1914), Greimassian semiotics, and Lotmanian semiotics. Additionally, we draw from socio-semiotics, sociology and anthropology, as matters of taste require multidisciplinary analysis.

In order to better analyze issues related to the meaning of taste from the perspective of the taste experience it is crucial to understand human body perception. To study these dynamics we focus on Maurice Merleau-Ponty's theory of perception (1945; 2014) so as to understand the relationship between the object that produces taste and its mediation through the human body.

Furthermore, we highlight the issues surrounding the translation between the dynamics inherent to artificial intelligence and to humans, as these are fundamental when analyzing a phenomenon that triggers sensory perception. If we understand that the human body is central to perception and to the taste experience, artificial intelligence must be able to analyze this relationship. To this end, we rely on Francesco Parisi's (2019) research, which emphasizes the importance of providing artificial intelligence with a body similar to that of humans. Thus, one

of the central goals of this thesis consists in investigating this translation by analyzing existing case studies, such as the case of *gastrobots,* where a kitchen robot uses artificial intelligence to observe cooking videos and replicate recipes. We analyze the work of engineers from the University of Cambridge, Grzegorz Sochacki, Arsen Abdulali, Lucy Cheke, and Fumiya Iida (2023), who explored how to give their robot a body capable of replicating human movements in cooking.

On the topic of artificial intelligence, we discuss various authors from different disciplines to understand both its functioning and the elements that demonstrate a form of anthropomorphization of artificial intelligence. We also focus on the ethical issues arising from the use of artificial intelligence in the realm of taste, and then present case studies where artificial intelligence has been used to generate new flavors, highlighting all the relevant elements for understanding the significance of this practice.

We next present some cases where artificial intelligence has been employed in gastronomy, from 2019 to the present, such as *Flavor Graph*, an application created by SONY; *Gastrograph*; *Chat GPT Sous Chef; Bing*; Dale Markowitz and Sara Robinson (2020), who created a recipe using artificial intelligence; Michael Bronstein (2020), who uses artificial intelligence to detect cells that could cause cancer in food; Frank Dunshea, Sigfredo Fuentes, Claudia González, and Damir Torrico (2019), who use an artificial intelligence system to create new beer flavors. Additionally, we consider the case of Thilini Ariyachandra, Mark Frolick, and Harshini Sirinanda (2017), who also rely on this technology to enhance the taste of beer. On the other hand, Mikael Davidsson (2021) raises concerns about the cultural aspects of taste and how artificial intelligence systems lack cultural knowledge, merely analyzing data to find new possible flavor combinations.

Another key aspect of our analysis involves news articles found on *Google* from various countries about the use of artificial intelligence in gastronomy. The objective of this analysis is to understand the social imaginary (Castoriadis 1975) currently present in our societies regarding this topic. The news articles were searched and selected in different languages: Spanish, Italian, French, and English. Understanding the social discourse present in the media is crucial, as this discourse is part of a *storytelling* process which significantly influences our sensory perception when tasting a dish.

In terms of methodology, we rely on socio-semiotics (Landowski 1992) as the phenomenon of taste, its experience, and the perspective of artificial intelligence require multidisciplinary analysis. To fully understand it, we find it essential to have direct contact with

the main social actors involved in these dynamics. For this reason, this thesis includes five in-depth semi-structured interviews conducted with chefs currently working with artificial intelligence to develop their dishes, as well as similar interviews with artificial intelligence experts. This provides relevant material for analysis, revealing the importance of creativity and the influence of *storytelling* in the perception of a dish from the chefs' perspective. On the other hand, the artificial intelligence experts emphasize in their interviews the importance of database creation to achieve better results.

Another methodological aspect applied in this thesis is the analysis of images of typical dishes created by artificial intelligence. For this analysis, we rely on both Greimassian semiotics (1987; 1984) and Peirce's semiotics (1839–1914). This allows to practically understand the functioning of artificial intelligence and the importance of database creation as a pillar for the final results delivered to humans.

One of the main findings from the analysis of the aforementioned material is that, while artificial intelligence can currently generate new flavor combinations, it does not yet delve deeply into what constitutes a taste experience. Additionally, there is a need to improve and understand who created the database for each of the applications mentioned, as cultural factors are central when referring to taste experience. This is especially true when considering the lack of data when it comes to certain cultures, which can lead to ethical issues concerning the authenticity of recipes created by this technology. For instance, in cases where certain cultures lack internet access, their recipes and flavor combinations are not present in the database, potentially leading to artificial intelligence being credited with the authenticity of an already existing recipe. This presents fundamental ethical issues regarding database creation, cultural perspectives, as well as which recipes are considered accurate, thus enabling the algorithm to generate results in terms of new flavors.

In conclusion, this innovative work highlights the main challenges regarding the use of artificial intelligence in the culinary field, the limitations of these technologies, and the elements that need improvement to achieve not only a new flavor but also—and more importantly—a new taste experience. All of this must be considered within the multidisciplinary analysis necessary to understand this phenomenon.

Résumé

Cette thèse a pour objectif de comprendre ce qui se produit et quelle est la signification et le sens de la possibilité de créer une nouvelle expérience gustative grâce à l'utilisation de l'intelligence artificielle.

À cette fin, je problématise les différentes recherches existantes concernant le goût et son aspect synesthésique, pour ensuite discuter de la nécessité de définir une expérience gustative, en tenant compte de tous les éléments qui peuvent modifier le sens d'une dégustation. Un élément clé est de passer de la conception du goût comme sens à ce que représente une expérience gustative, étant donné que, selon les définitions utilisées dans cette thèse, la notion d'expérience gustative est plus précise pour comprendre le sens et la signification des pratiques alimentaires marquées par l'utilisation de l'intelligence artificielle. Si l'on considère le goût comme synesthésique, il est nécessaire d'analyser tout ce qui se passe lors d'une dégustation, à travers tous les sens : visuel, olfactif, tactile, auditif et gustatif. Cette approche prend en compte le goût en tant que sens, puisqu'il implique les autres sens dans une perception globale. Pour analyser ces dynamiques et mieux comprendre la signification de l'acte de dégustation, ce qui permet de passer de la compréhension du goût en tant que sens à la mention de l'expérience gustative, je m'appuie sur différentes disciplines en raison de la complexité de l'objet d'étude. Parmi les disciplines sur lesquelles je me base, les principales sont la sémiotique et les sciences de l'information et de la communication. En ce qui concerne la sémiotique, je me concentre sur la sémiotique triadique de Charles Sanders Peirce (1839-1914), la sémiotique greimassienne et la sémiotique lotmanienne. De plus, je me fonde sur la socio-sémiotique, la sociologie et l'anthropologie, car les questions relatives au goût exigent une analyse pluridisciplinaire.

Lorsque nous réfléchissons aux questions liées au sens du goût afin d'établir une meilleure analyse fondée sur l'expérience gustative, il est fondamental de comprendre la perception du corps humain, car il s'agit de l'élément central pour appréhender l'expérience gustative. Dans le but d'étudier les dynamiques corporelles, je me concentre sur la théorie de la perception de Maurice Merleau-Ponty (1945; 2014), cherchant à comprendre la relation entre l'objet qui produit le goût et sa médiation à travers le corps humain.

Par ailleurs, je mets en lumière les problématiques liées à la traduction entre les dynamiques de l'intelligence artificielle et celles des êtres humains, car elles sont fondamentales pour analyser un phénomène qui provoque une perception sensorielle chez les humains. Si l'on comprend que le corps humain est central pour la perception et l'expérience gustative, l'intelligence artificielle doit être capable d'analyser cette relation. Pour ce faire, je me base sur les recherches de Francesco Parisi (2019), qui développe l'importance de doter l'intelligence artificielle d'un corps similaire à celui des êtres humains. Ainsi, l'un des éléments centraux de cette thèse consiste à explorer cette traduction en analysant les études de cas existantes, comme par exemple le cas des *gastrobots*, où un robot de cuisine, grâce à l'intelligence artificielle, est capable de regarder des vidéos de cuisine et de reproduire les recettes. À cet égard, j'analyse le travail des ingénieurs de l'Université de Cambridge, Grzegorz Sochacki, Arsen Abdulali, Lucy Cheke et Fumiya Iida (2023), qui ont étudié comment donner au robot un corps lui permettant d'effectuer des mouvements similaires à ceux des humains lorsqu'ils cuisinent.

En ce qui concerne l'intelligence artificielle, je présente différents auteurs issus de diverses disciplines, afin de comprendre tant son fonctionnement que les éléments qui démontrent une forme d'anthropomorphisation de celle-ci, et de me concentrer sur les problèmes éthiques qui surgissent avec l'utilisation de l'intelligence artificielle dans le domaine du goût. Je présente ensuite des études de cas où l'intelligence artificielle est utilisée pour générer un nouveau goût, en montrant tous les éléments pertinents à considérer pour comprendre la signification de cette pratique.

Je présente également certains cas d'utilisation de l'intelligence artificielle dans la gastronomie, datant de 2019 jusqu'à nos jours, tels que le cas de *Flavor Graph*, une application créée par l'entreprise SONY ; *Gastrograph* ; *Chat GPT Sous Chef* ; *Bing* ; Dale Markowitz et Sara Robinson (2020), ingénieures qui ont créé une recette avec intelligence artificielle ; Michael Bronstein (2020), qui se concentre sur la détection de cellules susceptibles de générer un cancer dans l'alimentation et utilise l'intelligence artificielle pour les détecter ; ainsi que Frank Dunshea, Sigfredo Fuentes, Claudia González et Damir Torrico (2019), qui utilisent un système d'intelligence artificielle pour créer de nouveaux goûts dans les bières. Il en va de même pour Thilini Ariyachandra, Mark Frolick et Harshini Sirinanda (2017), qui s'appuient également sur cette technologie pour améliorer le goût de la bière. Par ailleurs, Mikael Davidsson (2021) s'inquiète des questions culturelles que le goût implique et de la manière dont

les systèmes d'intelligence artificielle, dépourvus de cette connaissance culturelle, se contentent d'analyser des données pour trouver de nouvelles combinaisons gustatives possibles.

Un autre aspect clé de mon analyse porte sur les articles de presse trouvés sur *Google*, provenant de différents pays, concernant l'utilisation de l'intelligence artificielle dans la gastronomie. L'objectif est de comprendre l'imaginaire social (Castoriadis 1975) présent dans nos sociétés à ce sujet. Les articles ont été recherchés et sélectionnés en différentes langues : espagnol, italien, français et anglais. Il est essentiel de comprendre le discours social qui apparaît dans les médias, en particulier dans les journaux de différents pays concernant l'utilisation de l'intelligence artificielle dans le domaine gastronomique, car ce discours fait partie du *storytelling*, un élément central qui conditionne notre perception sensorielle lors de la dégustation d'un plat donné.

Concernant la méthodologie utilisée dans cette thèse, je m'appuie sur la socio-sémiotique (Landowski, 1992), car le phénomène du goût, son expérience et la perspective de l'intelligence artificielle nécessitent une analyse pluridisciplinaire. Pour le comprendre dans sa totalité, je considère qu'il est pertinent d'avoir un contact direct avec les principaux acteurs sociaux qui construisent ces dynamiques. Par conséquent, cette thèse comporte cinq entretiens semi-structurés en profondeur, réalisés avec des chefs qui travaillent actuellement avec l'intelligence artificielle pour développer leurs plats, ainsi que des entretiens similaires avec des experts en intelligence artificielle. Ce matériel a ainsi constitué un autre élément d'analyse pertinent pour cette thèse, où les chefs soulignent l'importance de la créativité et de l'influence du *storytelling* lors de la perception d'un plat, tandis que les experts en intelligence artificielle insistent sur la nécessité de créer des bases de données pour obtenir de meilleurs résultats.

Un autre aspect méthodologique appliqué dans l'analyse menée tout au long de cette thèse est l'analyse d'images de plats typiques créés par l'intelligence artificielle. Pour ce faire, je me base à la fois sur la sémiotique greimassienne (1987; 1984) et sur la sémiotique de Peirce (1839–1914). Cela me permet de comprendre de manière pratique le fonctionnement de l'intelligence artificielle et l'importance de la création de bases de données, comme fondement du résultat final fourni aux humains.

Par conséquent, l'un des principaux résultats que l'on peut observer grâce à l'analyse du matériel mentionné est que, bien que l'intelligence artificielle soit actuellement capable de générer de nouvelles combinaisons de goûts en tant que sens, elle ne se penche pas encore en profondeur sur ce que représente une véritable expérience gustative. Par ailleurs, il est crucial d'améliorer et de comprendre qui a créé les bases de données pour chacune des applications

susmentionnées, car les facteurs culturels sont centraux lorsqu'il s'agit de parler d'expérience gustative. Il faut notamment tenir compte du manque d'informations sur certaines cultures, ce qui peut entraîner des problèmes éthiques concernant l'authenticité des recettes créées ou non par cette technologie. Cela est particulièrement vrai dans les cas où certaines cultures n'ont pas accès à Internet, et où leurs recettes et combinaisons de goûts ne figurent pas dans les bases de données, ce qui pourrait amener l'intelligence artificielle à être créditée de l'authenticité d'une recette qui existe déjà. Cela soulève une problématique éthique fondamentale, notamment quant à la clarté sur la manière dont les bases de données sont créées, en comprenant leur origine culturelle et les recettes considérées comme authentiques qui permettent à l'algorithme de générer des résultats futurs en matière de nouveaux goûts.

En conclusion, ce travail innovant met en lumière, à travers l'analyse de divers matériaux, les principales problématiques liées à l'utilisation de l'intelligence artificielle dans le domaine gastronomique, en comprenant les limites de ces technologies et en identifiant les éléments qui doivent être améliorés pour obtenir non seulement un nouveau goût, mais également, et surtout, une nouvelle expérience gustative. Tout cela en tenant compte de l'analyse pluridisciplinaire nécessaire pour comprendre le phénomène décrit.

Introduction

The objective of this thesis is to comprehend the dynamics surrounding the potential creation of a taste experience through the use of artificial intelligence.

Given how this tool has only recently begun to see use by chefs and artificial intelligence experts to create new flavors and enhance culinary creativity, this work entails the analysis of a novel phenomenon. Based on the research conducted thus far, there has not yet been an in-depth study of the implications of artificial intelligence for individuals' perception and taste experience. At present, artificial intelligence is being employed in the gastronomic field to improve nutrition, aiming to detect ingredients that do not harm the human body while also mitigating environmental impact. These narratives can be found in both the companies that develop such technology and in the media. It is important to note that, as the analysis in this thesis reveals, there are also discourses expressing concern about the changes that these technologies might bring to traditional cooking practices. Therefore, we believe this topic warrants further analysis and continued investigation due to its relevance and the lack of research on the dynamics of what constitutes a taste experience in relation to artificial intelligence.

The first aim of this thesis is to define taste as an all-encompassing sense, understanding how it is affected by the other human senses. Therefore, it is crucial to comprehend perception by focusing on the relationship between the body and the object being tasted. Recognizing that this sense is complex, we find it pertinent to employ the term "taste experience," which involves considering context and perceptual memory—both of which are essential elements that shape each individual's taste experience.

The second objective is to analyze and understand how artificial intelligence operates, using definitions from various disciplines to explore how it can create new flavors. According to the definitions found in this thesis, artificial intelligence can be described as a neural system in which each neuron represents an algorithm. These algorithms receive information from a database and, based on that information, generate a response to a specific prompt. In our case, the database can be understood as a collection of recipes. Starting from this database, the algorithm calculates combinations of flavors that have not yet been used and produces a new

combination. Clearly, this explanation of how artificial intelligence functions raises issues concerning anthropomorphization and cultural translation. Hence the need to understand and critically examine the creation of databases, reflecting on the cultural aspects involved in the selection of each recipe to train the algorithms that will, based on this training, generate new flavors. It is also important to consider the ethical dilemmas associated with this selection of recipes and to analyze the issue of translating sensory perception in the context of artificial intelligence. The question arises: can artificial intelligence truly create what would constitute a new taste experience, or is it merely limited to creating new combinations, and thus a new taste, understood in terms of the sense itself?

To understand this phenomenon, we employ socio-semiotics (Landowski 1992) as the primary methodology due to its ability to handle complex analyses. Additionally, we draw upon the works of various researchers from multiple disciplines, including Arjun Appadurai (1988), Ave Appiano (2012), Roland Barthes (1964), Lorenzo Bianciardi (2011), Pierre Bourdieu (1979), Jean- Jacques Boutaud (2011; 2019), Claude Fischler (2001), Francesco Mangiapane (2021), Gianfranco Marrone (2013; 2014; 2015, 2016; 2022), Maddalena Mazzocut-Mis (2015), Nicola Perullo (2011; 2016), Jean Vincent Pfirsch (1997), Simona Stano (2005; 2012; 2015; 2017; 2018a,b; 2019; 2020; 2021), and Ugo Volli (2015), among others.

As asserted by Bianciardi (2011), to delve into this issue it is essential to begin by understanding taste as a synesthetic sense. This definition implies that all senses come into play simultaneously during a tasting, adding complexity to the analysis of taste. For methodological clarity, we have chosen to examine the tasting process by isolating the contributions of each sense, even though, in reality, the process occurs holistically.

Throughout this thesis, we rely on Peirce's triadic semiotics (1839-1914) to analyze the phenomenon as a *continuum* between the social and personal aspects of taste. This approach is fundamental for understanding the notion of experience, which is crucial for transitioning from the concept of taste to that of a taste experience. Additionally, we draw on the works of semioticians such as Algirdas Julien Greimas (1987), Roland Barthes (1980), and Jurij Michajlovič Lotman (1979).

The transition from 'taste' to 'taste experience' is pivotal, as taste generates an experience linked to taste memory (Boutaud 2011), influencing our perception during each tasting. Additional factors, such as the context of the tasting (e.g., *being at the table*) and cultural influences, also play significant roles in shaping the taste experience. These external and internal factors determine not only the choice of dish but also its perception and the overall taste

experience. Thus, to fully comprehend this phenomenon, it is necessary to consider both the sensory and experiential dimensions of taste.

Additionally, this thesis addresses the social and ethical issues related to the use of artificial intelligence in gastronomy. We examine how artificial intelligence operates and how humans anthropomorphize it in their attempts to understand its functioning.

Given the complexity of the topic, the thesis is organized into two main parts. The first part, titled "Semiotics of Taste Experience," emphasizes the importance of transitioning from 'taste' to 'taste experience'. In the first chapter, "The Taste", we analyze taste through various disciplines, including sociology, anthropology, aesthetics, and semiotics, with a focus on socio-semiotics to understand the sensory aspects of taste. An abstract at the beginning of the chapter outlines the main points addressed.

Section 1.1, "Main Issues on Taste," establishes the framework for understanding the synesthesia of taste, followed by sections that explore the contributions of each sense:

1.2. "Sight": Analyzes visual factors affecting taste, including the appearance of dishes and the visual ambiance of the tasting location.

1.3. "Smell": Examines the impact of smell on taste, highlighting its connection to individual memories.

1.4. "Touch": Focuses on tactile sensations in the mouth, such as temperature and texture.

1.5. "Hearing": Emphasizes the importance of auditory elements, inspired by Murray Schafer (1993), categorizing sounds from the tasting environment and those perceived during the act of tasting, such as the crunchiness of food.

Chapter one concludes with section 1.6, "Taste", which highlights the significance and characteristics of the gustatory sense during a tasting.

Within the first part of this thesis, the second chapter, titled "The Taste Experience" highlights the necessity of transitioning from the sense of taste to a comprehensive taste experience. This chapter is divided into three sections, each beginning with an abstract to outline the main themes.

The first section, "2.1. Human Body and Perception," emphasizes Merleau-Ponty's theory of perception (1945) alongside Peirce's semiotic theory to understand the dynamics of perception that occur in our body in relation to the object being tasted.

In the second section, "2.2. Distinction Between the Terms 'Tasty' and 'Flavorful'," focuses on the distinction made by Marrone (2022), which explores the link between the social

and individual aspects of taste. This section distinguishes between the perception and recognition of flavors and the social value that each culture assigns to certain flavors.

The third section, “2.3. Subjectivity and the Social Construction of Taste: Taste Memory,” examines the social construction of taste, linking Boutaud’s (2011) definition of taste memory with Cornelius Castoriadis’s (1975) notion of the social imaginary. This analysis reveals the dynamics and key actors that influence taste selection, ultimately affecting our expectations and taste experiences. The objective of this first part of the thesis is to demonstrate all the factors that affect a taste experience and then reflect on the impact of artificial intelligence in this field. It underscores the theoretical necessity of transitioning from taste as a mere sense to a broader understanding of the taste experience.

The second part of the thesis, titled “Artificial Intelligence Applied to the Gastronomic Field,” begins with the third chapter, which addresses the main issues surrounding artificial intelligence, a topic of current interest among researchers. This chapter is divided into four sections, each starting with a summary of the topics covered.

The first section, “3.1. Main Issues Concerning Artificial Intelligence,” discusses key researchers in both the philosophical and engineering fields regarding the functioning of artificial intelligence. It includes perspectives from authors like Hannah Fry (2018), who emphasizes the autonomy granted to algorithms, and Nello Cristianini (2023), who highlights the anthropomorphization of artificial intelligence, among other reflections.

The second section, “3.2. The Issues of the Filter and the Translation Between Man and Machine,” discusses the importance of filters that humans need to interact with artificial intelligence. It differentiates between various filters that help delineate artificial intelligence results, arguing that written language functions as a crucial filter, enabling artificial intelligence to select necessary information for creating specific dishes. This facilitates the discovery of a mediating language between mathematical computational language and human language.

In the following section, titled “Perception: Simulation of the Human Body”, we focus on the dynamics of translating human perception into artificial intelligence, building on Parisi’s (2019) argument that human perception is clearly dependent on our body and its limitations. Therefore, if artificial intelligence is to create a perceptual element for humans, it needs to have a body that simulates our own. This theory explains cases where, for example, electronic noses and tongues have been developed, bearing a strong resemblance to the structure of our own sensory organs.

The section titled “3.4. Analysis of Images of Traditional Dishes Created by Artificial Intelligence” concludes the third chapter and presents images of dishes from various countries created by AI. This country-based analysis proved instrumental to understand the social imaginary (Castoriadis 1975) circulating in newspapers on these topics and was accomplished by searching for news articles in different languages about the application of artificial intelligence in the gastronomic field. The countries identified through this analysis were: Canada, Korea, England, France, Italy, and Spain. These countries were also those used as part of the input for generating images of typical dishes using the *ChatGPT Sous Chef* function, and *Bing* to demonstrate gaps in the database regarding typical cuisine, highlighting the importance of comprehensive database creation. Methodologically, we draw on Everardo Reyes’s (2022) explanations of digital imagery and semiotics by Algirdas Julien Greimas (1987) and Barthes (1980), among others.

The fourth chapter, “The Taste Experience and Artificial Intelligence”, is divided into five sections. The first section, “4.1. Case Studies,” presents cases where artificial intelligence is being used in the field of taste, highlighting cultural factors and influences on the taste experience.

In the second section, “4.2 Analysis of Newspaper Narratives about Artificial Intelligence and Food”, we analyze a selection of news articles from Canada, Korea, England, France, Italy, and Spain. The reports present various approaches to the topic, with some countries focusing more on ethical issues related to the use of artificial intelligence, such as the potential replacement of human labor or concerns about traditional cooking methods. On the other hand, some narratives support the use of artificial intelligence, highlighting its potential to improve quality of life in terms of health or environmental benefits. In this section, we also analyze images used by different newspapers to represent the phenomenon, which often illustrate the hybridization between humans and artificial intelligence. Moreover, many of the issues raised in media discourses also surfaced in the interviews conducted with both chefs and artificial intelligence experts. This analysis is particularly relevant as it allows for an understanding of the media construction of the social imaginary (Castoriadis, 1975) surrounding the topic in question.

In the third section, “4.3. Socio-semiotic Analysis of Perception: Interview Methodology,” We explain the methodology used for these interviews and the necessity of conducting interviews with the main actors involved in the field, meaning chefs working with

artificial intelligence and experts in artificial intelligence who develop devices for the field of taste.

The fourth section, “4.4. Interviews with Chefs Working with Artificial Intelligence,” analyzes interviews with chefs, exploring themes such as the creation of new tastes, the importance of *storytelling*, and the integration of artificial intelligence and human work. The interviews were conducted in Spanish and French and translated into English for presentation. We highlight the potential creation of a new taste through the use of this technology, the importance of *storytelling* by the chefs leading up to the tasting, and how it changes individual perception. Additionally, we explore the social aspects of working with artificial intelligence, the potential integration of work between humans and machines, and the demographics most open to trying food made by artificial intelligence. We also emphasize the importance and role of traditional cuisine and its potential evolution, among other themes.

The final section, “4.5. Interviews with Experts in Artificial Intelligence and Gastronomy,” examines interviews with artificial intelligence experts, focusing on ethical issues, database creation, and the problem of telling a new recipe created by artificial intelligence apart from a mere lack of information in the database. These interviews were conducted in French and English. Key issues include the impossibility of creating a connection between people’s memories and the dishes tasted, implying a lack of information, especially in providing artificial intelligence with gastronomic critiques that link taste with expected human reactions.

Chapter five, titled “Conclusions,” is divided into three sections: “5.1. The Transition from the of Taste to the Taste Experience,” “5.2. Perception and its Translation into Artificial Intelligence,” and “5.3. Artificial Intelligence and Taste Experience.” Each section presents the main conclusions of the thesis, divided into the major themes identified throughout the research.

The “Appendix” section includes the full text of the interviews in their original languages: Spanish, French, and English. This provides access to the complete content of each interview, emphasizing the importance of the interviewed social actors. It is worth noting that the interviews specify whether the interviewee is a chef or an artificial intelligence expert; however, due to privacy considerations outlined by the University of Turin’s code of ethics, we have chosen to refer to each interviewee as Expert 1, 2, 3, 4, and 5.

Part I- Semiotics of Taste Experience

Chapter 1–The Taste

Abstract

This chapter aims to elucidate various notions related to the study of taste as a sense. To achieve this, we analyze research on taste which emphasizes its synesthetic nature: understanding taste requires consideration of all the senses that contribute to it. In exploring this phenomenon, we draw on Charles Sanders Peirce's semiotics, which enables us to examine the continuity between the individual and social dimensions of taste. Following this framework, we introduce the concept of 'taste *semiosis*', where flavors, ingredients, and dishes are recognized through a taste memory that establishes a value system associated with taste.

The chapter is structured into six sections. In the first, we address the main issues concerning taste from both social and individual perspectives. The second section focuses on vision, one of the easiest senses to digitize through artificial intelligence technology. When analyzing artificial intelligence generated images, it is necessary to apply Algirdas Julien Greimas' definitions for a proper analysis.

The third section addresses the sense of smell, emphasizing its significant influence on the perception of flavor. In the fourth section, we examine touch, highlighting the importance of texture in shaping how we experience taste. Both individuals and societies have specific expectations regarding the texture of a dish, which affects the overall taste experience.

The fifth section focuses on sound, using Murray Schafer's theory of the soundscape (1993; 2013) to analyze the auditory elements of a meal. This theory distinguishes between external and internal sounds, such as those produced by chewing, both of which are integral to the synesthetic nature of taste and influence the taste experience.

Finally, the sixth section discusses how all these senses collectively contribute to taste. This analysis leads to the understanding that we should not only study taste as a sensory phenomenon but also as a taste experience. The aim of this chapter is to transition from an analysis of the senses involved in taste to an exploration of the taste experience itself.

1.1. Main Issues on Taste

In order to develop a semiotics of the taste experience, it is imperative to define taste as a symbolic element capable of eliciting a spectrum of sensory responses. This research employs semiotics as the main principal theoretical framework to understand the feelings, perceptions, and cultural significance arising from a taste experience and it is crucial to recognize the interdisciplinary nature of this study due to the complex subject matter being investigated. As such, in order to delve deeper into this phenomenon, the semiotic framework established by Charles Sanders Peirce (1839-1914) is specifically utilized, as it allows for an interpretation of the taste encounter as a *continuum* between the object being tasted and the subsequent sensations elicited. It is worth noting that several scholars also highlight these connections between sensations and the object being tasted, such as Jean- Jacques Boutaud (2019; 2011).

This theory, in turn, implies a *semiosis* of the taste experience, to establish continuity between the individual tasting a flavor, the society to which the individual belongs, and the society in which the tasting is taking place—assuming it occurs in a location different from the individual's place of origin. We are therefore facing a subjective and, at the same time, social process.

Over the years, a multitude of scholars from diverse perspectives in the field of human sciences have been engaged in ongoing research on the phenomenon of taste. Noteworthy researchers in this area include Arjun Appadurai (1988), Ave Appiano (2012), Roland Barthes (1964), Lorenzo Bianciardi (2011), Pierre Bourdieu (1979), Boutaud (2011; 2019), Claude Fischler (2001), Francesco Mangiapane (2021), Gianfranco Marrone (2013; 2014; 2015; 2016; 2022), Maddalena Mazzocut-Mis (2015), Nicola Perullo (2011; 2016), Jean Vincent Pfirsch (1997), Simona Stano (2005; 2012; 2015; 2017; 2018a,b; 2019; 2020; 2021), and Ugo Volli (2015), among others.

From all these research efforts, a central element emerges: in order to analyze the taste experience and flavor it is essential, on the one hand, to define taste as an element that combines both its individual and social aspects, and on the other hand, to understand its synesthetic characteristics. Every time we engage in a tasting process, a dynamic unfolds where the meaning of this act involves not only the sense of taste, but also entails a combination of elements that go beyond taste and appeal to all human senses—touch, sight, hearing, and smell. Henceforth, our focus lies on examining taste as a sensory perception and the intricate process of interpreting the meaning and signification it entails. In the concrete act of tasting, a set of sensations occurs simultaneously, that allow for and constitute a taste experience.

In this thesis, we explore the various elements involved in shaping a tasting experience, particularly concentrating on the senses involved in the act of tasting. The main aim is to shift the focus of the analysis from the individual senses to the broader sense and meaning of taste. It is vital to clarify that this distinction is purely theoretical and methodological, given that the process occurs simultaneously. Nevertheless, throughout this research, we emphasize the progression from sensory perceptions towards infusing them with a deeper sense and meaning that unfold in each tasting occurrence.

First of all, it is relevant to focus on the concept of taste, which finds a correspondence in the studies cited earlier. Within the definitions of this concept, this thesis will focus on Bianciardi's (2011) explanation as it allows for the development of the dynamic relationship between the individual and the social. The author begins by defining taste as an element that emerges after each tasting and involves the ability to recognize the specific flavors of each food. This mechanism includes the voluntary selection of certain flavors over others (*ibid*. p. 31). According to Bianciardi (2011), in the case of taste, we are always confronted with a differentiation of the value of each tasted ingredient. This understanding is associated with subjective personal matters as well as with the context where the subject is located, which affects the type of taste derived from ingredients that are accepted as edible in a given culture.

Within this dynamic, Bianciardi (2011) argues for the importance of viewing taste as a matter that primarily concerns the individual and their relationship with the object, which in this case is the dish to be tasted. Simultaneously, there is a need to reflect on and emphasize the different aspects that must be considered when analyzing taste. According to Bianciardi (*ibid*., p. 29, 75), one of the central problems of taste is to define its duration, taking into consideration both the physical-biological aspect (tongue, palate, nose) and its cultural aspect.

Scholars have examined the temporal aspect of taste in depth, emphasizing its importance across a range of studies as evidenced by the works of Jean- François Bordron (2002), Herman Parret (2004), Giorgio Grignaffini (2005), and Stano (2017). These studies center on the sensory experience associated with wine tasting.

Bordron (2002) identifies that:

> Tasting initially presents itself as an ordered sequence of moments, each engaging different sensory modalities: one observes, sometimes listens (to the sound of Champagne bubbles), senses and breathes, establishes contact, and tastes. These phases, especially the last three, are not necessarily distinct since taste and smell are challenging to dissociate. However, they constitute separate stages in a relatively canonical figurative syntax (*ibid*., p. 5, my engl. trans.).

Hence, within his scholarly investigation, the notion of the "attack" emerges in relation to the timeframe of a tasting. The researcher delves into the enunciative changes that occur subsequent to wine tasting, highlighting that, for instance, in terms of visual perception, a connection with time emerges solely through comparison "with tradition as if the very time of the description did not need to be mentioned. The present of sight is a gnomic present that erases the duration of its enunciation" (*ibid*., p. 7). Moreover, Parret (2004), in discussing temporal aspects and the length of a tasting experience, observes that it involves a linear duration, leading to the interpretation of different sensory encounters.

Additionally, he refers to Bordron's study (2002), revisiting the concept of "attack" in tasting processes:

> If there is a syntax, it is because in wine tasting, it is "linear", unfolding in a temporality strongly actualized. Predicates are organized around three canonical "semiotic aspects": inchoatively, durativity, and terminability, which Bordron renames as attack, evolution, and finale (Parret 2004: 91, my engl. trans.).

The elements previously discussed form the foundation for contemplating the temporal characteristics of taste. Significantly, Parret (2004) posits that the perception of taste diffuses with a certain level of durability; the duration of taste being influenced by a delicate balance of flavors, wherein the presence of each flavor affects its duration (*ibid*., p. 92). This phenomenon can be observed in dishes composed of specific ingredients that evoke a stronger response on the palate than others.

In addition, Grignaffini (2004) explores the tasting of wine and contends that smell and touch are the initial senses activated in the process. Consequently, individual preferences are translated into social and group trends in wine tasting (*ibid*., p. 216). In this outlook, when it comes to the timing of the tasting, the author observes a tension between societal and individual aspects, facilitated by the physical-biological characteristics of the wine; however, these components create a temporal continuity (*ibid*., p. 223, 224). In a nutshell, the internal temporal suspension occurs within a few minutes in the body, swiftly influencing the individual (*ibid*., p. 225), while the act of tasting wine involves a continuous process of perception among the senses, particularly smell and hearing, which then turns into a discursive and textual translation (*ibid*., p. 226).

Furthermore, Grignaffini (2005: 5, 6) introduces the notion of considering a dish as a form of textual expression when exploring the shift from experiences related to taste to the realm of text. He posits that the categorization of individual dishes involves a sensory coherence that is impacted by the societal context. As a result, this aspect allows for contemplation on the factors influencing gustatory expectations in the selection of each dish[1]. In a related vein, Stano's (2017) recent investigation delves into the temporal aspects of taste, thus elucidating the tension arising from the time discrepancies between the cooking, the preparation phases of dishes and the act of tasting. Stano argues that cooking times are often more pronounced, while tasting times are structured:

> At various moments involving different senses and dimensions, tasting seems to exhibit a different connection with temporality, necessitating a transition from the fast-paced rhythm with which the phases of culinary practices unfold to the forced slowing down of the staging of the perceptual-taste experience (*ibid*., p. 416, my engl. trans.).

Hence, it is pertinent to consider these temporal dynamics as they offer valuable insight into the rapid formation of judgments concerning tasted dishes. This process, as indicated by various scholars, holds significant influence over both personal and communal aspects of the dining experience. Revisiting the concept of taste as a biologically-rooted phenomenon impacted by cultural factors, we are confronted with a dual form of discrimination. One aspect pertains to the individual, while the other is intrinsically linked to the societal norms within which the individual is situated. Within this framework, it can be traced a cultural semiotic structure, inspired by Jurij Michajlovič Lotman's (1979) portrayal of culture as a universally organized system that must juxtapose itself with non-culture in order to establish its identity. Embedded in this structure there is a social hierarchy of taste preferences intertwined with taste recollection, as emphasized by Boutaud (2011: 7). Boutaud contends that individuals retain memories associated with their dining rituals and the context in which a dish is savored. According to Boutaud, during communal eating rituals, individuals engage in a personal "bricolage" between their subjective memories and the actual experience of consuming food (*ibid*., p. 30).

[1] This element is further explored in the second chapter of the thesis, specifically in paragraph 2.3.

> Each food, like each dish, has a story: its own story embedded in the collective imagination, but it also has a personal history, residing within us, in our memory. Therefore, in the experience of food, the aliment consistently remains something to discover and taste again (*ibid*., p. 39, my engl. trans.).

Boutaud (2011) posits that a cognitive process linked to taste intricately blends sensations, flavors, and memory. Thus, memory plays a crucial role in shaping the sensory perception that fundamentally evolves into a taste encounter. However, to grasp this evolution of memory, one must transcend the concept of taste as a mere sensory function and delve into the necessity of transitioning to a taste experience in order to analyze it fully, thereby unraveling its sense and meaning.

Therefore, one of the main problems we encounter involving taste is the sensory complexity it brings with it. Hence, it is necessary to establish an analytical classification that takes into account all the senses.

Taking up Boutaud's (2011) terms and focusing on the visual aspect of taste allows to recognize a problem of the image and taste also emphasized by Stano (2017: 421). Stano reflects on the concept of the "taste image" created by Boutaud (*ibidem*) which arises from the interrelation between different levels presented in the image of a dish to be tasted. Initially, there are the sensations generated by that taste image. In other words, this is an aspect that initially relates to the subjective inner sensations evoked by the image of each food. On the other hand, there is a discursive dimension, a process through which one moves from sensations to words: this is the description of the dish to be tasted, which implies a translation between the sensory dimension and language. As per the previously cited reference, a shift is observed from the realm of "sensory image" to that of "taste image". This observation is supported by the same scholarly source.

> The term "sensory image" is used in the physiology of perception but corresponds to operations of qualitative and quantitative coding; a third component is added to them, the hedonic component. The first two components, which play a role in taste discrimination, depend solely on the physico-chemical properties of what is ingested. Qualitative coding allows for identifying the nature of the stimulus, for example, sweet or salty, based on previous experiences (Stano 2017: 64, my engl. trans.).

This concept holds significant importance as a precursor to the introduction of the term "taste image", enabling a deeper comprehension of the phenomenon that transcends mere sensory experiences and the cognition of taste perception, as noted by Boutaud (2011).

> By proposing to transition from a broadly used term, such as taste, to the concept of *taste image*, our intention is not to create theoretical clutter; instead, we believe that this is a way to promote a coherent and unified approach to the significant dimensions of taste, understood as a universe of meaning. From the flavor of foods to the value of a social bond constructed through them, the concept of taste image accounts for three interdependent dimensions: the *sensory image*, which occurs when the sensation takes shape yet seems to elude communication; the *figurative space of foods*, with its significant power of social representation and construction of the imaginary; *taste performance*, which materializes the relationship with foods and manifests in widespread customs, sometimes demonstrating contradictory practices and more or less free or stereotyped behaviors (*ibid*., p. 62, emphasis in the original, my engl. trans.).

Ultimately, we come across the context or as Boutaud (2011) defines it, the "image of the alimentary scene". In this last step, we find ourselves in the place where the tasting itself would take place. Clearly, the social context where this takes place causes a change in expectations of the tasting subject. Eating in a restaurant with friends or family is not the same things as to conduct a tasting experience at one's own place or at a friend's house.

The concept developed by Boutaud (*ibidem*) regarding the levels of the "taste image" in this thesis is closely related to Peirce's semiotics. The three levels outlined earlier can be aligned with the levels proposed by Peirce, who analyzes reality and experience. Peirce employs the semiotic *Phaneron* to elucidate the experience of individuals, which consists of three fundamental elements: the universe of sensations (*Firstness*), corresponding to Stano's (2017) and Boutaud's (2011) first level; the discursive dimension (*Secondness*), which encompasses the transition between sensations and the tangible object to be tasted; and lastly, the scenic level (*Thirdness*), which pertains to the symbolic and implies the symbolic character of *Thirdness* as defined by Peirce.

In this thesis, we specifically focus on Peirce's framework to explicate the taste experience, drawing on the concepts of "taste image" and "taste memory" developed by Boutaud (*ibidem*). To illustrate the taste process we provide an example of a tasting experience

using the terms previously mentioned. Peirce's perspective on experience (CP 1.335)[2] proves valuable in understanding the unfolding of a taste experience. By employing this theory, we analyze how the process of tasting unfolds. The individual progresses from *Firstness* (CP 1.302), which, as previously described, emphasizes the sensations produced by taste prior to the actual act of tasting. The concrete sensations manifest distinctly during the moment of tasting. This indicates a multitude of possibilities before the specific moment of consumption, when the subject cannot yet actualize these sensations.

Consequently, a social imaginary (Castoriadis 1975) emerges concerning the potential flavors associated with certain food items.

According to Peirce, *Firstness* implies that "freedom can only manifest itself in unlimited and uncontrolled variety and multiplicity; and thus, the first becomes predominant in the ideas of unlimited and varied senses. It is the guiding idea of the 'variety of senses'" (CP1.302). It is worth noting that the amount of possibilities established by *Firstness* depends on the society to which the subject belongs, as the possibilities of certain ingredients to be tasted or not depend on the culture in which subjects find themselves. This concept echoes Lotman's notion of culture (1979), who claims that each culture, to define itself, needs a non-culture. In this particular case, this notion involves the definition of which elements are considered edible and which are not, to create a distinctive culinary identity, a theme that we delve into throughout this thesis.

Given this framework, to discuss the next step of the taste experience this thesis will delve into what Peirce refers to as *Secondness* (CP 1.325) which is strongly linked to the inherent characteristics of the object to be tasted. An example of this concept could be given by defining the temperature and texture of the element being tasted. According to Peirce, in *Secondness*, "secondness is predominant; for the real is that which insists upon forcing its way to recognition as something dyad consists of two subjects brought into oneness. These subjects other than the mind's creation" (CP 1.325).

Finally, we highlight the concept of the semiotic *Thirdness* (CP 1.26), in the sense that if the individual belongs to the culture from which the tasted comes from, they will be able to define, categorize and classify tastes and flavors. Following this process, it is possible to describe a taste experience when the individual manages to recognize the tasted elements. Notably, at this point in the process, we engage with *Thirdness* (CP 1.26), namely, the

[2] The citations to the work of C. S. Peirce are made in the usual manner: CP [x.xxx] refers to the volume and paragraph in *The Collected Papers of Charles S. Peirce* edition.

Interpretant, which enables a *semiosis* of taste recognition and of taste experience. It is essential to clarify that this tasting process occurs instantaneously and concurrently. These stages have been outlined to analyze and understand the process above described but it is important to point out that these elements and levels of tasting take place simultaneously, as a whole (Abdala 2023). According to Peirce, *Thirdness* (CP 1.26) implies:

> To say that a prediction has a decided tendency to be fulfilled, is to say that the future events are in a measure really governed by a law (…) A rule to which future events have a tendency to conform is ***ipso facto*** the happening of those events. This mode of being which ***consists,*** an important thing, an important element in mind my word if you please, the mode of being which ***consists*** in the fact that future facts of Secondness will take on a determinate general character, I call a Thirdness (CP 1.26, emphasis in the original).

Therefore, now delving into the idea that a "tendency" towards the taste experience is implied when mentioning both "taste memory" (Boutaud 2011) and what has been here defined as "taste *semiosis*". Here, a taste *Interpretant* is generated to determine and recognize each tasted element belonging to a specific culture and society.

When considering the aspects and characteristics of taste mentioned before we outline the different levels of taste that might occur during the experience, taking into account the creation of taste through artificial intelligence (Abdala 2023: 290, 291). Drawing on the linguistic theory of Louis Hjelmslev (1943: 52) we can outline two fundamental levels, that of content and that of expression.

The level of content implies an arbitrary meaning when considered in relation to the level of expression. In the content level, it is possible to identify form, matter, and substance, just like in the expression level. Applying this model to the taste experience of artificial intelligence allows to recognize different types of signs: the outputs (recipes on the screen, algorithms, 3D foods, etc.), which are also expression planes of the sensory stimulus that is the taste experience, and the database, that is, the paradigm of possible combinations of ingredients.

Each of the aforementioned symbols corresponds to a distinct plane of expression and a plane of content, which are further divided into the components of form, substance, and matter. It is firmly established that on the plane of expression, the form encompasses the range of manifestations such as recipes, three-dimensional representations of food, and other similar elements. These manifestations are predicated on a paradigm, serving as a database that contains a multitude of potential combinations. Additionally, the background of this plane encompasses the set of technologies, ingredients, and culinary creations that define

contemporary artificial intelligence. These elements are reflected in various symbols and cultural manifestations.

The aforementioned database pertains to the manner in which artificial intelligence assimilates and prepares the combinations of ingredients, it encompasses cultural stereotypes that are ingrained and embedded in the system. Moreover, the concept of materiality encompasses both the actualized symbols and the multilingual materiality of the machine, as well as the biological aspects of sensory stimulation including taste, touch, and smell. Furthermore, it includes the visual aspects of the dish and the auditory aspects that accompany the tasting experience. Lastly, materiality also encapsulates the overall context of the tasting experience, including the physical setting in which it takes place. This theoretical foundation is of paramount importance when scrutinizing the images generated by artificial intelligence of specific traditional dishes, as will be elaborated upon in the following part.

The plane of expression correspondingly encompasses the entire spectrum of signs that make up the *storytelling*, which manifests itself both within the realm of gastronomy and restaurants and through media channels where it is being said that artificial intelligence possesses the capability to generate novel tastes. This *storytelling* can manifest itself through visual representations, which hold a central role in the second part of this work, as well as through narrative forms, such as when a chef elucidates the intricate process behind the creation of a specific dish. The significance of *storytelling* is further explored in the following part of this thesis in conjunction with an analysis of the interviews conducted with esteemed chefs. Hence, at the level of content, all customary interpretative and deductive operations carried out by both human and non-human agents are situated, including those pertaining to the discernment of flavors, such as bitter, sweet, salty, and umami, which play a fundamental role in the taste experience. These operations extend to the cultural recognition of taste and texture, as well as the orchestration of sensory and synesthetic elements, memory, and gustatory judgment (Bourdieu 1979). Another significant component is the role of taste memory, which facilitates the connection between various elements that contribute to the recognition of a particular dish. During the act of tasting, the expression is identified through tactile signs, such as texture (for instance, the crispiness or smoothness of the dish, as well as its temperature), allowing the subject to recognize the dish based on their past encounters with similar tastes (Abdala 2023: 291). These intricacies are delved into in the following parts of this thesis. Consequently, another paragraph is dedicated to an in-depth exploration of all the senses that

form an integral part of the taste experience: visual, olfactory, tactile, auditory, and taste. In the last part of this chapter, the main conclusions of what was previously discussed are presented.

1.2. Sight

As previously established, the concept of taste encompasses the recognition of all the senses involved in each tasting. One of the most relevant is the visual perception, as noted by José Luis Fiorin and Eric Landowski (2000: 18). Both authors highlight that taste begins with the identification of various flavors and culminates in the definition of aesthetic judgments (values) regarding food. Consequently, the study of taste necessitates the consideration of its aesthetic dimension, as it influences the acceptance of a dish in relation to the societal ideals associated with it (Castoriadis 1975). Fiorin and Landowski (2000), whose ideas have been consistently referenced in this chapter, further emphasize that taste is a social construct that reflects culturally accepted norms (*ibid*., p. 26). Moreover, these authors underline the subjective component of culinary pleasure, which, as has been previously discussed, is crucial to observe as a *continuum* spanning between individual and social acceptance. According to their research, when individuals taste food an emotional, passionate, and affective experience distinctly emerges (*ibid*., p. 111). Once again, through these concepts, the fundamental notion of the taste experience arises, thus determining the range of emotions encountered by individuals based on their personal history with taste.

On the contrary, Marrone (2000) underlines in an academic essay within the book edited by Fiorin and Landowksi (2000) a significant correlation between taste, the sensory faculties involved, and the key components of the oral cavity as a biological mechanism, facilitating the discernment of various flavors. Specific regions of the oral cavity enable humans to perceive sensations of bitterness, saltiness, and sweetness, which are predominantly recognized through the sense of touch when direct contact is established between the object and the mouth. This phenomenon has been elucidated within Peirce's semiotic model, framing it as a taste process that highlights the aspect of *Secondness* (CP 1.325). According to Marrone (2000), this human capacity to detect and discern different flavors relegates the primal biological imperative of survival to a subordinate position, as food preferences form and evolve based on both taste memory and cultural influences. This would elucidate why individuals often gravitate towards indulgent yet unhealthy dietary choices that align with their cultural and personal inclinations. In cases where strict dietary regimens, such as those adopted by athletes, guide food selection

based on the caloric requirements of specific activities, it is essential to acknowledge the intertwined nature of cultural and ideological factors. It is worth noting that even in such situations, individuals are inevitably influenced by cultural parameters when determining their dietary preferences. Marrone (*ibid*., p. 175) additionally underscores the significance of taste and its intrinsic affective predisposition, characterized by an emotional component when evaluating and choosing foods based on their aesthetic appeal.

Within this realm of research, it is essential to highlight the investigation conducted by Mazzocut-Mis (2015), where emphasis is placed on the Aristotelian classification of the senses, delineated into high and low categories, with scent acting as a mediator between the two. It is pertinent to note that the author challenges this categorization, which has since faced several critiques. In relation to these assertions, there is an absence of a hierarchical arrangement among the senses. Conversely, the senses of sight and hearing are activated by engaging with other components. The author notes that taste is associated with a more basic form of pleasure, specifically the act of eating (*ibid*., p. 15, 16). Furthermore, it is stressed that the understanding of what constitutes a dining experience is unique to humans:

> Enjoying food and drinks for their own flavor, enhanced by proper preparations and cooking, but also for the aroma they emanate, the tonality of colors, and the presentation that delights the eyes, the different consistencies and fragrances that also involve tactile and auditory sensations. Therefore, the pleasure of the table is a multisensory pleasure (*ibid*., p. 54, 55, my engl. trans.).

This type of reflection is in congruence with the aesthetic concept of gastronomy and falls within the realm of social repulsion, which is an area of specialization for Stano (2017). Stano examines instances of food decomposition and identifies the specific elements that are considered unappetizing. However, the acceptability of certain decomposed foods varies depending on the cultural context, as observed in the case of given dairy products and cheeses. Regarding the exploration of aesthetic considerations in gastronomy, Parret (2004) provides valuable insights into aesthetics defined by sensory qualities. Parret analyzes the act of wine tasting and establishes an association between colors and flavors. For instance, a brighter color is associated with a more acidic taste, with the understanding that this analysis is specific to wine (*ibid.*, p. 92). This finding underscores the significance of visual perception and its influence on personal predispositions during the act of tasting. Furthermore, it indicates an awareness developed through experience, which may not be accessible to all individuals consuming the beverage. However, with increased expertise, one can attain such a perspective.

This analysis perfectly aligns with what Peirce refers to as "*Firstness*" (CP 1.302), as it suggests that as individuals acquire more knowledge, a range of potential interpretations related to the recognition of the color of the drink become available. The incorporation of the visual aspect into the semiotic interpretation of taste is a significant aspect of this perspective. Another intriguing element in Parret's analysis is the application of Peirce's triadic semiotic framework and the function of the index to emphasize certain features of wine.

Moreover, another scholar who discusses the role of wine tasting in relation to the indexical aspect is Michael Silverstein (2003: 222). Silverstein argues that during the aesthetic experience of tasting, the actual aesthetic object becomes less prominent. He explains that a moment of ritualized interpretation can be identified when the aesthetic sense of the object being tasted is revealed. Silverstein suggests that when speaking about wine experience, the aesthetic object is approached through a static structure of the senses, allowing each sense to encounter different dimensions (*ibid*., p. 223). According to Silverstein, this process involves a visual stage where the appearance, color, and overall structure of the wine are observed; a moment followed by an olfactory stage in which the aromas of the wine are detected. Ultimately, during the aesthetic encounter of the tasting experience itself, the characteristics of a given wine are assessed through bodily reactions, such as the perceived roughness from tannins and the level of acidity. This experience aligns with Peirce's concept of experience, as it involves a continuous transition from *Firstness* (CP 1.302) to *Thirdness* (CP 1.26), particularly in terms of recognizing the various attributes of the wine, with an emphasis on the visual sense. In the case of taste specialists, such as wine tasters or gastronomic critics, Peirce's perspective suggests that we are dealing with a *habitus*: a combination of dispositions, habits, and embodied cultural knowledge that shape an individual's preferences:

> What the habit is depends on when and how it causes us to act. [...] Thus, we come down to what is tangible and conceivably practical, as the root of every real distinction of thought, no matter how subtle it may be; and there is no distinction of meaning so fine as to consist in anything but a possible difference of practice. [...] Thought is an action, and that it consists in a relation (CP 5.399).

In order to comprehend and classify the sensory encounter related to taste, it is imperative for an individual to cultivate a form of *habitus*. Through deliberate training, the act of tasting molds the discerning abilities of gastronomic critics, enabling them to attribute specific significances to the objects being tasted. According to Claudio Paolucci (2021: 18), within the realm of taste analysis, it can be detected an institutionalization and standardization of the

tasting process, deeply rooted in a specific cultural context. However, it is important to acknowledge that these processes are subjectively influenced by the sensations evoked on the individual's tongue upon direct contact with the object of interest. The underlying premise of these processes is the "acquisition of interpretive habits that provisionally connect personal bodily taste sensations with socially established categories" (*ibidem*). As such, in order to classify the elements being tasted, the ability of a sommelier lies in establishing connections between the subjective experiences and its juxtaposition against societal experiences. As stated by Paolucci (2021), these instances involve the interplay between cultural norms and habits that generate an implicit "discourse" within the sommelier's individual and subjective "discourse", which is always interwoven with the enunciating instances of others (*ibid*., p. 19). This represents the central relationship when analyzing taste experiences and the *habitus* that arises from them. It is imperative to bear these concepts in mind when examining related cases and understanding their implications in relation to artificial intelligence, and to the emergence of new tastes.

On the other hand, Perullo's research (2016) elucidates the significance of the aesthetic aspects of food within the field of gastronomy. Aesthetics plays a pivotal role in stimulating the sense of sight and, above all, in enhancing the somatic perception associated with gastronomy, thus becoming an integral component of the synesthetic concept of taste. As such, aesthetics is conceived in this thesis as an academic and scientific discipline that investigates sensory knowledge, exploring perception and the manner in which its influences on the subject's environment extend beyond visual contemplation. Once again, this means delving into an analytical approach that requires a separate examination of each sense, in order to comprehend the varying degrees of prominence experienced simultaneously during the tasting experience.

> Taste appears unreliable from the point of view of science (at least since it, distinguished primary qualities from secondary qualities, operates mainly through analysis and measurement) because it is activated through a sensitive contact and is introjected, mixing with us and thus becoming our body. Furthermore, it opens up the field of pleasure and enjoyment: it is that object in which necessity and pleasure mix together, risking to get confused and to cancel the distinction between necessity and desire, with the consequent assimilation of humanity to animality (Perullo 2011: 74, my engl. trans.).

In conclusion, as stated by Perullo (2011), the easiest approach to induce desire in food involves an aesthetic and taste imagery, a method which elucidates the complexities surrounding the definition of taste. Chiara Vigo (2004) further underscores the significance of

aesthetics in culinary pursuits, as future cuisine primarily emphasizes its visual aspects. Drawing on this notion, Appiano (2012) advocates for the importance of the "visual appeal" in food, thus transforming food consumption into a communicative and aesthetic phenomenon. Food is more an object of pleasure rather than mere consumption, an object which satisfies both the gaze and the palate, thus not having just a nutritional purpose (*ibid*., p. 140).

Considerable research has been dedicated to food representation, primarily through the lens of photographic systems. This holds great significance in the field of semiotics, given that the notion of representation puts a particular emphasis on the visual dimension of a text. Hence, Stano (2018a) contemplates the significance attributed by various media platforms to the portrayal of food.

According to Stano:

> Food pornography typically tends to include amateur photographs, not professional ones, characterized by extensive use of various types of filters – which have become easily applicable through numerous apps or devices offered by social media platforms (*ibid*., p. 3, my engl. trans.).

A fundamental concept that we need to delve into is the phenomenon known as *foodporn* (Allard, David 2022). In this context, the significance of this phenomenon in the realm of media is accentuated. Through the utilization of images, a connection to the sensory and provocative aspects of food is established, thereby giving rise to the term itself, which aims to elicit pleasure and a desire to taste the depicted dishes in those who view the images. Consequently, there are instances where the sensual and culinary dimensions are explicitly intertwined, while in other cases, the focus shifts towards the food itself as the object to be savored. In the present analysis, our attention will be directed towards the latter scenario. The fundamental characteristics associated with the concept of *foodporn* are further elucidated by Cambre and Sicotte (Allard, David 2022), who claim that "foodporn amalgamates food and sexuality in a manner that is skewed, symbolic, playful, humorous, and ironic, yet it remains a powerful force" (ibidem.: 71, my translation).

These definitions lead us to another crucial concept, which is the notion of *filter.* We engage with this concept in the subsequent section of our thesis, as it arises not only from a technical perspective concerning the visual aspect of foodporn, but also emphasizes its role as a cultural filter, closely tied to considerations of what is deemed acceptable to taste in different cultural contexts. In relation to the concept of filter, Massimo Leone (2016) draws a parallel by

analyzing the veil as a filter: this research revolves around the captivating quality of the veil and the inherent impossibility of fully perceiving what lies beneath it. These notions are therefore representative of a key characteristic of filters: on one hand, they allure, attract, and capture attention, yet on the other, they restrict the viewer's access to complete and unfiltered information. In such a light, we recognize the fundamental role of this element when considering taste analysis and the social filters that exist from both a societal and individual perspective.

In order to comprehend the images that are generated when contemplating the preparation of a dish, it is essential to consider Greimassian semiotic theory (1987; 1984) for analysis. The study of images through the lens of plastic and figurative semiotics is central, as plastic semiotics implies a second language - a metalanguage - that establishes a reconfiguration of visual material. Conversely, figurative semiotics focuses on the representational function of the image. Therefore, we acknowledge that both aspects are integral to the analysis of images and constitute an essential part of the taste experience. In the subsequent section of the thesis, we delve deeper into the analysis of images using this semiotic theory, as all contextual elements leading up to the tasting of a dish condition the sensory perception.

This visual aspect holds centrality as it serves as a guide to the social imaginary (Castoriadis 1975) of how the final dish will unfold, thus exerting a clear influence on the ultimate perception of the dish. While this analysis has traditionally been employed to understand gastronomic images, from Barthes (1964) to contemporary authors such as Marrone (2022; 2016; 2015; 2014) and Stano (2015), we firmly believe that this type of analysis is indispensable in comprehending the representation of dishes created by artificial intelligence. We provide examples and conduct a detailed analysis in the subsequent section of our thesis. Within Algirdas Julien Greimas' theory (1984), we specifically focus on the relationship between visual semiotics, particularly figurative semiotics, which inherently involves the representation of objects, and the artificial aspect that arises through the construction of visual images.

As Greimas (1984) emphasizes, the semiotic aspect in the analysis of images is crucial since it enables the comprehension of the system of meanings:

> The choice of the term 'semiotics' to designate the field of exploration that we seek to establish is not innocent: it implies that the doodles covering the surfaces used for this purpose constitute meaningful sets and that collections of these sets, the boundaries of which remain to be specified, are, in turn, meaningful systems (*ibid*., p. 6, my engl. trans.).

Hence, the significance of this theory is paramount in the visual analysis of images generated by artificial intelligence, particularly concerning the correlation between the naturalness of depicted objects in these images and the potential hyper-artificiality of their representation. Examining this aspect is crucial for understanding the implications of encountering objects in a figurative context that exhibit a heightened artificial quality, especially when devoid of any reference to artistic or abstract conceptualization, as emphasized by Greimas (1984: 11).

> Iconic representation systems, it is said, are different from others because the recognizable relationship between the two modes of "reality" is not arbitrary but motivated. It presupposes a certain identity, total or partial, between the traits and figures of the represented and the representative. Under these conditions, and despite the refinements that centuries of reflection have brought to the concepts of "imitation" and "nature" (*ibid*., p. 8, my engl. trans.).

While in these cases, which will be later analyzed, we are dealing with a motivated type of representation, observed from the moment the user indicates through the linguistic system the input to generate these images, it is crucial to question why the relationship between "natural" and more artificial representation comes into play. This is due to the differences that we find and delve into regarding the images of a dish and the images of the same dish created by artificial intelligence.

Regarding the importance of culture and the concept of the social imaginary (Castoriadis 1975), Greimas emphasizes the form of representation of objects that depends on each culture where the subject creating the image finds himself and towards whom the image is directed. This is a fundamental notion that needs to be applied in the case of artificial intelligence, as it is characterized as a constant non-space and non-temporality due to its feature of having a database generated by globalization. Obviously, in a specific case, it can be determined which country's dish is desired and where the inputs generated to create the final visual product come from. From a more abstract perspective, this issue could be observed as a non-space and non-temporality. Greimas (1984) regarding social aspects of the visual aspect states that:

> Each culture having its own "worldview" also imposes variable conditions on the recognition of objects and, at the same time, on the identification of visual figures as "representing" objects in the

> world, sometimes content with vague schematics but occasionally demanding meticulous reproduction of "truthful" details (*ibid*., p. 9, my engl. trans.).

The relation between the worldview of the cultures creating inputs for artificial intelligence and the cultures of the users employing these devices is crucial to understanding the dynamics of artificial intelligence operations, the creation of the database, and the inputs. This aspect will be addressed in greater depth in the second part of this thesis.

One of the studies upon which this thesis relies to analyze both the pictures in media reports mentioning the news about artificial intelligence and gastronomy and the pictures generated by artificial intelligence of typical foods from the countries providing such news will be examined considering Maria Giulia Dondero's (2004) considerations. One of the important aspects is the plane of representation of the images to reach the plane of enunciation. In this articulation, there is a dimension of space and time for both the enunciation and the enunciate. This relationship in the images created by artificial intelligence is formed differently, as the enunciator would assume the same temporal space as the enunciate. The enunciate does not exist without the presence of the enunciate because they are created based on the inputs provided by the subject to artificial intelligence. As Dondero (*ibidem*) establishes:

> Here, the configurations of objects, their topological arrangement, chromaticism, particular lighting, and texture manage to challenge how different modes of the sensible participate in vision. According to the logic of sensation, and no longer of representation (Deleuze), the presence of food becomes an "experiential figure", causing the image not only to be a message for our gaze but also compelling the observer, as an "eye-body", to "consume" it through smell, taste, and touch (*ibid*., p. 4, my engl. trans.).

Although Dondero (2004) does not specifically examine images generated by artificial intelligence, there are significant considerations when analyzing such images. In terms of Peirce's concept of the *final Interpretant*, the primary objective of food images is to elicit an experience of consumption. In an image depicting a dish not created through artificial intelligence, Dondero (*ibidem*) discusses the significance of "what is depicted in these images is not merely the physical food item itself or its packaging, but, through the implementation of a tasting program, its potential flavors and aromas" (*ibid*., p. 5, my engl. trans.). These concepts are revisited in the latter part of this thesis during the examination of the images.

Another prominent aspect of discussion is the methodology employed to interpret these images. Dondero (*ibid*., p. 10, 13), referencing the methodologies of Krauss (1990), Panofsky (1955), and Schaeffer (1987), underscores the concept of the "ready-made" effect, which is not manifested in the same manner in images generated by artificial intelligence.

Moreover, a significant element in Dondero's analysis (2004) is the concept of *débrayage*, derived from Greimas' semiotics dictionary (1986).

> This passage obliges us to acknowledge the existence of three autonomous dimensions of narrativity: the pragmatic dimension*, the thymic dimension*, and the cognitive dimension*. Consequently, we are invited to distinguish three types of subject-actants. Alongside pragmatic subjects, thymic and cognitive subjects are encountered in discourse, appearing either in syncretism, as autonomous actors, or in the form of implicit positions (such as the observing actant). The enunciative act itself can be described according to this tripartition: a pragmatic act (verbal, plastic, etc.), a thymic act (emotions, subjective opacity of discourse, evaluative choices), and a cognitive act (the organization of knowledge and knowledge-sharing). It is thus appropriate to anticipate ***three types of pragmatic débrayage***, allowing enunciation subjects to speak, to enunciate within the statement; ***thymic débrayage,*** which differentiates evaluations, affective reactions of enunciation subjects from those of enunciation; and ***cognitive débrayage*** (*ibid*., p. 61, emphasis in the original, my engl. trans.).

The definitions are fundamental for the examination of the visual properties of images generated by artificial intelligence. In addition, Greimas (1982: 87, 90) introduced another significant concept for such analysis, namely *disengagement*. *Disengagement* denotes a process that locates individuals within a specific space and time in expression. It involves the enunciative instance projecting categories associated with its foundational structure (individual, time, and space) beyond its own realm to establish the foundational elements on which discourse relies. This process is essential in assigning individuals a distinct space and time, which holds significance when analyzing images produced by artificial intelligence.

1.3. Smell

Regarding the classification of senses, Mazzocut-Mis (2015) criticizes an outdated categorization that considered taste as one of the "lesser" senses due to its association with the mouth, palate, and its connection to basic pleasures related to eating, activities that were traditionally viewed as lacking intellectual merit (*ibid*., p. 15, 16). This classification has faced significant criticism, highlighting the previous undervaluation of the sense of taste.

The first aspects of the sense taste here addressed are the ones connected to the sense of smell. Smell, being one of the senses primarily associated with matters of taste memory (Boutaud 2011), was also emphasized during the interview conducted with the expert in artificial intelligence applied to gastronomy, Expert 3. This aspect is explored further in the second part of this thesis. An example that is associated with the sense of smell can be found in perfume advertisements, where a connection between the perceived smell and the activation of a specific memory is evident. This can be analyzed from Peirce's perspective where we move from *Firstness* (CP 1.302) representing all the possibilities of smells a human can perceive, to the concrete smell detected by the individual, *Secondness* (CP 1.325), and eventually reaching *Thirdness* (CP 1.26). Considering Boutaud's analysis (2011), if a person does not reach *Thirdness* (CP 1.26) in the case of the sense of smell, it is because the recognition of the smell is not linked to taste memory. In the context of perfumes, there are different stages of odor recognition. When an individual detects and classifies a smell as a perfume, there is an untrained *Interpretant*. In such cases, when a person recognizes a perfume and categorizes it as such, they reach a *Thirdness* (CP 1.26) because they classify that smell as a perfume, but it is a limited type of classification. As Paolucci (2021) asserts, cognitive processes can lead to different levels of *Interpretant*, but the ability to have more information about that smell comes from *habitus*, a constant knowledge derived from the subject's previous experiences. This constant training is essential, especially for experts in gastronomy or sommeliers.

Hence, in this context classified as inferior, training is necessary to enhance the specificity of *Thirdness* (CP 1.26). Additionally, the crucial factor is that this sense is easily linked to the subject's memory. The more experience an individual has in detecting certain types of aromas and smells, the more information they can gather. The greater an individual's proficiency in discerning various types of aromas and scents, the greater the amount of information they can ascertain. Consequently, there are varying degrees of interpretation. Another level of interpretation relevant to the present research theme becomes apparent in the case of scents in the case of smells associated with foods. In these instances, interpretation encompasses not only memory but also the circumstances surrounding the initial consumption of the specific dish. This cognitive process mirrors the instance when a specific perfume triggers reminiscences of someone from a person's past, such as a childhood fragrance. In summary, the significance of the olfactory sense lies in its strong connection to memory, the subject's experiences, and personal associations. It evokes recollections from one's past, often linked to a sense of nostalgia. Given the finite capacity of human memory, in stark contrast to artificial

intelligence – this topic is delved deeper into in the second part of this thesis – the brain tends to retain memories of scents associated with tied to moments of personal significance.

Indeed, in the case studies of this research, the sense of smell, particularly when associated with food, emerges as one of the primary sensory faculties engaged during a taste encounter. As Paolucci (2021) notes, gastronomic critics have a more trained ability to discern the multifaceted components at play during a tasting experience.

Therefore, each of our sensory faculties provides distinct interpretive levels that undeniably hinge upon an individual's unique taste encounters. What makes this intriguing is observing this transition when grasping the functioning of artificial intelligence specifically with regard to the digital reproduction of aromas and scents. The digitization of these sensory attributes constitutes an initial step towards artificial intelligence forging a novel sensory experience.

One of the relevant case studies preceding the integration of artificial intelligence is that of the electronic nose. This device, designed to resemble a human nose, is capable of detecting the chemical constituents of various ingredients. Issues related to the simulation of the human body in technological advancements will be further considered in the latter segment of this thesis. Initially devoid of artificial intelligence, the primary objective of this device was to comprehend the chemical makeup of each ingredient, a task unattainable by the human olfactory system. Consequently, the intention was to augment sensory capabilities, enabling the machine to engender diverse levels of olfactory perception, in Pierce's terms.

According to Manuela Baietto and Alphus Wilson (2009), electronic noses "were designed to mimic the olfactory system of mammals within an instrument designed to obtain repeatable measurements, allowing for the identification and classification of aroma" (*ibid*., p. 2). This research explores various applications of the electronic nose in relation to food. According to the authors, the electronic nose can be used to determine if an ingredient is in an inedible state, as this possesses the capability to ascertain whether an ingredient is unfit for consumption, as it is adept at detecting the condition of each ingredient. This research is closely tied to matters of food safety due to health concerns, as certain chemical molecules emitted from ingredient aromas have been identified as potential triggers of health issues, such as cancer, in humans. Consequently, a fervent quest exists for machines that can detect elements imperceptible to humans, with the aim of enhancing the quality of food, particularly in addressing health-related apprehensions. The discrepancy in interpretation between the machine and humans lies in their divergent primary objectives, which are directed by human

requirements. The machine's purpose is limited to detecting, describing, and classifying chemical components. Unlike humans, it lacks the ability to associate these components with specific memories as its objective does not seek to emulate human functionality in this regard. However, a form of learning is involved, as certain chemical components are linked to the potential to trigger specific health issues, such as cancer in humans. The aspect of *machine learning*, within the realm of artificial intelligence, is further explored in the latter part of the thesis.

A further analysis that mentions the application of the electronic nose is Andrea Pivetta's (2012). The author explains that this specific device is being used to improve to improve food ingredients widely that can be commonly found in many types of meals, for example, in order to test the quality of olive oils, for instance. Due to its functionality that goes beyond that of a human nose, it can detect certain components harmful to health. To explain the functioning of the electronic nose, Pivetta (*ibidem*) mentions the idea of replacing the sense of smell by imitating the form of human suggests of replacing:

> The goal is to develop an EN capable of imitating the human olfactory system, the peculiar feature of imitating and characterizing the human nervous system, the ability to gain experience from examples. The imitation of the human nervous system has led to the development of methodologies, algorithms, typically implemented on computers, known as 'artificial neural networks' (*ibid*., p. 94, my engl. trans.).

In these instances, the introduction of algorithms to the device initiates its utilization in conjunction with artificial intelligence. Consequently, artificial intelligence is provided with a specific outcome, enabling it to accumulate knowledge and discern whether the oil contains components that pose no harm to humans. However, as previously mentioned, the operation of artificial intelligence will be expounded upon in the subsequent paragraph of the thesis. This suggests a specific understanding associated with the concept of food literacy (De Iulio, Kovacs 2022).

According to the authors:

> Knowledge about food is relayed by medical books, textbooks, film strips, the professional press, cookbooks as well as by blogs, internet forums, websites and social networks. In addition, the written and visual forms and genres used to disseminate this knowledge are also very diverse, ranging from institutional directives to scientific reports, from petitions to 'faqs', from computer graphics to press releases (*ibid*., p. 14).

The database that artificial intelligence utilizes to produce specific outcomes is constructed by observing and translating various elements.

Moreover, Sara Spinelli (2011) also scrutinizes the utilization of the electronic nose in evaluating the caliber and flavor of olive oil. Thus, it is established that, in order to comprehend the taste of a particular food, the concept of synesthesia resurfaces as a fundamental factor in understanding all the senses that influence and comprise that taste. According to Spinelli (*ibidem*), the adoption of this technology is imperative in appraising the quality and flavor of olive oil.

> That cannot be summarized in a 'detection' of perceptual or sensory values (for example, in terms of salty, sweet, bittersweet, etc.). In reality, what is perceived (the value) is the value that is attributed (how it is evaluated, how it is appreciated, that is, the 'value of the value') (*ibid*., p. 74, my engl trans.).

Hence, it becomes imperative to comprehend the various dimensions that warrant consideration when analyzing the taste experience. The issue of value within the value, as highlighted by Spinelli (2011), pertains to the determination of what responses would be deemed acceptable or unacceptable within a particular cultural framework, in light of the predetermined objectives established for artificial intelligence. This deliberation is essential in determining the suitability of specific ingredients for a taste experience. It is worth noting that, in such instances, the suitability of ingredients for a taste encounter entails their potential impact on health. This consideration, however, omits other facets that we have addressed throughout this thesis. Consequently, it becomes evident that certain mechanisms underpinning the taste experience may be compromised when subjected to the imperatives imposed upon artificial intelligence, a matter we shall elaborate upon in the subsequent section of this thesis.

On the contrary, it is noteworthy to emphasize the recent study conducted by Helen Papagiannis (2017: 55) concerning olfactory matters. Papagiannis elucidates *Google's* interest in integrating an electronic olfactory system into its operations. This particular application leverages a vast database containing over 15 million aromas from various regions across the globe. The objective of *Google Nose* is to detect scents and correlate them with the emotions of individual users, ultimately providing tailored recommendations for locating restaurants with desired aromas. Consequently, this statement once again addresses the interrelation between the sense of smell and the recollection of taste. As stated by Papagiannis (2017), the sense of smell and taste "are the singular senses directly linked to the limbic system of the brain, which

governs emotions and memory. Smell and taste possess the unique capability to evoke exceptionally personal narratives, memories, and emotions" (*ibid*., p. 55). From this perspective, it is clear that the connection between aromas and human emotions is intricately intertwined with an individual's cultural taste memory. *Google's* endeavor portrays an artificial intelligence capability that elicits a more sentimental response from users, neglecting the health-related aspects associated with food consumption. Nevertheless, Papagiannis (*ibid*., p. 63) elucidates the *Nourished* project, which aids individuals in selecting appropriate foods based on their specific health conditions, such as allergies, intolerances to particular ingredients, or adherence to specific dietary choices such as vegetarianism, veganism, or sports nutrition.

Therefore, in these instances, we can discern a deliberate endeavor toward full immersion through the integration of artificial intelligence. This integration is manifested in two crucial dimensions: the user's sentimental and taste recollections, as well as considerations surrounding health concerns. This specific discourse asserts that these technological advancements are intended to enhance our overall quality of life. These essential aspects are further explored in the subsequent section of the thesis.

1.4. Touch

The subsequent sensory experience here investigated within the realm of taste is the tactile sense. Analogous to the sense above, when juxtaposed with human perception, Peirce's experiential framework reveals a multitude of varying interpretations. The relevance of this specific sense lies in its ability to discern the temperature and texture of the food being consumed, particularly in the act of eating. While the tactile sense is typically associated with the human hand, in this specific context, its significance is more closely tied to the oral cavity. According to Peirce's perspective, a state of initial impression exists (*Firstness*), prior to the act of tasting, which is restricted by the object of our desire to sample (CP 1.302). The final tactile attributes of a dish, such as its desired crispness, are contingent upon the selection of food and the employed cooking technique. It is worth noting that our expectations regarding the texture and temperature of a specific dish are greatly influenced by societal conceptions (Castoriadis 1975), as well as our individual experiences and recollections as diners.

Another factor that determines and impacts the tactile sense is the choice of the object used for tasting, as well as the manner in which it is presented on the plate, or even without a plate. These factors significantly contribute to and establish a lasting impression of the taste of the object being consumed. This is one of the reasons why certain dishes should be sampled

with specific utensils. Naturally, each aspect that influences the proper enjoyment of a particular dish is shaped by cultural factors and the intricacies of the dish itself. At the very moment of contact between the object and the mouth, what Peirce refers to as *Secondness* (CP 1.325) comes into play. This entails the transition from the potential diversity of textures and temperatures to a specific experience determined by the direct contact with the object. Subsequently, this process leads to a stage of *Thirdness* (CP 1.26), whereby individuals, with increasing experience, develop a more comprehensive and intricate classification of this *Thirdness* (CP 1.26). It becomes evident that each sense necessitates a distinct level of competence, or what we previously termed as the *habitus*, enabling individuals to attain varying levels of interpretation.

Within each category of culinary preparation, varying degrees of sensation are associated with the act of tasting. Let's think for instance, within the realm of frying, to different and yet overlapping methods of cooking tempura, with each variant having an impact on the tactile aspect. In Bourdieu's seminal research (1979) on gastronomic preferences, an individual's acceptance within a particular social group is determined by their familiarity with diverse cooking techniques. Therefore, it can be asserted that all these understandings are inherently and inextricably linked to the cultural milieu in which an individual finds himself and operates. In the second section of this thesis, the interviews conducted with chefs shed a light on specific instances, in which even the way of slicing and dicing the ingredients can significantly influence the tactile dimension of the culinary experience. Each level of intricacy implies a *habitus*, thereby facilitating a comprehensive account of all the constituent elements that ultimately contribute to the final outcome when undertaking a tasting experience. The tactile sense also encompasses a sense of taste memory (Boutaud 2011), which fundamentally shapes one's anticipation of particular temperatures or textures when encountering a dish. Consequently, when contemplating the application of artificial intelligence in the creation of new tastes experiences, it becomes mandatory to effectively translate these findings derived from the tactile realm in order to achieve a taste encounter akin to that which is associated with the consumption of specific culinary creations.

With regard to the more technological aspects, it is worth to address the study conducted by Raúl Urueña (2004), which emphasizes the necessity for humans to develop specialized devices for detecting the state of food. For this reason, electronic tongues have been devised to categorize various textures based on input data provided to artificial intelligence. As stated by Urueña (*ibidem*), "these instruments usually consist of several components, an automatic

sampler, a set of chemical sensors of different specificity, instrumentation to acquire the signal, and software with the appropriate algorithms to process the obtained signal" (*ibid*. p. 38, my engl. trans.). Each electronic tongue incorporates numerous sensors that serve as samples and establish parameters for recognizing texture, temperature, and individual flavors. In order for the device to attain a level of proficiency that enables it to detect these parameters, it is imperative to program algorithms that, through mathematical parameters, discern the outcome of each ingredient. Therefore, an analogy can be drawn between taste cells and chemical sensors, a connection that we explore extensively in the latter section of this thesis wherein we analyze the interplay between human beings and machines. Hence, it is imperative to contemplate the shift from taste as a mere sensory perception, a task relatively straightforward for a machine to mimic, to the nuanced notion of the gustatory encounter, encompassing a myriad of factors that influence it.

1.5. Hearing

The subsequent sense here scrutinized is hearing, which undeniably affects the taste experience. In the realm of analysis, two distinct factors concerning the auditory sense come into play: one pertains to the internal process of a taste experience, while the other primarily relates to the environmental setting in which the tasting occurs.

In the first instance, when considering the internal aspect (i.e. the stated object in the mouth), this focus lies on the auditory aspects that occur during the act of tasting. This encompasses the identification of the sounds produced by the act of chewing the object and the subsequent process of swallowing. Additionally, attention is directed towards the sounds originating from the digestive process within the stomach as the tasted object interacts with our body. These auditory elements are contingent upon the specific composition of the dish and are further influenced by the cooking techniques employed. Although it may prove challenging for individuals to consciously concentrate on these sounds during the act of tasting, they nonetheless form an integral part of the overall taste experience. Another internal sound that is discernible is the contact made by the mouth with the utensil being utilized for tasting. For instance, if a fork is being used, the sound produced by the metal touching the teeth will be more pronounced compared to the contact made by a wooden chopstick typically used for sushi. Therefore, we observe a distinct relationship between the object being tasted and the accompanying sound emanating from within our body. In the second case, we encounter the soundscape inherent to the environment in which the tasting occurs. This contextual factor, as

mentioned by Boutaud (2011), highlights how the setting of the table contributes to the association of ambient sounds with the overall taste experience. The auditory encounter differs, thus implying that partaking in a meal at a friend's residence elicits a distinct auditory experience compared to dining in a restaurant.

Within the realm of external auditory stimuli, one may discern the auditory manifestations associated with the process of culinary food preparation. When it comes to the act of frying, for instance, it is evident that the auditory emissions are considerably more pronounced, as implied by the very term. In this specific culinary endeavor, an intriguing linguistic correlation emerges wherein the nomenclature employed seeks to emulate the sound that originates from the act of frying food. This linguistic phenomenon can be observed in various languages such as Spanish "fritura", Italian "frittura", Portuguese "fritar", French "friture", and English "frying". Likewise, a comparable linguistic phenomenon can be recognized, albeit pertaining to the tactile quality of the culinary creation, as evidenced by the usage of the term "crocante" in Spanish, "croccante" in Italian, "crocantes" in Portuguese, "croustillant" in French, "crispy" in English, and "knusprig" in German. All these terminologies, employed to connote a particular cooking method and the resulting texture of the dish, center around the external auditory sensations engendered by the cooking process itself or the internal auditory impressions experienced upon consumption of said dish. Hence, it becomes apparent that the sonic attributes associated with the preparation of a dish play a determinative role in its nomenclature.

Moreover, it is worth noting that the auditory stimuli generated during the culinary process establish a sensory imprint in the human psyche, allowing individuals to recognize and envision the sensory characteristics of the dish under preparation. This phenomenon is made possible through the application of Peirce's concept of experiential knowledge. Another significant sonic encounter in every taste experience, whether encountered within a dining establishment or a private setting, is the auditory output generated by the plates and utensils employed.

Furthermore, when considering the environment in which the tasting takes place, it is noteworthy that chefs emphasize the significance of carefully selecting the accompanying music, which should align with the theme of the restaurant. This observation is consistent with the analyzed news articles on artificial intelligence and gastronomy.

To analyze the auditory ambiance during a tasting, we employ Murray Schafer's concept of soundscape, which encompasses the acoustic environment. However, capturing all the

sounds produced within this study poses a significant challenge. According to Schafer (1993: 25), a soundscape "consists of events heard, not seen objects". Thus, the study of sound presents inherent complexities. Schafer (1993) suggests that it is imperative to identify indicative elements within a soundscape. In the present case study, the identification of important sounds depends on the specific location of the tasting and the elements that influence gustatory perception.

According to the author's classification, the background music heard in a restaurant can be categorized as a tonic-type sound. While it is associated with the music in the context of tasting, it does not take on a central role. Furthermore, in restaurants, the background music that is played aligns appropriately with the type of cuisine served. For instance, if one were to visit a Uruguayan restaurant, the background music would likely originate from Uruguay. As Schafer points out, "tonic sounds may not be consciously heard; they are, however, overheard and should not go unnoticed as they inadvertently shape our listening habits" (*ibid*., p. 27). Therefore, in these cases, although the background music related to the restaurant's theme is present, it does not assume a central position but rather creates an environment, with each restaurant selecting music that is characteristic of the cuisine's place of origin. Simultaneously, there is nothing preventing this tonic sound from becoming what the author refers to as "sound signals", which implies a conscious listening when recognizing a specific song chosen for the restaurant. However, in case that the music chosen for the dining experience is the instrumental one (which somehow transports me to the thematic place of the restaurant), it still remains as a tonic sound.

Another example of this dynamic transition can be observed in Schafer's (1993) classification of sounds. Specifically, the sound of utensils used by other individuals within a restaurant can be classified as tonic. However, when a loud noise, resulting from the fall of one of these utensils, is perceived, attention is immediately drawn to that sound, elevating it to the status of a sound signal. The significance of this classification lies in its essential role in the overall taste experience, always intricately intertwined with the environment in which it takes place. Lastly, within this dynamic classification (which we assert is dynamic due to its ability to change based on our analysis), lies the concept of "soundmark". As explained by Schafer (*ibidem*), soundmark occurs when sounds disclose the geographic location of one's surroundings. In the context of tasting, whether in a restaurant or a private setting, the sound of cooking food falls within this categorization. While we may not be able to pinpoint the exact

geographical location, we can certainly assert that we are present to partake in a taste experience, to savor and consume something.

An additional intriguing aspect to consider is the auditory component's influence on the sense of taste, as emphasized by Parret (2004). Parret points out a fundamental distinction between the two senses: while two distinct tastes cannot directly influence each other, the auditory sense can perceive and respond to multiple sounds concurrently. Moreover, he contends that both the sense of taste and the auditory sense possess a critical capacity associated with position and time, which are vital factors to consider in any analysis.

1.6. Taste

In conclusion, this section of this thesis centers on the sense of taste. Although it has been extensively discussed throughout this chapter, this focus in this section is primarily on the biological and psychological factors that contribute to the taste experience. In this regard, taste is closely associated with the mouth and the tongue, as certain regions of the tongue possess inherent biological significance, as they are biologically predisposed to detect certain flavors. It is through these organs that we recognize salty, sweet, umami, bitter, and sour tastes. While this classification has a biological aspect because specific parts of the tongue detect certain flavors, it also has a strong social and cultural classification. The process of cognitive recognition of flavors is essential for the overall tasting experience. To observe this process, we can draw on Peirce's theory of experience, according to which individuals progress from an initial subjective perception (*Firstness*) to a more generalized understanding (*Thirdness*) by classifying tastes as salty, sweet, umami, bitter, or sour. This cognitive process also encompasses a subjective psychological dimension, wherein individuals develop a personal value system that influences their preference for certain flavors and their ability to quickly identify them. It is worth noting that while this process manifests an individual aspect, the range of flavor choices is always influenced by societal factors. Furthermore, the ability to recognize the flavors of all the ingredients in a given meal is honed through personal experience and cultural upbringing. For instance, when consuming a dish from a foreign country, individuals often manifest a decreased ability to recognize and appreciate the distinct flavors of that cuisine due to differences in familiarity and exposure. As individuals refine their palate through experience, they develop *a habitus*. In such instances, perusing the menu and noting the listed ingredients may predispose individuals to identifying familiar flavors associated with specific

ingredients. However, the utilization of different cooking methods and the amalgamation of these ingredients in diverse ways give rise to new flavors, which the palate must adapt to discern in the realm of taste *semiosis*.

Furthermore, this specific aspect, as asserted by Urueña (2004), has been replicated technologically via the implementation of the "electronic tongues"; devices that possess the capability to decipher the taste of individual ingredients by analyzing their chemical components.

In a manner akin to the olfactory sense, Boutaud's (2011) study suggests that the sense of taste is linked to taste memory. The ability to recognize a specific taste allows for the retrieval of significant culinary experiences, rooted in one's personal history. There are certain tastes that are classified as familiar, individualized by the subjective experiences of each individual. Expounding on this distinction between flavor and taste, a comprehensive exploration is undertaken in the second chapter of this thesis.

According to Urueña (2004), in cases where technology is utilized to recognize flavors, there is no direct correlation between taste recognition and an individual's memory, in the context of artificial intelligence. However, as discussed by Papagiannis (2017), it may be conceivable to link a person's culinary memories with specific flavor combinations, thereby prompting the algorithm to suggest novel taste experiences. This concept aligns with the previous discussion on the role of the olfactory sense.

To conclude with the sense of taste, although it allows us to recognize the flavors of each ingredient and each dish, it is evident that it is necessary to consider all the senses that are activated when experiencing a tasting in order to probably complete analysis. Simultaneously, it is essential to shift the focus from perceiving taste solely as a sensory experience to a domain of connotation and importance, a transition that is only conceivable through a deep reflection on the experience of taste.

Chapter 2 – The Taste Experience

Abstract

The aim of this chapter is to explore the relationship between the body, perception, and the taste experience, emphasizing the direct impact of the consumed object on the body. To examine bodily perception, we draw on Maurice Merleau-Ponty's theory (1945; 2014), which deepens the understanding of the relationship between the body and the external world. We integrate this theory with Peirce's semiotics. Merleau-Ponty's argument that sensations always occur as a unified whole is especially relevant for taste, which is inherently synesthetic. However, through Peirce's semiotics, we can also understand the relationship between object, perception, and body as a process of *semiosis*, allowing us to grasp the meaning behind this relationship. From Merleau-Ponty's perspective, we can see that the unification of sensory messages is key to each taste experience.

The chapter also reflects on the human tendency to idealize the past, a characteristic that affects taste experiences by influencing memory and, consequently, perception. Moreover, the chapter discusses how memory creates a system of values, blending the subjective with the social. Boutaud (2011) emphasizes that memory is shaped by the '*food scene'*, which is filled with symbolic relationships tied to each culture.

The chapter concludes by underscoring the importance of the social imaginary (Castoriadis 1975) in shaping what constitutes an ideal taste experience. This social imaginary is influenced by institutions such as the media and education, which idealize taste experiences.

The central argument of this chapter is that analyzing taste requires a broader perspective beyond the senses. Instead, we should examine the meaning and significance of taste as a taste experience. This approach allows for a deeper understanding of the relationships that extend beyond perception and include individual aspects such as taste memory (Boutaud 2011).

2.1. Human Body and Perception

This section delves into the intricacies of taste perception, examining the interplay between sensory experience and corporeal responses. The analysis is framed within Stano's (2019: 149) perspective to facilitate a connection with Peirce's (1839-1914) semiotic framework of experiential understanding, as elaborated upon in this dissertation. Stano (2019) highlights that:

> The body is not only a signifier but actively participates in processes of signification (of the world in which it finds itself, of other bodies, and of itself). This opens up a wide range of issues of strong interest and semiotic relevance, from the problem of the connection between sensoriality and cognition to various practices of body writing (*ibid*., p. 149; my engl. trans.).

The concept underscored by Stano (2019) holds significant importance in elucidating the intricate interplay between the body and perception. In this context, we delve into pertinent factors to be taken into account when deliberating on a taste encounter and its correlation with the body and perception, drawing upon Stano's (*ibidem*) insistence on the necessity of exploring the body:

> Not as a simple place but as the very instance of translation between these regimes—an instance that, precisely due to the translational work it carries out, emerges as the threshold par excellence of semiosis, as it is capable of generating, interpreting, and simultaneously circulating meaning. (*ibid.*, p. 158; my engl. trans.).

These factors prompt an exploration of the phenomenology of perception as expounded by Maurice Merleau-Ponty (1945). The author initially delves into the concept of sensation, which serves as a foundational element in comprehending perception. Sensation is an occurrence within a framework, yet humans tend to prioritize specific sensations emerging within a distinct domain. Moreover, Merleau-Ponty contends that perception inherently carries significance, thereby giving rise to the problematic dimension also underscored by Stano (2019). According to Merleau-Ponty (1945), experience entails a concrete form of perception, aligning with Peirce's semiotics. Peirce asserts that it is through experience that we develop habits and grasp our surroundings. Through Merleau-Ponty's lens (*ibidem*), we concur that experience encompasses an event linked to a reality; according to Peirce's semiotics, every experience is intrinsically tied to a particular tangible entity, thus revealing a shared element

between both theories. Nevertheless, in Merleau-Ponty's theory of perception (*ibidem*), the primary quandary lies in the dichotomy between body and mind, leading to a dualistic perspective.

One of the fundamental aspects in Merleau-Ponty's (*ibidem*) work, which also aligns with the construction of a taste experience, is the notion of the ensemble of sensations in the world that exist external to human bodies. According to the author, individuals attribute meaning to sensations because they are already immanent to the factual elements. However, adopting Peirce's theory of experience, we contend that the sense-making relationship between what is encountered in the realm of sensations and the objects that elicit those sensations is fundamentally established through *semiosis*, primarily facilitated by humans. This is where the recognition of the existence of these elements, which are associated with a specific experience, becomes crucial. Moreover, Merleau-Ponty (*ibidem*) distinguishes between perceiving the characteristics of a specific object, which does not entail knowledge of the object itself:

> To see is to have colors or lights, to hear is to have sounds, to feel is to have qualities: to know what feeling is, is it not enough to have seen red or heard a note? Red and green are not sensations but sensibles, and quality is not an element of consciousness but a property of the object. If we consider it in the very experience that reveals it, quality is far from offering us a simple means to delimit sensations but is as rich and obscure as the object or the entire perceptual scene (ibid., p. 19, engl. trans.).

Upon analyzing this statement, we can observe a distinction between the inherent characteristics of an object that, according to the author, signify specific properties of the object itself. However, Merleau-Ponty asserts that experience merely simplifies the sensations produced by the object and does not entail a genuine recognition of the object in itself. Conversely, adopting Peirce's perspective, we can understand that there are qualities associated with what Peirce describes as *Firstness* (CP 1.302), which encompasses sensations of the qualities inherent in a specific object. This includes the sensations of color, light, and other elements derived from the classification of the object. Recognizing these sensations is crucial for gaining an experience and comprehending the object with which the human body comes into contact. In fact, according to Peirce, the classification of objects plays a vital role in determining their existence:

> All classification, whether artificial or natural, is the arrangement of objects according to ideas. A natural classification is the arrangement of them according to those ideas from which their existence

> results. No greater merit can a taxonomist have than that of having his eyes open to the ideas in nature; no more deplorable blindness can afflict him than that of not seeing that there are ideas in nature which determine the existence of objects (CP. 1.231).

From this perspective, it is imperative to comprehend the taste experience due to its interplay with the objects being tasted, the bodily sensations they elicit, and their subsequent integration into a specific encounter.

The concept proposed by Merleau-Ponty (1945) regarding the notion of field within sensations also resonates in the examination of the taste experience. This is primarily because there is always a multitude of sensations in our body that capture our attention, with certain ones taking precedence over others. This phenomenon is particularly evident in gastronomic critics who undergo training, as noted by Paolucci (2021), thereby cultivating a *habitus* that forms the essence of such practices. Moreover, Merleau-Ponty's idea (1945) also extends to all senses and finds particular relevance in Schafer's classification of sound (1993), where this notion of field is anticipated. It suggests that our body selects which elements to focus on based on contextual factors and expectations. In the case under analysis, as previously mentioned, the expectation of tasting specific dishes highlights that the taste experience relies not solely on taste but on other factors such as the dining environment (Boutaud 2011).

Another noteworthy concept from Merleau-Ponty (1945) to consider when analyzing an experience is the idea of the sensory apparatus. The author explains that modern physiology no longer views the sensory apparatus as solely performing a "transmitter" function, as classical science did:

> The sensory apparatus, as modern physiology conceives it, is no longer suited to the 'transmitter' function assigned to it by classical science. Non-cortical lesions of the tactile apparatus certainly thin out the points sensitive to heat, cold, or pressure, and decrease the sensitivity of the preserved points. But if a broad enough stimulus is applied to the damaged apparatus, specific sensations reappear; the elevation of thresholds is compensated by a more vigorous exploration of the hand (*ibid*., p. 21).

In this outlook, it is understood that the functioning of sensations within the body cannot be solely explained from a physical standpoint. The sensations arising from various stimuli cannot simply be classified as the production of a stimulus equivalent to a message. This understanding is particularly evident in the taste experience. By classifying and analyzing it as the amalgamation of various sensations elicited within the body by an object, one can argue

that different sensory messages collaborate to create the taste experience. This experience therefore leads to a classification according to Peirce's perspective, which is always contingent upon direct contact with the object, thereby resulting in recognition and the emergence of *Thirdness* (CP 1.26).

Within Merleau-Ponty's theory of perception (1945), there exists a certain degree of ambiguity regarding the differentiation of experience. In one part of his theory, he introduces the concept of varying perceptions based on an individual's age. As stated by Merleau-Ponty (*ibidem*), "this means that perception is more closely linked to the local stimulus in its later state than in its early state and is more in line with the theory of sensation in adults than in children" (*ibid*., p. 23). However, there is not a clear explanation of the relationship between age and the form of perception. In Peirce's terms, it becomes evident that lived experience plays a significant role in determining each sensation that constitutes a perception in such cases. From a Peircean perspective, sensation can be categorized as belonging to the realm of *Firstness* (CP 1.302), characterized by the capacity to apprehend sensations from a specific object. On the other hand, in perception, when we refer to the ability to reflect upon the object that has elicited certain sensations, we are dealing with a recognition derived from experience, and we can thus reach *Thirdness* (CP 1.26).

Another element within the theory of perception, as highlighted by Merleau-Ponty (1945), is the notion of distinguishing a particular sense generated through a separation between the environment and the concrete object. Consequently, it necessitates observing both the object itself and the perception it engenders while not placing excessive emphasis on its surrounding environment.

Hence, for the author, the concept of the world surrounding perception is fundamental, as it establishes a distinction between the dualism of the body and the external environment. What is paramount in this research is the notion of considering the environment in which the taste experience occurs, as it influences the final *semiosis* of taste, as previously mentioned. This element can be understood in every sense, such as the context impacting hearing or the concept of *débrayage* with regard to the visual aspect. This *débrayage* becomes crucial not only in relation to the images produced by artificial intelligence, but also in understanding the sense of place where taste is experienced or the setting where one aims to generate a specific photograph or recipe through the use of artificial intelligence.

Returning to the concept of *experience* in Merleau-Ponty's theory (1945), he explains there is an association of ideas "that which recalls past experience can only provide extrinsic

connections, among which it must necessarily be included, as the original experience did not involve others" (*ibid*., p. 27). Within this context, a contradiction arises from this disparity, which the author himself elucidates when contemplating the relationship between age and experience. In this regard, Peirce's framework posits that experiential processes occur through multiple trials and errors over time, leading eventually to attaining *Thirdness* (CP 1.26). We outline a nexus between these two theories since Peirce allows for a more profound exploration of issues related to experience within a framework that emphasizes an ongoing relationship between humans and objects.

Conversely, even if the author revisits this notion of experience and its place within the theory of perception, the relationship between these two concepts remains somewhat unexplained. However, through Peirce's semiotic theory, we can transcend this duality and achieve a better understanding of the functioning of both concepts. According to Merleau-Ponty (1945):

> The sensations and images that should begin and end all knowledge never appear except in a horizon of meaning, and the meaning of the perceived, far from resulting from an association, is instead presupposed in all associations, whether it be the synopsis of a present figure or the evocation of past experiences (*ibid*., p. 28).

Therefore, the idea of the outline or context that determines the horizon of meanings reemerges, whether stemming from the present object or the memory of something experienced. Essentially, this element enables the connection to be made with what typically occurs in every taste experience, generating a range of meanings from the very moment one begins contemplating a taste experience. This process takes place whenever there is knowledge of an element to be tasted, but simultaneously it is conditioned by the information one can gather about the element prior to its actual consumption. These preceding elements also contribute to the taste experience, as they influence it, as discussed in the interview with Chef Expert 1, which will be analyzed in the second part of this thesis. In relation to memories, which are significant and referred to by Boutaud (2011) as memory in the context of taste experience (an element explored in section 2.3 of this chapter), Merleau-Ponty (1945) states:

> The fact is that, to come to completion in perception, memories must be made possible by the physiognomy of the data. Before any contribution of memory, what is seen must presently organize itself in a way that offers me a framework in which I can recognize my previous experiences. Thus,

> the appeal to memories presupposes what it is thought to explain: the structuring of data, the imposition of meaning on sensory chaos (*ibid*., p. 30).

Therefore, it is evident from this assertion that memory, also referred to as *recollection* by the author, unequivocally exerts an influence on both our physical state and the perception of every sensation. In the realm of taste encounters, as well as all other types of similar experiences, memories play a role in shaping the significance and interpretation we assign to each sensory input. Nevertheless, Merleau-Ponty (*ibidem*) introduces the idea that meaning is inherent in perception and somewhat autonomous from actual lived experience:

> If, finally, it is admitted that memories do not project spontaneously onto sensations and that consciousness compares them with present data, retaining only those that accord with it, then an original text is recognized that carries its meaning within itself and opposes it to that of memories: this text is perception itself (*ibid*., p. 31).

Consequently, it can be discerned from this statement that memory (or recollections), do not automatically superimpose sensations; rather, consciousness juxtaposes them with present data and selectively retains only those that correspond with its current state. This dynamic gives rise to an original text that embodies its meaning while contrasting with memories, and this text is none other than perception itself. The challenge of creating a taste experience presents a direct issue. Through the lens of semiotics, it becomes apparent that the meaning of an object is not predetermined by the object itself. The object, in its essence, only triggers sensations such as cold, heat, texture, sound, color, and so on. However, the meaning of the object arises within the framework of taste *semiosis*, taking into account the individual's context and taste memory.

Peirce understands *semiosis* as:

> Yet this does not quite tell us just what the nature is of the essential effect upon the interpreter, brought about by the semiosis of the sign, which constitutes the logical interpretant. (I important to understand what I mean by ***semiosis.*** All dynamical action, or action of brute force, physical or psychical, either takes place between two subjects [whether they react equally upon each other, or one is agent and the other patient, entirely or partially] or at any rate is a resultant of such actions between pairs. But by "semiosis" I mean, on the contrary, an action, or influence, which is, or involves, a cooperation of ***three*** subjects, such as a sign, its object, and its interpretant, this tri-relative influence not being in any way resolvable into actions between pairs. {Sémeiösis} in Greek of the Roman period, as early as Cicero's time, if I remember rightly, meant the action of almost

> any kind of sign; and my definition confers on anything that so acts the title of a "sign".) (CP 5.484, emphasis in the original).

Therefore, it is through this relationship that we can comprehend the meaning and significance of the taste experience, albeit partially contradicting Merleau-Ponty's explanation. It is necessary to incorporate aspects of both theories within the experience to achieve a comprehensive understanding of the phenomenon's complexity, particularly by integrating Peirce's semiotic theory. Another significant element from Merleau-Ponty's theory of perception involves the analysis of objects and their relationship with our bodies:

> In other words, to look at an object means to come and inhabit it, and from there to perceive all things according to the aspect they present to it. But, as I see them, such things remain open abodes to my gaze, and, virtually situated in them, I already see the central object of my current vision from different angles (*ibid*., p. 66).

In the process of engaging with an object and placing it within a certain context, perceptions give rise to sensations that evoke the object's significance. It is essential to note, however, that this does not assert an inherent meaning within the object itself; rather, the manner in which individuals relate to and comprehend an object is influenced by the elements highlighted in Peirce's theory of *semiosis*.

Moreover, Merleau-Ponty emphasizes the body as the central point from which individuals perceive and understand external objects. Consequently, the body's role in the experience of taste is vital, serving as the starting point for perception and the interpretation of each taste sensation. The author argues that by acknowledging the body's significance, individuals can familiarize themselves with the shapes of surrounding objects and provoke sensory experiences. Nevertheless, this reflection brings forth the dichotomy between the body and the soul once again:

> But one could object that this 'experience of the body' is also a 'representation', a 'psychic fact', that, as such, it is at the end of a chain of physical and physiological events and that only these latter can be attributed to the 'real body'. Is not my body, just like external bodies, an object that acts on receptors and finally gives rise to consciousness of the body? Is there not an 'enteroceivitivity' as there is an 'exteroceptivity'? Can I not find in the body threads that the internal organs send to the brain and that are established by nature to give the soul the possibility of feeling its body? In this way, the consciousness of the body and the soul are set aside, the body returns to being that well-

> cleansed machine that the ambiguous concept of behavior was on the point of making us forget (*ibid.*, p. 71).

This reflection delves into the hindrance caused by the aforementioned dichotomy in perceiving perception as a comprehensive relationship encompassing the body, the sensations it undergoes, and the objects triggering them. Such comprehension is pivotal in understanding the taste experience. Merleau-Ponty (1945: 86) underscores that consciousness or experience involves an internal dialogue with the world, the body, and others. It embodies a state of coexistence rather than isolation from them. Consequently, an intricate interconnection forms among the body, experience, and objects, influencing knowledge. In semiotics, this interconnection involves deciphering the significance assigned to each element in relation to one another.

Merleau-Ponty emphasizes the significance of individual senses within perception, making it impossible to completely articulate all senses and sensations experienced internally. This is particularly evident in the taste encounter when identifying the flavor of a specific dish. In fact, gastronomic critics undergo training not only to be receptive to all sensory perceptions but also to effectively communicate the sensations arising from each taste experience to others.

Merleau-Ponty argues that humans cannot grasp the unity of an object without the mediation of bodily experience, thus underscoring the importance of the body in the taste encounter and the exploration of how this process can be interpreted in the realm of artificial intelligence, a topic further examined in the subsequent section of this dissertation. In the author's words:

> The object and my body would indeed form a system, but it would be a bundle of objective correlations, and not, as we said before, a set of lived correspondences. The unity of the object would be thought, and not experienced as the correlate of that of our body (*ibid*., p. 165).

Hence, it is within this context that the significance of lived experience in comprehending the bodily sensations and their role in the taste experience becomes apparent. The author argues that our perception of the external world is intimately connected to our body. Furthermore, each external perception is equivalent to a bodily perception, and these perceptions are expressed through a language external to our body. This necessitates a translation process between the sensations experienced by our body and the language used to explain and rationalize them. In summary, the author posits that every object can only be identified and understood through a

series of subjective experiences and exists solely for the perceiving subject (*ibid*., p. 172). This implies the assertion of the existence of each object solely based on one's perceptions, wherein individuals attribute meaning to them within specific relationships.

In concluding his theory of perception, the author emphasizes its relationship with lived experiences and the tangible objects to which humans assign significance. It is understood that Peirce's perspective delves deeper into these themes, serving as fundamental elements for reflecting on the relationship and significance of our bodies when analyzing the taste experience and its context. Furthermore, the amalgamation of both theories enables a comprehensive understanding of this phenomenon.

2.2. Distinction Between the Terms "Tasty" and "Flavorful"

To further this exploration of the taste experience, it is crucial to consider the difference between the terms "tasty" and "flavorful". Marrone (2022) has examined this distinction using the Greimassian semiotic model as the basis for his analysis. While the significance of these differences proposed by Marrone will be acknowledged.

Within the field of semiotics, making a distinction between tasty and flavorful is essential for enhancing comprehension without causing confusion since both elements are integral to the overall taste experience. In this study's context, taste, in conjunction with encompassing all senses (*ibidem*), pertains to a collective set of sensory perceptions. On the other hand, flavor is closely associated with an individualized tasting experience intertwined with memories of various types of dishes sampled during each taste encounter. From this perspective, it can be determined that:

> The taste process always goes from tasty to flavorful. Let's reverse the usual reasoning: it is not that sensation comes first and then cognition, but the opposite; cognition is already there, dictating the semantic and cultural patterns of perception; sensation can emerge if and when it manages to dodge these patterns and bring esthesia back as such, which, being in itself unspeakable, can only be categorized après coup, in a nostalgic, imperfect, and approximate way. The sensory process is, in fact, a process: not a series of isolated sensations randomly lined up but a syntagmatic series of events, sensory and non-sensory, that make sense based on the syntagmatic rules of concatenation (*ibid*., p. 129, my engl. trans.).

Marrone (2013) utilizes plastic and figurative semiotics to delineate hierarchies of meaning that span from the tasty to the flavorful. According to the author, taste is "from the

semiotic point of view, the most important of the sensory processes, the one that produces more sense and greater meaning, more symbolism and more language" (*ibid*., p. 118, my engl. trans.). This definition further reinforces the intricate nature of the sense of taste, particularly in the context of its application to the realm of artificial intelligence. Another aspect of taste explored by Marrone (2023) pertains to the notion of "added value", which implies that during a taste experience, the object being consumed possesses a certain value, which may be either positive or negative. Although the author does not explicitly undertake an analysis of this concept from a Peircean semiotic standpoint, we can infer that this value arises from the relationship between the tasted object and an individual's taste memory[3].

From a Peircean perspective, this suggests that the act of consuming specific elements can cultivate a *habitus*, subsequently leading to the formation of the added value that Marrone (*ibidem*) refers to. Ultimately, this added value influences one's preference or aversion towards the object of taste even before the act of consumption has taken place. In the latter portion of this thesis, we will explore how this added value manifests itself in cases where the elements being consumed are generated by artificial intelligence. In order to accomplish this, we will analyze the semiotic facets of news articles sourced from various media outlets that discuss this phenomenon, with a particular focus on the linguistic dimension. These news articles will be categorized based on different languages – namely Italian, Spanish, French, and English; subsequently, we will scrutinize the depictions of typical foods associated with these countries, as mentioned in the media coverage of this phenomenon that have been created by artificial intelligence.

Returning to Marrone's (2013) conceptual framework, it becomes apparent that the flavorful encompasses a system of values established through the sensory recognition of familiar figures and objects. Precisely, according to Marrone (*ibidem*), the flavorful involves:

> The site of sensory 'reasoning' in itself, which operates through perceptual processes no longer tied to previous cognitive patterns but, rather, to a direct engagement with the sensory qualities inherent in gastronomic substances – in relation to each other through syntagmatic contrasts or paradigmatic references, and in connection with specific contents through ad hoc semiosymbolic systems (*ibid*., p. 119, my engl. trans.).

[3] Term that I analyze in section 2.3 of this same chapter.

This approach allows for verbalizations that are encoded in languages commonly found in gastronomic reviews. In this case, the symbolic system is clearly identifiable from a Peircean perspective as it facilitates the expression of sensations evoked by the tasted object. In other words, the *interpretant* sign provides the argument needed to describe and translate the sensations experienced and the sensations generated by the object into words, with the purpose of forming a judgment about the tasted element. Marrone (*ibid*., p. 125) concludes that the gustatory process always progresses from tastiness to flavorfulness after defining the two key distinctions between them; this progression occurs as the subject first associates tastiness with experiential value and then the sensory processes integrate with cognitive schemas, ultimately leading to the experience of flavorfulness.

Moreover, Marrone's (2022) book serves as a valuable resource as it revisits these distinctions; when examining the concept of taste, it is important to consider the entire set of senses that contribute to this perception. In relation to the visual aspect, Marrone (*ibidem*) emphasizes the significance of the aesthetics of food, as it allows for the visual depiction of the relationship between objective beauty and subjective representation, which evokes the sensory experience and pleasure. This element must be taken into account in analyzing a taste experience, particularly regarding the aesthetic representation of dishes observable in pictures created by artificial intelligence—a topic explored further in the second part of this thesis. This aspect relates to a different unity within a dish where the ingredients themselves are highlighted more than the dish as a whole. Consequently, it creates another type of aesthetic relationship.

Returning to the distinction between taste and flavor, Marrone (*ibidem*) highlights that "the taste of food, the perception of food in the mouth, is a sensory experience in which the aroma of food mixes with touch, temperature, texture, appearance, smell, etc." (*ibid*., p. 81, my engl. trans.). Therefore, we are once again emphasizing the need to consider all senses when discussing the aspect of taste. According to Marrone (*ibid*., p. 86), semiotics should bear responsibility for identifying critical mechanisms to comprehend processes of perception by emphasizing synesthesia—an idea that associates taste with smell, sight, touch, and hearing.

Methodologically speaking, through semiotics we can analyze these aspects while considering the interplay between all senses in order to grasp taste comprehensively. This analysis focuses on what encompasses the taste experience such as *being at the table* and memory (Boutaud 2011). Furthermore, taste emerges as a subjectively nuanced matter closely tied to specific flavors but also encompassing a social and shared perspective. In these instances, we clearly encounter the concept of a social conception that establishes which tastes are deemed

acceptable within each society—a topic further explored in the subsequent section of this chapter.

Given the inherent nature of taste, an interdisciplinary study is necessary when considering the methodology. Previous studies have focused on biological aspects, explaining the functioning of the organs involved in taste, as well as socio-cultural perspectives. As emphasized by Landowski (1992), a comprehensive understanding of this phenomenon can be achieved through semiotics, which involves an interdisciplinary integration with the discipline of sociology. This is due to the fact that tasting elicits responses of acceptance or rejection in individuals.

Therefore, this viewpoint allows the analysis of the internal social dynamics surrounding taste, given that these dynamics precede the subject's existence and encompass the specific dish being tasted. Consequently, it becomes pertinent to address this question within the realm of our research, as it implies the emergence of a truly novel taste, personalized and created by artificial intelligence, thus raising questions about the latter impact on the historically rooted and independent nature of taste. In summary, based on media coverage and interviews with experts in artificial intelligence and chefs utilizing this tool, we encounter a *storytelling* that showcases a new approach to taste creation. As a result, we are not limited to socially recognized or classic dishes.

Moreover, it is worth considering that we are not dealing with a society where individuals share the same dishes, as each algorithm generates new dishes with unique variations (based on the input and provided database) that have not been tasted before and lack a means of social sharing. What can be shared socially is the idea that anyone can create a distinct dish with the assistance of artificial intelligence, tailored to their specific preferences and dietary needs. We explore this line of thinking in the second part of the thesis, which addresses the feasibility of such an approach, the ethical implications it entails, and the potential consequences for traditional food and gastronomy.

In reference to Marrone's semiotic analysis (2022: 99), it is evident that his approach is firmly rooted in the principles of Greimassian semiotics, specifically concerning the differentiation between the plastic and the figurative in the examination of taste. Marrone contends that figurative language entails the representation of images, which in turn involves discerning objects.

In the analysis conducted in the second part of the thesis, specifically regarding the images generated by artificial intelligence, we employ the analysis of the plastic and the

figurative to comprehend the phenomenon of taste, particularly considering its visual dimension.

Regarding Marrone's utilization of the concept of the plastic (2022: 100, 101), particularly within a visual context, it becomes apparent that there exists a secondary language within an image known as the plastic. This implies a novel articulation of depicted objects that is intimately linked to the processes of meaning they imply. It is worth noting that this visual analysis can also be conducted through Peirce's semiotics by considering the relationships embedded within an image that give rise to meaning. In Peirce's framework, a photographic image falls under the category of an index, signifying its connection to something that was present. As Peirce states:

> Just as a photograph is an index having an icon incorporated into it, that is, excited in the mind by its force, so a symbol may have an icon or an index incorporated into it, that is, the active law that it is may require its interpretation to involve the calling up of an image, or a composite photograph of many images of past experiences, as ordinary common nouns and verbs do (CP. 4.447).

Moreover, it is essential to recognize that increased familiarity with the production of food images through artificial intelligence cultivates an experience and *habitus* that fosters a perception of these images as authentic. Notably, a shift occurs towards highlighting individual ingredients over the dish as a whole. Drawing on Marrone's (2022) study, the role of aesthetic elements is underscored for enriching the palate experience through accentuating sensory aspects rather than the narrative of the dish. It is important to emphasize that the narrative dimension of the dish, which involves a *storytelling* within its creation, also influences the sensations and final perception of the dish.

Marrone (*ibid*., p. 103) posits that within the realm of cognition, a sense of imperfection and nostalgia manifests. He further suggests that the aesthetic component serves as a form of syntagmatic organization, guiding the plastic-sensory dimension in an effort to diminish the figurative-cognitive facet. Consequently, a correlation emerges with the nostalgia associated with familiar perceptions encountered during tasting experiences, which, according to Marrone (2022), influences the ultimate perception of a dish. This introduces the concept of taste memory, which notably shapes expectations regarding flavors encountered during tastings; particularly those reminiscent of past experiences or containing familiar ingredients recognized by the individual.

This notion aligns with Boutaud's (2011) concept of taste memory, underscoring its significant role in shaping our gustatory encounters through past recollections and future aspirations to recreate desired flavor profiles across various contexts and stages in life.

Marrone (2022: 105) also highlights the significance of individuals' recognition and pursuit of favored taste elements within their culinary experiences. The author identifies taste as a sensory recognition mechanism tied to past encounters, reflecting one's cultural background. This process commences with sensory inputs and progresses towards recognizing previously savored flavors, establishing a semi-symbolic system rooted in personal history.

In this specific context, the Peircean concept of experience holds particular significance as it facilitates the transition from the sensory domain associated with direct interaction with an object to the cognitive realm, where the object is identified. This transformation can be understood from a Peircean perspective as the progression from sensations produced by the object to its identification within a specific framework, indicating a shift from *Firstness* (CP 1.302) to *Thirdness* (CP 1.26), as expounded upon in the introductory chapter of this dissertation.

Therefore, it is crucial to delineate these components within the semiotics of taste to enhance the understanding of each concept individually, as they both play a substantial role in the overall experience of taste. In differentiating between 'tasty' and 'flavorful', Marrone (2022) links these terms to what Greimas defines as 'plastic' and 'figurative', where 'tasty' pertains to the 'figurative', and 'flavorful' is associated with the 'plastic'.

> The terms 'tasty' and 'flavorful' tend to connote positive appreciations regarding the sensory process they refer to: 'tasty' is a category term (/tasty vs. disgusting/) and pole of the same category. The same applies to 'flavorful' (/flavorful vs. bland/). However, choosing to use them as metalanguage terms can help dispel the misunderstandings that this double semantic valence tends to generate in common speech. (...) The sensory perception related to taste and that related to flavor tend to merge in lived experience (*ibid*., p. 106, my engl. trans.).

The importance of recognizing the sensory process is emphasized in this context, where taste perception is influenced by a blend of cultural elements, cognitive processes, and notably, an individual's inherent proclivity towards taste. This inclination is molded by past experiences and the narratives prevalent in the cultural milieu surrounding a particular culinary style, whether it is technical, classical, traditional, or innovative, as demonstrated in the current research. When considering dishes crafted by artificial intelligence, the appeal or interest in

trying these creations arises from the possibility of encountering something novel, free from any prior taste references to compare with or preconceived notions, except for the freshness or stories popularized in media channels endorsing these emerging culinary movements.

These discourses encompass a range of aspects including sustainability, environmental improvement, critical evaluation of specific ingredients, and the pursuit of enhanced health through the utilization of more natural or less harmful elements, both for the environment and human well-being. The overarching objective of these narratives is to establish a connection between the natural world and humanity, with the goal of improving elements that have been negatively affected by the uncritical use of resources from our environment. However, the analysis of media discourse pertaining to these emerging culinary practices will be further explored in the subsequent section of this thesis.

Fundamentally, a prevalent expectation is observed to shape the gastronomic experience, specifically among individuals who have not yet encountered cuisine generated by artificial intelligence. This expectation does not arise from past experiences but rather from the anticipation of a unique culinary adventure. These elements contribute to the construction of a societal framework (Castoriadis 1975), a concept that will be thoroughly examined in paragraph 2.3 of this chapter.

Furthermore, Marrone (2022: 273) emphasizes a key aspect pertaining to the notion of authenticity in the gastronomic realm. This concept serves as a framework for evaluating the extent of artificial intelligence involvement in the culinary creation process and the resulting ethical implications. As outlined by Marrone (*ibidem*), the semiotic viewpoint places its primary emphasis on generating an impression of the natural rather than on accurately representing each individual ingredient. This approach underscores the freshness of the ingredients, thereby evoking a sense of authenticity.

It is of paramount importance to emphasize that the creation of each dish is influenced by a particular context, which plays a significant role in shaping the perceived value of taste and the overall taste experience for individuals. A comprehensive understanding of the elements under scrutiny requires a systematic consideration of these factors. Therefore, the research methodology utilized in this thesis employs a socio-semiotic approach, incorporating a semiotic analysis of in-depth interviews with artificial intelligence experts and chefs who utilize AI to innovate taste and advance culinary creativity. In line with Landowski (1992: 11), socio-semiotics assists in attaining a more thorough comprehension of our actions by providing a socio-cultural rationale. This approach enables the examination of the interactions established

by individuals as agents and the interpretation of their social significances, which influence the behaviors of each person. When exploring taste experiences, it is imperative to adopt a socio-semiotic perspective, allowing for an evaluation of the collective significance of each taste encounter while assigning specific values to the participants involved. This perspective enables the examination of media content, as demonstrated in this research, influencing our preferences for dishes crafted by artificial intelligence. In terms of methodology, Marrone (2022: 311) underlines the significance of focusing on socio-semiotics to delve into societal and cultural aspects and comprehend how these concepts circulate within the *semiosphere*.

Therefore, it is pertinent to consider the intricacies of the taste experience and its associated processes in conjunction with the prevailing societal discourses on the genesis of new tastes facilitated by artificial intelligence. This analysis is critical not only because of the influence of these dialogues on the taste experience but also because it is within the cultural and social context that the significance of these innovative culinary practices can be understood. Furthermore, by utilizing Peirce's semiotic framework, one can methodically examine the significance inherent in each cultural practice, taking into account the contextual foundations in which they occur.

In conclusion, it is pertinent to underscore Stano's (2021; 2015) contemplation on the vital importance of comprehending the semiotics of gastronomy within what he terms as the "*foodsphere*". He further introduces the concept of "*gastrosphere*", drawing an analogy to Lotman's theory of the "*semiosphere*". In this context, the significance of human culinary practices is intricately intertwined with the cultural milieu in which they evolve. Stano (*ibidem*) has undertaken research delving into the semiotics of gastronomy, establishing a correlation between the culinary creations and their spatial consumption. Furthermore, Fabio Parasecoli (2011: 647) also accentuates in his scholarly work that both ingredients and dishes are perpetually influenced by their preparatory environment. As per Parasecoli:

> Food systems, as ongoing processes of semiosis and communication based on a limited- although very wide – variety of edible substances, sensory signals, practices, beliefs, and norms, complicate distinctions between the materiality of the biological body, its lived experience, and its reflective aspects, including agency and cognition (*ibid*., p. 648).

Hence, it is essential to uphold this investigative approach while considering the societal context in which such artificial intelligence-generated taste experiences are introduced.

2.3. Subjectivity and the Social Construction of Taste: Taste Memory

In order to gain a comprehensive understanding of the social construction of taste, it is essential to take into account the subjective component, specifically the concept of *taste memory*. By bridging the gap between the analysis of taste as a combination of senses and the interpretation of meaning from a semiotic perspective, it becomes imperative to explore the cognitive processes involved in an individual's memory when they are inclined to appreciate a particular dish: in such a light, it could be argued that memory influences our experience of taste. This process is not directly linked to the perception of taste or its synesthetic characteristics, but rather to our inclination as humans to idealize past experiences. In fact, when contemplating the taste experience, whether associated with a past event or not, we are confronted with a type of recollection that permeates our selection of each dish from the moment we make a choice. This memory may stem from a previous gastronomic encounter or simply from the *storytelling* associated with the dish about to be savored. Moreover, the recommendation of the dish, whether through media channels or personal communication, plays a significant role in shaping our memory and subsequently influencing our choices. In this context, memory becomes an inherent part of the taste experience, even though it is not directly connected to the sensory processes involved in tasting a particular item.

However, to fully grasp the subjective significance of the taste experience, it is necessary to shift our perspective from viewing taste solely as a sensory process and embrace the realm of senses and meanings that arise within this experience. From this standpoint, we can understand the subjective impact of the taste experience on our selection and engagement with dishes that may or may not become part of our personal taste repertoire. In fact, the taste experience has the potential to evoke nostalgia, transporting us back to moments imbued with sentimental value. This process is rooted in a preexisting framework of values, which may include pleasure or a shift in our value system, associating it with enjoyable experiences and triggering memories when encountering the tasted dish. The interplay of these values gives rise to the subjective aspect of taste memory. However, it is important to acknowledge that these values are also socially determined, actively influenced by societal factors. Therefore, by analyzing these aspects through the lens of Peirce's semiotics, we can explore the subjective and social dimensions of taste memory. Neglecting this dynamic relationship hinders a complete understanding of the sense and meaning of each taste experience. Thus, in order to delve into the concept of taste memory, we draw upon the analysis of Boutaud (2011), who

emphasizes the pivotal role of the context in which tasting occurs in shaping each taste experience. This context serves as a foundational element that, when viewed through the lens of Peirce's perspective, establishes a *habitus*, a *tendency* where the memory formed within a specific tasting context can influence the subsequent experience of future dishes.

In the words of Boutaud (2011):

> It is evident, then, that being at the table, along with scenes of shared meals, represents a theater of experience and observation, both on the social and symbolic levels. Going further, the table, or the alimentary space, is to be seen as a place of exchange that provides an exemplary framework for communication itself. Defining *communication, above all, as a relationship taking shape*, throughout this work, we will see that being at the table is an authentic revealer of the communicative process, in its form and formation (*ibid.*, p. 7, emphasis in the original, my engl. trans.).

Hence, the culinary experience not only shapes the present taste encounter but also establishes a form of *continuum* within the individual's memory, impacting subsequent tastings long before they occur. It is evident that all aspects associated with the culinary experience are closely intertwined with Peirce's concept of *Thirdness* (CP 1.26), as articulated by the author in connection with its symbolic dimension:

> The objects of the understanding, considered as representations, are symbols, that is, signs which are at least potentially general. But the rules of logic hold good of any symbols, of those which are written or spoken as well as of those which are thought. They have no immediate application to likenesses or indices, because no arguments can be constructed of these alone, but do apply to all symbols. All symbols, indeed, are in one sense relative to the understanding, but only in the sense in which also all things are relative to the understanding. On this account, therefore, the relation to the understanding need not be expressed in the definition of the sphere of logic, since it determines no limitation of that sphere. But a distinction can be made between concepts which are supposed to have no existence except so far as they are actually present to the understanding, and external symbols which still retain their character of symbols so long as they are only ***capable*** of being understood. (CP 1.559, emphasis in the original).

Within these conceptual frameworks, it becomes apparent that within each moment of the culinary realm (Boutaud 2011), we encounter symbolic relationships that imbue significance into our choices during each taste experience. The importance of this lies in the realization that, akin to most human relationships, we are often unaware that our comportment in these culinary circumstances is not inherently natural, but rather influenced by certain cultural frameworks

that were acquired through our earliest taste encounters and the subsequent emulation of familial practices. In essence, the emergence of novel forms of culinary scenes, such as those created by artificial intelligence, undeniably impacts our future tasting experiences. Hence, the introduction of any novel element that introduces a fresh symbolic dimension will evidently impact our approach to various taste encounters. This influence can manifest through anticipations of future experiences or endeavors to more effectively recreate a nostalgic taste encounter.

On one hand, we may observe the human pursuit of novelty in culinary preparations, aimed at addressing various societal challenges. These predicaments are frequently expounded upon in media discourse, which highlights the lack of ideas regarding ingredient utilization and time constraints that prevent the preparation of certain dishes. Consequently, artificial intelligence emerges as a conceivable solution to these quandaries, exemplified by the *Sous Chef* functionality of *ChatGPT* that facilitates the generation of recipes based on available household ingredients within the constraints of limited preparation time. The intricate mechanisms governing these aspects will be analyzed in the subsequent part of this thesis. Significantly, these advancements clearly influence our relationship with the culinary realm, consequently impacting taste memory and engendering a novel dynamic in our engagement with taste experiences.

Furthermore, it is noteworthy that an alternative approach to the preparation of dishes created by artificial intelligence exists, one which seeks not to fundamentally transform the culinary scene but rather aims to innovate the manner in which we interact with it. An illustrative example of this is the first book compiled by artificial intelligence[4], encompassing a multitude of practical recipes.

Such instances underscore the pivotal role of the culinary scene, as underscored by Boutaud (2011), in discussions surrounding taste experience. In instances involving artificial intelligence, efforts are made to introduce innovation to the realm of food and our tableside

[4] The book titled "The Chef's Delights AI: In the Kitchen with Artificial Intelligence (The AI Chef's Delights Book 1) (English Edition)" is available for purchase on *Amazon*. The first edition is in English and can be found at the following link:<https://www.amazon.it/ChefsDelightsAIArtificialIntelligenceebook/dp/B0CDDMG2DW/ref=sr_1_2?__mk_it_IT=ÅMÅŽÕÑ&crid=2N7QMIM77GSID&keywords=ia+chef&qid=1708094408&sprefix=ia+che%2Caps%2C103&sr=8-2 >. There is also a translated version in Italian titled "Le Delizie dello chef AI: In cucina con l'intelligenza artificiale", which can be found at this link: < https://www.amazon.it/Delizie-dello-chef-lintelligenza-artificiale-ebook/dp/B0CC5Z4YBJ/ref=sr_1_1?__mk_it_IT=ÅMÅŽÕÑ&crid=3VYYIQUFRQ3E1&keywords=intelligenza+artificiale+chef&qid=1708094537&sprefix=intelligenza+artificiale+chef%2Caps%2C102&sr=8-1 >.

comportment. However, there are also instances where the objective is not to drastically alter the relationship with the culinary scene. A more comprehensive exploration of this aspect shall be undertaken in the subsequent portion of the thesis, yet it is fundamental to acknowledge its relevance when addressing subjective taste memory. At the same time, Boutaud (*ibidem*), regarding the context in which tasting occurs, argues that:

> The *aesthetics,* at the level of basic feelings, are linked to flavors, to the most elementary sensory perceptions, but also to the gustatory emotions that the *me-sensory* (Brillat-Savarin) tries to express; the *aesthetics* of communication manifest themselves through the forms of our food exchanges and our commensal and convivial relationships, at all levels of the greedy theater, in the staging previously evoked: that of foods, dishes, table, context, moment; food and gastronomic *ethics*, finally, inspire all these levels of staging, respecting values, codes, and norms, or manners, which, composing the history of our table and our taste culture, follow the movement of our society (*ibid*., p. 10, emphasis in the original, my engl. trans.).

The essence of the appreciation of taste lies in the intricate relationship between sensory perception and the societal influences. Particularly noteworthy is the ethical dimension associated with the integration of artificial intelligence in the culinary domain, as addressed by Boutaud (2011), which significantly contributes to the overall gastronomic panorama and consequently shapes our gustatory encounters. Moreover, the author underscores a key aspect tied to the earlier discussion, specifically in the context of the modern-day society and the profound temporal constraints that are currently reshaping our food-related interactions. According to Boutaud (*ibidem*):

> Today everything must proceed quickly, and we are certainly far from a gastronomic temporality capable of articulating, both at home and in restaurants, multiple forms of time: *culinary time* for preparation; *gastronomic time* when added to the act of sitting at the table; or even *social time*, which regulates dietary practices. In a time now calculated based on productivity imperatives and following the acceleration of social rhythm, with its pleasures and rituals, even sitting at the table is seized by regimes of appearance and immediacy. It is here that the signs of the alimentary scene solidify, and its millennia-old symbolism becomes the object of deconstruction (*ibid*., p. 26, emphasis in the original, my engl. trans.).

The notion discussed is prominently featured in debates asserting that artificial intelligence has the potential to mitigate human time constraints and aid in memory-related issues. A key attribute of artificial intelligence is its extensive data storage capacity,

continuously expanding its database. Consequently, advocates of artificial intelligence in culinary settings posit that individuals could readily access significant recipes from their past. This is highlighted as a potential advantage of incorporating such technologies in cooking. However, we argue that individuals strive to recreate these recipes not merely for prompt retrieval but to rekindle moments that cannot be revisited in physical form. The pursuit of a dish reminiscent of one prepared by a grandmother, for example, is motivated by the aspiration to revive a taste memory and, in essence, recapture bygone times. These technological advancements are intricately linked to enduring human needs, specifically the aspiration to immortalize entities inherently transient and irreplaceable. This examination is further expounded upon in the subsequent section of the thesis, utilizing insights from the aforementioned authors to establish a framework for scrutinizing distinct cases.

Another aspect which Boutaud (2011) contemplates and lays out guidelines for scrutinizing case studies is to reevaluate the correlation with the various temporal dimensions encountered when exploring the connection with the culinary domain:

> The dimension of time and space is not lacking in participating in the theater of commensality, as observed at all levels of analysis; however, despite being recurring dimensions, they fully constitute modes of the multimodal communication considered here. (...) We will be interested, for example, in the semiotic investment (signs, codes, processes) of temporal forms such as:
>
> a) *Organic* time, where the life cycle of foods is magnified, respecting nature in the cultivation of products to consume them with all guarantees of freshness and quality (...)
> b) *Culinary* time, which includes the choice and preparation of foods, recipe realization, cooking, and dish distribution (...)
> c) *Gastronomic* time, already extensively discussed here, concerns the experience of sitting at the table proper, as a moment of consumption, sharing, food exchange, and symbolism (...)
> d) *Social* time, which gives order and rhythm to food practices in all their diversity. It determines regimes of consumption or commensality according to a social context (...) (*ibid*. p. 47, emphasis in the original, my engl. trans.).

All these described elements that would be affected when we talk about a taste experience generated by artificial intelligence would impact the imagination and desire of the future tasting subject. In instances where the interface between taste perception and artificial intelligence is discussed, the temporal dimension becomes intriguing as Boutaud (2011) argues that all temporal facets could potentially be influenced by the utilization of technology.

Companies involved in the development of such applications suggest that artificial intelligence could enhance sustainability by curating recipes with minimal environmental impact, thus aligning with Boutaud's concept of *organic time*. Notably, *gastronomic time* is directly impacted by artificial intelligence, as it greatly expedites the process; merely inputting a few ingredients yields recipe suggestions in accordance with the aforementioned principle. *Gastronomic time*, identified by the author, will undergo modification through the novel experience of crafting recipes with artificial intelligence. Consequently, social time may introduce a different cadence to the moment of tasting and the ensuing taste encounter.

All these elements, which are prone to alteration in the context of taste experiences generated by artificial intelligence, have the potential to influence the imagination and anticipation of the prospective taste recipient. As highlighted by Boutaud (*ibid*., p. 63), memory, sensory perceptions, and psychological factors establish a structure for the sensory representation, where the most metaphorical component emerges. It is within this framework that sensations intertwine with object representations to form sensory images, thereby shaping perceptions of pleasure or displeasure. It is within this dynamic interplay that taste perception takes shape.

Thus, it becomes evident that the taste experience is influenced not only by the biological aspect of perception but also by taste memory. How individuals construct this memory is crucial in determining their preference or dislike for each taste experience.

Another aspect that influences our taste experience and taste memory involves the impact of various research studies that emphasize the connection between health and nutrition, as outlined by Stano (2022). These studies also delve into establishing connections with ideological factors, particularly in the context of dietary practices.

In this regard, Stano (*ibidem*) explores how individuals, influenced by cultural or religious factors, subject their bodies to food deprivation through different diets. Stano (*ibid*., p. 202) highlights various relationships based on bodily control or denial in order to attain a state of tranquility associated with religious practices. Additionally, efforts are made to exercise self-control by refraining from eating. Consequently, these practices, along with the adoption of specific diets for athletic purposes or due to psychological disorders like anorexia or bulimia, significantly impact our relationship with taste experience and leave a lasting impression on our taste memory.

Another intriguing point raised by Stano (*ibid*., p. 205) asserts that diets always entail restricting certain ingredients for our bodies; therefore, the prevailing dynamic in these cases is

one of denial. This becomes evident when artificial intelligence suggests selecting elements devoid of harmful chemicals for our bodies. These aspects primarily stem from ideological factors as highlighted by Stano (2023a). Food can be viewed as a symbol embedded within practices, techniques, and *habitus* that produce meaning and ideology while generating diverse social values.

On the other hand, Marino Niola (2019) examines the issue of restrictions within diets which undeniably influence our taste memory. Niola (2019) argues that all types of diets profoundly impact our lifestyle by fostering an obsession with healthier eating habits through the denial or prohibition of certain ingredients. Therefore, we contend that this aspect is crucial to consider when discussing taste experience since individual choices are intertwined with cultural norms that shape and affect this experience through acts of refusal.

Another author who highlights the relationship between food and nutrition is Gyorgy Scrinis (2020), who emphasizes the need to identify certain components or ingredients that may be harmful to our bodies, where different food companies try to portray the healthiness of their products to the public. It is emphasized that there are few ingredients, and flavors are not being manipulated by large companies (*ibid*., p. 2), highlighting the need to remember the role and social aspect of these elements that clearly impact both our taste experience and taste memory.

Additionally, Scrinis (2008) defines nutrition as food modified to enhance specific chemical components, prioritizing the well-being of the body. Scrinis (*ibidem*) states, "nutritionist is defined as where food is predominantly understood in terms of its nutrient profile and at the expense of other ways of understanding and contextualizing the relationship between food and the body" (*ibid*., p. 544). Significantly, when it comes to artificial intelligence technology, it is easy to find recipes focused purely on nutrition that neglect the taste experience. This focus on the relationship between body enhancement and nutrients affects taste and, ultimately, the taste experience.

Furthermore, an important aspect to delve into is the social dimension of taste memory construction. Drawing on Cornelius Castoriadis (1975) and his concept of the *social imaginary*, this notion becomes pivotal in explaining the construction of an ideal taste experience. Based on Castoriadis (*ibidem*):

> The imaginary component of every symbol and of every symbolism, at whatever level they may be situated. Recall the common meaning of the term 'imaginary', which is sufficient for the moment: we speak of the 'imaginary' when we want to talk about something 'invented' - whether this refers to a 'sheer' invention ('a story entirely dreamed up'), or a slippage, a shift of meaning in which

> available symbols are invested with other significations than their 'nor- mal' or canonical significations (*ibid*., p. 127, engl. trans. 1987).

Hence, we revert back to the concept that the connection between the imaginary realms signifies, according to the perspectives of Peirce, the presence of symbolic dimensions (CP 1.559). In the context of taste perception, individuals can contemplate, based on their experiences, what an ideal taste encounter might entail. Essentially, this process shapes the societal imaginary, which, in return, is dictated by the societal framework the individual is a part of. Every aspect of the culinary domain that influences our societal perception of taste is molded by the cultural and societal environment in which we operate, from table manners to food allocation and family member's respective roles. Consequently, as Castoriadis (1975) postulates, the imaginary encompasses a symbolic correlation as it emerges from the representation and interplay among various determining elements.

One of the fundamental elements that constitute and create a social imaginary, according to Castoriadis (*ibidem*), is institutions:

> There is, of course, a function of the institutional imaginary, although here, too, we observe that the effect of the imaginary *outstrips* its function; it is not the 'ultimate factor' (we are not looking for one anyway) - but without it any determination of both the symbolic and the functional, the specificity and the unity of the former, the orientation and the finality of the latter, remain incomplete and finally incomprehensible (ibid., p. 131, emphasis in the original, engl. trans. 1987).

This underscores the significance of the discourses propagated in the media concerning artificial intelligence and its impact on taste experiences. Media institutions play a pivotal role in shaping key aspects of this phenomenon. For instance, discussions revolving around improving environmental sustainability through the utilization of AI tools, optimizing food preparation efficiency, and underscoring economic benefits by reducing organic waste all contribute to shaping the discourse and fostering a particular social construct within defined parameters. Consequently, this significantly impacts the taste experiences of individuals as influenced by artificial intelligence.

According to Castoriadis (1975), the social imaginary "is operative in the practice and in the doing of the society considered as a meaning that organizes human behavior and social relations, independently of its existence 'for the consciousness' of that society" (*ibid*., p. 141, engl. trans. 1987). This denotes the inclination that arises within the realm of taste perception

to seek the experience envisioned by societal constructs. Although attaining the perfect taste encounter may prove elusive, the author illustrates, operationally it serves as an ideal towards which one strives from a taste standpoint. For this desire to materialize, establishments must be in place to establish symbolic standards for what is attainable in terms of taste encounters. In the context of examination, these establishments encompass gastronomic bodies, with the education of chefs collaborating with artificial intelligence, as evidenced by the Paul Bocuse Institute in Lyon; experts in artificial intelligence operating in the gastronomic domain, like those at the University of Cambridge with *gastrobots*. These instances will be delved into further in the subsequent segment of this thesis.

To conclude this paragraph, it is crucial to recognize the need to create a taste social imaginary as it invariably shapes our taste experience. Understanding the subjective construction of memory and the social aspects involved, as explored by the various authors in this section, lays the foundation for the analysis of the case studies presented in the second part of this thesis.

Part II- Artificial Intelligence Applied to the Gastronomic Field

Chapter 3 – Artificial Intelligence

Abstract

The chapter investigates definitions of artificial intelligence to better understand its functioning, with a consistent focus on the taste experience. A critical factor in the functioning of artificial intelligence is the creation of a database and the ethical issues this raises, as highlighted by Luciano Floridi (2022). The way artificial intelligence functions heavily depends on its database, as it enables the algorithm to provide relevant outputs.

In this chapter, we focus on key issues surrounding artificial intelligence, such as the concerns raised by Hannah Fry (2018), who argues that we must pay attention to the authority we grant artificial intelligence and ensure we do not lose our human capacity for choice. Furthermore, building on the reflections of the previous chapter, we again focus on the importance of memory, emphasizing how humans use vast memory of machines to combat concerns about death and the passage of time. Thus, the chapter reflects on the human desire to control elements that have always been a deep source of anxiety.

Another significant issue examined is the potential exclusion of traditional cuisines from regions without internet access, whose recipes may not be included in the artificial intelligence database. This exclusion creates an informational void, raising the risk of falsely attributing gastronomic innovation to artificial intelligence when it is actually due to the absence of certain data.

Finally, the chapter examines the anthropomorphization of artificial intelligence, as noted by Nello Cristianini (2023), recognizing the human tendency to explain artificial intelligence functions in anthropomorphic terms. This section offer a novel analysis of the intersection between artificial intelligence and gastronomy.

3.1. Main Issues Concerning Artificial Intelligence

This paragraph begins by considering the research of Stefano Quintarelli (2020), whose expertise in information and communication sciences underscores that artificial intelligence revolves around analyzing datasets to extract meaningful information. Specifically, the data

under consideration include aromas, chemical compositions of individual food components, and established recipes for diverse culinary creations. It is crucial to highlight that this data is intricately intertwined with the cultural contexts of its origin, as each culture delineates the permissible ingredients for culinary concoctions.

Numerous scholars across various disciplines have contributed to the discourse on artificial intelligence, resulting in a substantial body of literature on the subject at present. Nonetheless, our focus on those scholars whom we perceive as pivotal in defining artificial intelligence and comprehending its practical implications within the framework of this study. It is imperative to recognize that while research activities in artificial intelligence are ongoing, only those facets directly pertinent to this study have been chosen for examination.

Furthermore, Quintarelli (*ibidem*) highlights the general challenge faced by the majority of individuals in comprehending the operational mechanisms of artificial intelligence unless they possess expertise in the domain. While it is acknowledged that data is processed and potential outcomes are generated, Quintarelli contends that there exists a deficiency in grasping the intricate processes leading to these outcomes. This lack of comprehensive understanding may result in an unwavering trust being placed on any response or solution provided by artificial intelligence systems.

From a multitude of perspectives, several authors emphasize the significance and complexities involved in the utilization of artificial intelligence across various domains and societal spheres. Hannah Fry (2018), a mathematician, elucidates the essence of artificial intelligence by delineating the operational mechanisms of algorithms, which constitute the foundation of artificial intelligence. She states, “an algorithm is simply a series of logical instructions that show, from start to finish, how to accomplish a task. By this broad definition, a cake recipe counts as an algorithm” (*ibid*., p. 11). However, when considering algorithms as a set of instructions, important elements concerning the construction of a taste experience may be overlooked. Fry also highlights a crucial factor: the creation of algorithms involves instructions generated by humans, which are often ambiguous, potentially leading to errors embedded in the algorithm from the outset, resulting in errors in the output provided by artificial intelligence. “The algorithm’s predictions are based on the patterns it learns from the data; a random forest is described as a machine-learning algorithm, which comes under the broader umbrella of artificial intelligence” (*ibid*., p. 48).

Fry’s (2018) research highlights the relevance of algorithms in our society and daily lives, as well as the fact that not all humans might be aware of such relevance, given how

algorithms are often taken for granted and are now naturalized to some extent. They are present in various technological electronic devices, making decisions based on how we interact with each technology. From the first news we encounter on our social networks to the different suggestions we come across in our daily lives, all often stemming from algorithmic creations. It is for this reason that Fry (*ibidem*) emphasizes the issue of authority and autonomy that humans attribute to these algorithms, consequently impacting artificial intelligence. As a reflection on the authority and autonomy we grant to algorithms, Fry suggests that "perhaps acknowledging that algorithms aren't perfect, any more than humans are, might just have the effect of diminishing any assumption of their authority" (*ibid*., p. 153).

One possible solution proposed by the author regarding the problems that arise when it comes to the results provided by artificial intelligence across various human social domains—given that throughout her book she focuses on analyzing the different applications and erroneous outcomes of artificial intelligence in diverse areas such as law, automotive, etc.—is that algorithms should not simply provide a single solution to a given problem. On the contrary, algorithms should offer a range of options for humans to choose from, ultimately removing the authoritative power and the perception of the algorithm as unequivocal. This approach reinstates the capacity of humans to choose and have a level of control and autonomy that should not be relinquished to machines. According to Fry (*ibid*., p. 154), giving autonomy to the machine leads is the main source of problems.

Therefore, humans should not fully trust the result provided by the machine without questioning it. This reflection is based on the premise that the data provided to the machine and from which the algorithm draws its responses were provided by humans and are for this reason inherently ambiguous. This element is central to the thesis as it emphasizes the need to understand the construction of the provided data regarding different cultural recipes, which then determine the outcomes of what artificial intelligence considers new culinary recipes.

On the other hand, Eric Sadin (2018), philosopher reflecting on artificial intelligence highlights that currently, this device holds a power of precision at the social level, granted by humans, due to its immediacy and speed in finding different solutions. According to the author, artificial intelligence has, as an objective since its design and creation, the pursuit of truth (*ibid*., p. 10). This element is linked to the argument developed by Fry (2018), about the idea of solving different human problems is proposed.

However, Sadin (2018) a philosopher, also argues that currently, artificial intelligence is beginning to forge its own path to obtain answers and select outcomes through its own

experience (*ibid*., p. 47). This is due to the principle that, according to the errors it makes, it can through *machine learning*, thereby improving the responses it provides to humans. This element implies an experience on the part of artificial intelligence based on errors, which in a way resembles the human experience in the case of this thesis referring to perception. However, in the case of artificial intelligence, the process of perception is different because it originates from data provided by humans.

Regarding data, research by philosopher Maurizio Ferraris (2021) proposes a different perspective on artificial intelligence. According to the author, what is important are documents, which form the basis of each technology; hence, he defines the web as a large device for the registration of documents. At the same time, he argues that artificial intelligence is not intelligent, but rather its capacity stems solely from the accumulation of information.

According to this argument, a machine is not intelligent in itself; it simply has more memory and speed compared to humans. However, the author does not focus on the ability to provide solutions to human problems; essentially, he conceives of artificial intelligence as having the power of memory. This perspective is interesting in the context of this thesis, not because it aligns with the author's view of artificial intelligence, but rather because it is tied with the possibility of preserving the most important recipes for humans.

There exists a significant human endeavor focused on the preservation of elements that are prone to vanishing over time, exemplified by the recreation of a culinary creation originated by a deceased family member. In these scenarios, artificial intelligence serves as a viable solution to an enduring human challenge: the perpetual struggle against mortality. In addition to the environmental advancements emphasized by various corporations engaged in the development of gastronomy-related technologies, and beyond the health implications, a primary objective of such technologies is to uphold a repository of recipes that evoke significant memories for each individual. This premise challenges the conventional depiction of artificial intelligence often portrayed in media narratives[5] as an impersonal entity devoid of human sentiment. This sense of detachment is also mirrored in the visual representation of artificial intelligence as an unfeeling machine, typically depicted in shades of blue - a color connoting coldness and lack of vitality. However, in the context of utilizing artificial intelligence within gastronomy, particularly concerning taste perception, emotional dimensions and notably those connected to culinary reminiscences are duly considered. The objective is to ingrain within

[5] An aspect that will be analyzed in the following chapter of this thesis.

artificial intelligence's memory the most cherished dishes for every individual, facilitating the re-experiencing of meals crafted by individuals who have significantly influenced each person's gastronomic journey.

Regarding the concept of creation, Ferraris (2021) understands it as a tautologically human capability; by definition, machines cannot invent, they can only apply human discoveries and rules. According to the author, artificial intelligence writes articles, but it is not interested in reading them; it can solve mathematical calculations, but it does not understand what mathematics is; a truth machine can be created, but artificial intelligence would not be capable of understanding the concept of truth (*ibid*., p. 341).

In these cases, the functioning of artificial intelligence can be understood as primarily devolved to solving human problems, and Ferraris's discourse can be seen as losing sight of this element. In the case of this thesis, there is clearly a creation of gastronomic dishes in collaboration with humans, which would not be possible without the results proposed by artificial intelligence. These elements lead to ethical considerations of artificial intelligence, which will be mentioned later on. Essentially, there exists a hybrid type of creation between humans and artificial intelligence, especially considering that artificial intelligence is itself a human creation.

Concerning this dynamic, another author who highlights the conflicts regarding artificial intelligence is Frank Pasquale (2020) an artificial intelligence expert, who mentions that "artificial intelligence will continue to be artificial because it will always be a product built from human cooperation" (*ibid*., p. 6). However, he emphasizes that there are currently fields with an ethical consensus where artificial intelligence is analyzed as affective, making it difficult to separate humans from machines. On the basis of a number of studies, the author highlights how young people are more open to using these new tools for educational purposes (*ibid*., p. 69), a trend that we can currently observe encompassing increasingly more generations, also when it comes to individuals utilizing them for gastronomic purposes.

Finally, the author mentions the need to create new robotics laws that establish from scratch the responsibilities of humans and artificial intelligence. "We can embrace new forms of computing without abandoning quintessential human roles to artificial intelligence" (*ibid*., p. 231). This element is also highlighted by authors who focus primarily on the ethical aspects involved in the use of artificial intelligence.

On the other hand, cosmologist Max Tegmark (2017), in discussing the current situation of society and the aspects of artificial intelligence, mentions a classification of human evolution,

positing the existence of three stages: life 1.0, which encompasses biological aspects, life 2.0, involving cultural elements, and life 3.0, implying technological development (*ibid*., p. 42). The importance of this classification lies in the implication of a scale in which each stage involves the successive stage. This classification is interesting when it comes to the case study of this thesis as the use of artificial intelligence for gastronomy involves all three stages. The biological aspect comes into play due to the human need to obtain nutrients from food. The cultural aspect, as has been mentioned earlier, depends on the culture of each individual and their geographical location, which likely influences the response generated by artificial intelligence.

Moreover, this case clearly falls under the technological aspect because it implies a new way of creating food. Furthermore, the author emphasizes the importance of not anthropomorphizing artificial intelligence due to its incapacity to have emotions and primarily focus on results. However, the impact of these technologies clearly generates a different relationship between humans and their taste experience. Additionally, Nello Cristianini (2023) points out why there is a tendency towards anthropomorphizing artificial intelligence, which we will further develop later on.

Additionally, Tegmark (2017) explains the philosophical problem concerning whether artificial intelligence has consciousness or not and broadly defines consciousness as a subjective experience. The author's reflection is noteworthy for addressing the challenge of articulating sensory experiences such as colors, sounds, emotions, and notably the intricacy involved in conveying a sentiment itself (*ibid*., p. 362). The central issue with this type of reflection is that explaining the functioning of artificial intelligence often requires resorting to human terms such as consciousness or experience. While we understand that artificial intelligence, in order to reach a result, relies on its own experience of errors to approach a better outcome each time.

In these authors, we can observe that they are more concerned with understanding the value that artificial intelligence places on its own generation of results. However, the focus of this thesis is primarily on the value that humans attribute to the final outcome created by artificial intelligence and their interaction with it. Furthermore, we understood that the machine can only assign a positive or negative value to the result it provides based on human decision-making, as it was created to solve the problems that humans present to it.

Therefore, within the semiotic perspective of the taste experience, what's important is how we interact with these results, as well as understanding that humans are present in most

steps of the creation process. This is because the machine was created by humans, and the data provided was also generated at a social and cultural level, which will clearly influence the results provided by artificial intelligence.

Brett Friscmann and Evan Selinger (2018), tech experts, focus on the functions of artificial intelligence for humans. They view technology as an extension of perceptual capabilities, citing, for example, the case of blind individuals using canes, which expands their perspective (*ibid*., p. 32). These authors emphasize humans' ability to create tools that are products of human imagination but, in turn, shape our imaginative reconstruction of the world. This implies a reconstruction of the world through the creation of tools, so it is necessary to understand how gustatory perception is constructed when translated into digital terms for artificial intelligence to provide its new recipes. This construction primarily involves creating the data provided to the machine, as this is where the social imaginary (Castoriadis 1975) of each culinary recipe is reconstructed.

Friscmann and Selinger argue that several authors emphasize that technology expands the minds of humans beyond the brain and physical body, aiding in expanding cognitive processes. For example, in the case of a calculator, it would be considered a cognitive prosthesis, a reliable part of our minds, and consequently, part of ourselves. In these cases, artificial intelligence would be understood as an extension of humans (*ibid*., p. 81). However, both authors criticize this position: "apparently harmless mind-expanding technologies can be powerful instruments for technosocial engineering. The most powerful ones turn us into pawns in others' games" (*ibid*., p. 82).

Therefore, in this reflection on artificial intelligence, the issues of power, control, autonomy vs. alienation emerge. However, it can be maintained that it is relevant to understand how the dynamics of technology do not necessarily imply an extension of our cognitive abilities. In this case, it implies a new way of creating dishes that results in a new taste experience, but it is still perceived by humans. In summary, the authors conclude that humans create technology to solve problems, but this factor depends on knowledge, experimentation, and innovation. Once again, anthropomorphism appears, and especially the confusion between the value of the object created through artificial intelligence and the value that artificial intelligence itself applies to it. As we have observed, this classification task belongs solely to humans, who can give these parameters to the machine so that it regulates its results.

To understand how artificial intelligence works from the perspective of computational engineering, it is often explained that the logic organizing artificial intelligence is a simulation

of the neurons in the human brain. For example, Pragati Baheti (2022) engineer, argues that there is a computational neural network that operates through *machine learning*, which replaces human neurons. These are used to solve complex problems based on data, which again emphasizes the importance of creating such data and represents an explanation that tends to anthropomorphize artificial intelligence. Similarly, Jose Fumo (2017) engineer, asserts that the artificial neural network functions as a computational model based on how the biological neural networks in the human brain process information. The basic unit of computation in a neural network is the neuron, called a node or unit. It receives inputs from other nodes and computes an output. "Each input has an associated weight, which is assigned based on its relative importance with respect to other inputs. The node applies a function to the weighted sum of its" (*ibid*., p. 1). Moreover, this neuronal system has rules, with one of the most important being learning, which is an algorithm that modifies the parameters of the neural network so that a specific input to the network produces a favored output.

Therefore, in these explanations, we see the use of terms derived from the functioning of the cognitive information process of humans translated into computational terms. However, it is important to highlight that this occurs due to the attempt to replicate past human creation translated in the digitalization. Above all, the process of *machine learning* was also created by humans under parameters of trials and errors previously evaluated by humans.

To address the ethical aspects and implications of using artificial intelligence, we rely on Luciano Floridi's research (2022): the philosopher posits that artificial intelligence isn't characterized by intelligence per se, but rather represents a novel operational mode impacting the digital sphere (*ibid*., p. 11). According to the author, the contemporary focus should be directed towards striving for fair and environmentally beneficial information equality given how information, as previously mentioned, translates into data, forming the bedrock of artificial intelligence's functioning. Floridi (2022) argues that ethics isn't merely about applying it to artificial intelligence per se but lies in the hands of humans to employ it ethically. Regarding the definition of artificial intelligence, the author contends that:

> The conclusion is that AI is probably not a scientific term, like "triangle", "planet", or "mammal", but a generic expression, much like friendship or pornography. It is a shortcut, used to refer roughly to various disciplines, services, technoscientific products, sometimes only loosely related. AI is a family in which similarity, and sometimes only for a few traits, is the criterion for belonging (*ibid*., p. 17, my engl. trans.).

Therefore, stemming from this lack of understanding of the definition of artificial intelligence, the author's reflection emphasizes the ethical issues associated with its utilization in various aspects of everyday life. Additionally, the author highlights that it is unnecessary to compare artificial intelligence with human intelligence because of their inherent difference. There hasn't yet been such a replication, and the artificial intelligence is compared to the intelligence of a toaster, demonstrating that humans are not capable of creating something that simulates their form of intelligence (*ibid*., p. 21).

One of the ethical factors that according to the author we must consider is that currently "the success of AI is largely due to the fact that we are building an environment adapted to it, in which intelligent technologies feel at home while we are more like scuba divers. It is the world that is adapting to AI, not vice versa" (*ibid*., p. 22, my engl. trans.). Therefore, there is a concern about the place of humans in the face of the implementation of technologies with artificial intelligence.

The central idea of the author is that artificial intelligence operates thanks to the data provided to it and that its success depends heavily on them. Hence, there is an ethical importance in knowing who provides the data and what gets done with it. Following this line of reasoning, the author emphasizes the importance of distinguishing between data created by artificial intelligence and historical data. In this sense, a traditional recipe could be considered historical data, while a new recipe created by artificial intelligence would be synthetic data. Furthermore, this new recipe would then become part of the dataset for future interactions. Therefore, the most important ethical considerations highlighted by the author include equity, transparency, privacy, responsibility, and trust.

The author also draws on principles from bioethics, such as beneficence, non-maleficence, autonomy, and justice, aiming to establish accountability for the results provided by the machine and to explain its functioning. Additionally, the author references various congresses held by leading nations, advocating for the use of such tools under the premise of benefiting everyone, for example, by improving the environment through the creation of new practices of interaction between humans and the planet. This principle can be found in all media and business discourses promoting the use of such tools, as is the case with this thesis for what regards gastronomy, where suggestions for seasonal ingredients will be used for the creation of new recipes.

Another concern mentioned within the ethical principles is the autonomy granted to technologies with artificial intelligence, as delegating autonomy can imply a loss of decision-

making for humans, especially considering that AI systems increasingly tend to self-correct. However, what the author overlooks is that this ability for self-correction is provided by humans. Therefore, there should be a balance in decision-making power. Another important element is the aim to avoid discrimination in the use of data. The problem that arises, considering the object of study of this thesis is that of in societies that lack access to the internet, and thus have not provided recipe information through any other means: this creates an informational gap that artificial intelligence cannot observe. In these cases, artificial intelligence could attribute a mix of ingredients that have not been used, simply due to this data gap.

Therefore, it is crucial to consider these dynamics of potential informational gaps that could lead to the attribution of a recipe to artificial intelligence, which may already exist in other non-digitized cultures. It is important to consider the ethical aspect of discrimination, which in this case can be explicitly expressed as a lack of access to data.

On the other hand, Floridi (2022: 60) argues that all companies working with artificial intelligence should have the same obligatory ethical parameters when developing their products. He also mentions a lack of transparency regarding the functioning of algorithms, attributing it to their continuous reprogramming, which develops them beyond human control due to the sheer volume of data. It is in this sense that the task of self-regulation and self-control has been entrusted to artificial intelligence itself, by making it learn from its mistakes. This is a paradoxical situation because AI was created for speed and efficiency in processing data and generating solutions, yet humans are unable to constantly monitor its operations. This results in the creation of algorithms to manage this, entering into a paradoxical cycle. In conclusion, Floridi emphasizes the fundamental importance of transparency as a tool for ethical objectives.

On the other hand, we can mention here the research by Cristianini (2023) computer scientist, who synthesizes a series of dynamics surrounding the understanding of how artificial intelligence works. The author begins by emphasizing the difference between being intelligent and the capacity to adapt to new situations, a concept not strongly linked to the ability to be identical to humans.

> Attributing human qualities to all intelligent agents is misleading, and when we reflect on the intelligences we encounter in our browsers, it is more useful to compare them to the herbs or snails in the garden than to ourselves (*ibid*., p. 9, my engl. trans.).

Therefore, with this definition, the author distances himself from a comparison between artificial intelligence and humans. The author understands intelligence as any agent that can obtain information from its environment and make autonomous decisions, with modifications arising from experience. This definition manages to address the issues raised by other authors, but the difference lies in the fact that there is a problem with artificial intelligence because unlike other intelligences found in the environment, it was created by humans. Hence the problem of the anthropomorphization of artificial intelligence arises. According to the author, the more experience artificial intelligence has in different areas, the less likely it is to make errors, hence the idea, as several interviewees will mention in the following chapter, of increasing and promoting the use of these devices in gastronomy.

Furthermore, the author explains the functioning of the algorithm by likening it to a recipe, where a number of variations, ingredients, and cooking methods are calculated to determine the variants. Each experience would help improve and avoid errors in these recipes, but in this regard, the author leaves out everything mentioned earlier regarding the issues of taste experience. He also highlights the problem of trust that humans have in such intelligent agents, as Floridi (2022) mentions. However, we find the reflection posed by Cristianini (2023) relevant because it manages to break through the problem of the conception of intelligence and why it is labeled as an intelligent agent. These are issues that the previously cited authors fail to provide answers to.

To conclude, we highlight here the research by Berlanga Fernández and Everardo Reyes (2024), which emphasize the need to create a digital semiotics to better understand these phenomena that are part of the digital sphere. This is because these technologies generate new aspects that must be interpreted under a different dynamic, and considering these dynamics is fundamental in the construction of the database. As mentioned, in the context of this case study it is the central pillar for artificial intelligence to then create its results by generating new recipes. According to the authors:

> The digital, interactive and prosumer culture of content is transforming our traditional notions of language, it is necessary to rethink semiotics and consider it as an instrument that brings understanding and humanity to communication (ibidem.: 135).

Therefore, the need to study these phenomena from a different perspective, focusing on the creation of the database and how such data is interpreted, is justified. If we start from the

premise that each piece of information in the database, which involves recipes and chemical compositions of different ingredients in these cases, is designed for artificial intelligence to generate possible new flavor combinations, they intrinsically involve the element of an experience transferred to the digital sphere. With this focal point, along with the concept of metaphor developed by George Lakoff (1980) linguist, we can understand that the database implies a metaphor. “But metaphor is not merely a linguistic matter; it is a matter of conceptual structure. And conceptual structure is not purely an intellectual issue; it encompasses all the natural dimensions of our experience, including aspects of our sensory experience: color, shape, texture, sound, etc.” (*ibid*., p. 288). In this conceptual framework, we can understand that the construction of the database involves a metaphorization of it. In Lakoff’s terms (1980), metaphors facilitate the understanding of experience, and new metaphors can generate novel understandings and realities (*ibidem*).

Consequently, it is necessary to transition and translate all culinary data, which would involve their digitization to create the database. This would explain the previously mentioned cases of the electronic nose (Baietto, Wilson 2009) and the electronic tongue (Urueña 2004). We argue that these elements can be seen as a metaphorization of human perception transitioning into digitalization. We support this assertion based on how Lakoff (1980) defines the concept of metaphor. According to the author, “the metaphors that structure our perception, our thinking, and our actions. To give an idea of what it means to say that a concept is metaphorical and that it structures our daily activity” (*ibid*., p. 22).

Within the conceptual framework of metaphor employed by Lakoff (1980), we can understand that there is a metaphorization that allows us to comprehend our perception, leading to the creation of the database. Therefore, there is a metaphorization of this data to create a new taste with artificial intelligence.

Consequently, we understand that we are witnessing a new reality and, therefore, a new metaphor that entails the creation of this database. It is pertinent to conclude this paragraph of this chapter with a reflection on the construction of the database due to its importance in the final outcome of each new recipe, which will then lead to a new taste experience.

3.2. The Issues of the Filter and the Translation Between Man and Machine

The concept of filtration in the development of novel flavors using artificial intelligence is pivotal. It acts as a crucial intermediary between machines and individuals, facilitating

efficient communication. Each term within a query function as a filter, aiding in delineating the context and parameters of the discourse. This is imperative for comprehending individual tastes and producing tailored responses that meet user expectations. Furthermore, a filter can assist in refining and modifying outcomes incrementally, continually enhancing the flavor experience provided. To summarize, the filter serves as an essential component in fostering interaction between artificial intelligence systems and humans in the innovation of new flavors.

To understand the dynamics and relationships that humans have with filters, we draw on the research of Leone (2020a). While the concept of filters is often associated with the digital sphere, the author prompts us to reflect on the presence of filters at various levels in our social and everyday lives. Filters can be found in various elements of our daily routines, such as tea bags, coffee filters, air purifiers, pasta strainers, sifters, and more. Therefore, in the culinary domain, our kitchens are surrounded by these filters, which are designed to enhance the quality of our dining experiences and ensure that we consume digestible elements within our diets, meeting societal standards of taste satisfaction.

Therefore, the filter carries with it an ideological function, as exemplified by the cases mentioned. We can understand that there is an ideology dictating how certain cooking techniques should be performed, determining what is considered healthy for our diet and what is not. For instance, if we consider the case of coffee, there are different types of coffee: Turkish coffee for example requires a different brewing technique that does not involve a filter. In this method, the coffee grounds settle at the bottom, allowing one to drink the coffee without consuming the sediment. While both cultures agree that the sediment should not be consumed, the change in technique eliminates the need for a filter. In essence, we aim to demonstrate that the filter serves as a cultural and ideological element, and in the context of cooking, its usage reflects our naturalized approach to gastronomy. Despite variations in coffee beans and preparation methods, the use of a filter is common in most cases, except for Turkish coffee, where the natural sedimentation process eliminates the need for an external filter. This everyday example highlights one of the primary functions of a filter: to separate elements that certain cultures deem harmful to our bodies. These components consistently impact our gustatory perception, each filter acting as a mechanism of categorization. Taste is inherently molded by these filters, however, as we progress from basic sensory detection to the holistic taste encounter, they fundamentally influence our connection with the element under scrutiny.

Following this line of thought and the utilization of such dynamics, it can be understood that humans naturally see the filter as a positive aspect that allows to separate negative or

harmful elements for their well-being. We argue that to comprehend this relationship with the notion of the filter as something beneficial, it is necessary to step out of the digital sphere. Currently, if one thinks of the filter and translates it into this sphere, the ideological element changes and it is associated more with a negative aspect of hiding, concealing, even reaching falsehood.

One of the important elements to highlight is that both the everyday filters of the physical environment and those of the digital sphere serve the function of hiding or concealing certain elements that culturally, we reckon as having to be discarded.

We know that currently, different movements within the digital sphere emphasize the need to eliminate filters, thus highlighting their association with falsehood. However, we do not intend to delve into the distinctions or the barriers of levels of falsehood in the digital realm because it is not within the scope of this study. Nor do we aim to advocate for filters. What we seek to demonstrate are the various relationships we have with filters, highlighting their function. Without them, our daily lives would be much more complicated, especially when it comes to our dietary habits. The use of filters in food preparation implies a slower process aimed at avoiding the ingestion of elements that do not provide certain calories and/or energy, and especially of those that are socially unacceptable to consume. This is because certain elements do not belong to our social taste experience. Equally important are filters in the digital sphere, as they streamline our daily lives and save us time.

It is crucial in any digital sphere to have filters because they facilitate the search for the elements we wish to consult and find. Therefore, once again, we are faced with the conception of the filter as an element that separates and helps classify data and all types of information found on the web. Clearly, in aspects related to the creation of the database, it is essential to understand such categorization because it is filtered through the culture in which the database is developed. In these cases, one must consider the classification of ingredients that are deemed consumable or non-consumable for humans.

Therefore, in these cases, there is a feedback loop, as highlighted by Parisi (2019), between the machine and humans, where the classification of filters determines which elements can enter our bodies and which cannot. Along this line, we can establish that filters provide a sense of control, allowing us to choose which elements enter our bodies and what information we allow into the digital sphere. The key aspect of this element is to be conscious that our choices are determined by our culture. To be aware of these dynamics, the study of semiotics is

fundamental, as it enables us to understand our modes of interaction through the existence of each filter, whether physical or digital.

From the perspective of the illusion of control, as it depends on cultural factors, we can align with the ideas developed by Leone (2020a), where filters generate attraction and seduction because they provide us with a sense of control and decision over the elements that we want to be part of our daily lives. We mention here these dynamics, especially in the digital sphere, due to the existence of the so-called *filter bubble*, where each person finds news that aligns with their preferences. Such filtering also existed in the physical sphere within the media, especially in previous generations, where the choice of radio programs, television channels, or newspapers also had an editorial dynamic that aligned with one's thoughts. Few people would listen to or watch the same news on every television channel or read the same stories in every newspaper; most often, individuals selected outlets that matched their ideological leanings. However, those who worked in or studied media were more aware of these ideological dynamics and often made choices to counteract the effects of the *filter bubble*, even though the term is primarily applied to digital aspects.

What we want to emphasize here is that filtering does not belong solely to the digital sphere; there is a translation of it, and when it comes to cooking in our daily lives, we are surrounded by such filters. This is because it is in this environment where our bodies are at risk of ingesting substances that are not socially accepted. When humans consider allowing certain culinary substances into their bodies, is precisely when they are more inclined to use these filters that provide a sense of security, tranquility, and control over the aspects that are deemed pertinent to enter one of the most private human spheres: their bodies.

It is worth clarifying that we are constantly, albeit at different levels of consciousness, deciding which elements to ingest and which not to, in every daily dish, under different parameters, but always filtered by the culture to which we belong. From the various ingredients we select for each purchase, to creating a shopping list where certain items are chosen based on this dynamic, a filter is applied that allows us to select certain products. Clearly, this decision is not purely rational, as other factors influence our choices, such as economic factors, our past taste experiences with certain ingredients, obviously advertising, and *foodporn* (Allard, David 2022).

If we consider the mechanism of operation of all types of filters, they are always used as a means of negation, to know which elements one wants to exclude from any kind of dynamic. Furthermore, this mechanism generates a sense of power and control. We find the

notion of filtering relevant because taste can be perfectly considered as a filter under the previously described conditions. This is because the selection of certain products or whether to filter coffee or not are elements that fall under the perspective of whether something pleases me or not. This aspect is evident in the issues related to the *filter bubble*, where a portion of information is selected based on the user's tastes and preferences. Therefore, under this dynamic, taste can be considered as a filter that is always imbued with social and cultural elements that allow one to determine which elements would be to their liking.

Furthermore, within this dynamic, it is simple to translate tastes into the digital sphere. If it has been done with news, why wouldn't artificial intelligence be able to provide a different perspective in the culinary field? Essentially, if we view taste as a filter, it is a mechanism that the machine has perfectly incorporated within itself, thanks to that digital translation aimed at solving human problems.

Individuals naturally possess the capacity to filter, so it follows that artificial intelligence, created by humans, should have similar characteristics. This enables us to understand and interact with such technology easily, effectively, and swiftly. Thus, while it may seem novel for artificial intelligence to create new tastes leading to novel taste experiences, the underlying mechanisms used by machines for this purpose are akin to those found in the realm of news, involving filtering and categorizing each element. This again sheds light on the need to be aware of how the database is constructed, who provides the data, and what types of data exist, so that our tastes can be filtered, resulting in something innovative yet still within our taste *filter bubble*.

Following these ideas, we can once again ascertain what Parisi (2019) established regarding the feedback loop and the way machines and humans interact with the environment. This interaction is primarily facilitated by filters that provide us with a sense of control within the creation produced by artificial intelligence.

To better understand these elements, it suffices to consider how we interact, for example, with *ChatGPT* and its *Sous Chef* function. During such interactions, humans already operate with a kind of filter within gastronomy. It is only necessary for the users to provide the inputs that align with their gastronomic filters to obtain a result that fits their taste experience *filter bubble*.

Therefore, from this perspective we are looking at a new way of creating a taste. However, it is important to be aware that this innovation carries with it the filtered limitations that we bring to the table. This filtering always includes cultural aspects and the way the

database is created, along with other factors that determine the final result. Variables such as our geographical location at the time of the query or the country our account is associated to also provide their own gastronomic filter, influencing the outcome. The key aspect of these dynamics with filters is to be conscious of them. Additionally, linguistic factors play a role; the same input may yield different results in different languages.

Moreover, another filtering factor is the concept advocated by companies employing artificial intelligence in gastronomy, which is the use of seasonal ingredients. This is facilitated by accessing information about your geographical location, allowing the system to easily detect which ingredients are available and can be suggested to you. All these dynamics operate based on the idea of filtering, always conceived in terms of opposition. It is established that using seasonal ingredients is an important factor for the environment, and therefore, through this filter, the machine selects the most suitable element.

Another aspect that contributes to the so-called taste *filter bubble* is the information stored in our *Google Maps* account. This information reveals the types of restaurants we frequent and, consequently, helps detect the kinds of food we typically choose for consumption. Additionally, as with all artificial intelligence mechanisms, the algorithm responsible for providing suggestions must undergo training. This is akin to platforms like *Netflix* and *Amazon Prime Video*; the more movies or series we watch, the higher the probability that the suggested content aligns with our preferences, thus filtering recommendations according to our tastes.

Similarly, when it comes to recipes suggested by artificial intelligence, the initial suggestions may not fully match our preferences. However, as we provide feedback based on our dietary filters, the algorithm learns and becomes better at providing recipes aligned with our past taste experiences. Therefore, while innovation occurs, it does so within the confines of our taste preferences. It is worth noting that some individuals may be open to trying new foods to experience different tastes. Nonetheless, in each case, if the suggestion comes from artificial intelligence, it will contribute to a new taste experience based on the aforementioned factors that influence taste perception.

Underlying all the dynamics presented previously, for the purposes of this study, we will focus on conceptualizing the filter as a system that establishes a coherent structure and meaning in relation to a specific object. According to Leone (2016), the filter can be compared to a veil, as we mentioned in the first chapter of this thesis. This is because it serves the dual purpose of seducing and attracting, thereby allowing selective observation of particular aspects of the object. This engenders a fetishistic fascination with what remains completely hidden from view.

At the same time, through its function of concealment and partial revelation, the filter imparts value and order to the object.

Based on these definitions, it is evident that the filter serves as a semiotic operator, specifically acting as an operator of semiotic translations. On one hand, it directs the recipient's attention towards the final sign, which from a Peircean perspective implies a tendency towards the sense of the final *interpretant*, which, in the context of the taste experience created by artificial intelligence, refers to the taster of the final dish. On the other hand, it conceals certain elements. As Leone (*ibidem*) argues, the filter functions as a permeable membrane, allowing the passage of specific levels of information.

With these perspectives, we aim to examine the case taking into account the taste experience created by artificial intelligence, where the predominant filters involved are of an abstract nature. While previously we considered filters of a physical nature, we will now focus on those of an abstract nature that tend to become naturalized. To better understand this phenomenon, we will delve into a more thorough discussion of these filters, clarifying their alignment with Barthes' (1957) concept of *ideological* filters. Referring to these filters as more natural, we consider their complete integration within social constructions, rendering them imperceptible to human consciousness.

An integral differentiation of various degrees within the realm of the taste sensation becomes essential to shed light on the presence of discrete filters inherent in each gustatory encounter. This becomes especially pertinent when examining its creation through the use of artificial intelligence due to the factors we have established.

Furthermore, delving into the strictly physiological dimension, it becomes imperative to contemplate the multisensory and synesthetic foundations and implications of taste. This requires a thorough examination of all sensory faculties, including vision, olfaction, auditory perception, tactile sensations, and taste itself. In this regard, as previously established, Peirce's semiotics provides us with the means to understand the interconnectedness that exists among the senses—and the cultural connotations—that comprise the realm of taste and the actual experience of taste itself. Within this theoretical and analytical framework, it is plausible to begin with the sensory perceptions elicited by the tasted object, advancing towards an examination of its symbolic and cultural ramifications as integral components of the social imaginary theory previously mentioned by Castoriadis (1975).

If we base ourselves on the cases mentioned regarding the factors that limit the outcomes of artificial intelligence when suggesting a new taste, we can establish that there exists a deeper

level of filtering. This is because we are dealing with a *temporal-spatial* filter, wherein depending on the individual's geographical location, it is possible to determine the type of diet and ingredients consumed most frequently based on climate. Therefore, factors such as time, which determine the seasonality of certain ingredients, along with geographical space, implicitly impact this outcome. However, it is also a type of naturalized filter, as each time we interact with *ChatGPT* in its *Sous Chef* function to request a new type of dish, we are not consciously specifying the season or our location. Both elements act as automatic filters from the moment we use our account.

Another type of filter that we encounter, as mentioned earlier, is a linguistic filter, determined by the words we select as input, which subsequently determine the final outcome. However, with this type of filter, we are more aware each time we inquire about a recipe from such devices. On the other hand, it is worth highlighting that, as mentioned earlier, the language with which we choose to input conditions the result, and this factor we are not fully conscious of, due to the naturalization of our own language. Furthermore, another naturalized filter is the *cultural-social* filter, which we constantly live with, not only conditioning the questions we would pose to artificial intelligence but also influencing its use. Particularly when considering the reading of such gastronomic suggestions, there are cultures that are more open to gastronomic cultural changes than others, thus making this filter one of the most important determinants of the type of relationship we establish with artificial intelligence.

Furthermore, we argue that there is another filter that companies can incorporate, as we will see later, which is a factor present in the discourse of the company Sony[6]. This new filter is added to protect the customer and, above all, their new taste experience. This is the *ethical-ideological* filter, which takes into account each food taster's decision to avoid certain foods for ideological reasons, such as following a diet, being vegetarian or vegan, or having religious beliefs. We argue that it is an *ethical-ideological* filter because, unlike the *cultural-social* filter, it implies a different bias. In other words, the *cultural-social* filter is understood as a macro filter from which no individual is exempt, while the *ethical-ideological* filter is a more micro-level filter, as it moves from cultural and social bias to personal bias. This entails the selection of certain ingredients by certain types of people belonging to a particular society. It is worth clarifying that this micro filter is never entirely personal, as it is highly likely that other individuals within an individual's culture also share these dietary dynamics. This type of filter

[6] An article from the company's blog will be analyzed it in the next chapter of this thesis.

is recognizable when applying semiotics because it helps us understand the different meanings that can be found in relation to the food environment, in addition to aiding in the understanding of socially naturalized dynamics as mentioned by Barthes (1957).

Regarding the last filter defined as *ethical-ideological*, we do not take into consideration cases where individuals choose not to consume certain ingredients due to allergies or any health issues. In these cases, it is not so much the individual's choice not to ingest those ingredients, but rather the body itself rejecting them because they are considered harmful to the body. It is different if a doctor prescribes a diet low in sugars or salts; while there is a relationship with health issues, in this case, the individual can choose whether to follow the diet or not. However, in cases of severe allergies where there is a risk of death with each ingestion of certain ingredients, we can say that there is no voluntary filter. These cases we refer to are rather understood as an involuntary impossibility of the individual, and therefore would fall into another type of filter, more naturally created as a defense for the body.

Indeed, if we revisit Peirce's notions, the *ethical-ideological* filter is strongly associated with the notion that relates to the sense of belonging of each tasting individual. This belonging is defined within a specific group of people who share the same *ethical-ideological* filter within a society that belongs to the same *cultural-social* filter. This dynamic of belonging or not to a certain group is a fundamental element that the algorithm must take into consideration when training to suggest to each individual a new taste experience based on their choices.

Therefore, filters are an important aspect within the context of this thesis because they enable the seduction emphasized by Leone (2016), as this property of attraction can be found in each of the mentioned filters. As we have mentioned, each filter created by us generates the sensation of being able to control which elements we allow to be part of our daily diet and which ones we do not.

Indeed, another seductive element regarding the possibility of artificial intelligence creating a new taste experience lies in the pursuit of a recipe-level memory, of ingredients that imply a certain culture. We are drawn to the idea of having control over the memory that makes the database possible, and at the same time, this intriguing desire to select and determine more strictly what and how we decide to eat. It is tempting to think that we can determine through words which elements we want to cook. The idea of finding ingredients from a particular region is enticing, especially considering the discourse that artificial intelligence can aid environmental factors. Furthermore, the notion that we can decide what we want to eat on a cultural level is also appealing; the idea of artificial intelligence generates a feeling of having

more possibilities for new tastes. This element, according to Peirce's notions, belongs to *Firstness* (CP 1.302), increasing all the possibilities of different combinations of dishes that humans can imagine.

On the other hand, the *ethical-ideological* filter holds a fundamental attraction, especially for individuals who belong to alternative dietary groups, allowing for new choices within their daily diets. This significant element is highlighted by the interviewed chefs, a part that we will analyze in the following chapter, indicating that these individuals are, in a way, more open to trying recipes created with artificial intelligence. This openness stems from the fact that artificial intelligence can offer precisely tailored recipes, selecting ingredients that fully comply with their dietary restrictions.

It is also important to note that these filters I've mentioned are often not easy to recognize, as they are naturalized and, above all, semiotically translated through artificial intelligence. Currently, humans are constantly engaged in translations, from translating our taste preferences into language under certain parameters, to the language used to obtain specific results, as well as, as we have seen, simulating a human body. It is therefore important to understand how this translation appears in the traditional gastronomic realm. Clearly, a filter that can belong to the *ethical-ideological* realm is choosing to remain within a traditional gastronomic dynamic, highlighting with this choice the ideological factor and the social imaginary of such traditional dishes.

Therefore, we argue that it is important to be aware of all types of filters that exist in both the gastronomic and artificial intelligence realms. They allow us to understand how the dynamics work to create a new taste experience. At the same time, it is crucial for each individual to understand and create their own taste *filter bubble* to provide the best inputs to artificial intelligence, enabling it to create personalized new taste experiences, as emphasized by every company employing such methods to develop new dishes.

Furthermore, as we have mentioned, it is important to be aware of these filters and not merely perceive them from the perspective of deception, but rather focus on the understanding that they are necessary to interact more effectively with artificial intelligence. Thus far, there is no other dynamic through which we can communicate with artificial intelligence to express what we need it to solve for us. In this context, we perceive the filter as the capacity that enables a translation between the machine and humans, as it involves a conversion from the binary mathematical language used by all digital devices to the language used by humans.

Another central element in the issue of filters is that behind them lies the classification of categories, which is found in the creation of the database. This can be observed in the following paragraph, where the way information about gastronomy is classified by artificial intelligence depends on each country. In other words, when we input the need for a recipe or an image of a typical dish from a region or country, artificial intelligence manages to discern the country and provide us with a result that simulates the traditional food of the requested country. Therefore, the information provided to the database begins with the categorization of typical gastronomy by country. With this parameter, it can be established that each country represents a filter within all the information that artificial intelligence possesses, allowing it to recognize, through *machine learning* systems, the response being requested. It is worth noting that efforts are currently underway to improve this information because, as we will observe below, there are certain countries whose traditional or typical foods are not well-known, and in these cases, the results in the images proposed by artificial intelligence systems reflect this lack of information. This fact makes it difficult to identify such dishes, and since the written word is the name of the country, examples include dishes with the flags of the countries requested by each individual.

3.3. Perception: Simulating the Human Body

Given the components scrutinized in the second chapter of this thesis, notably the significance of perception and the human body, which are integral for a comprehensive comprehension of the taste encounter, it is imperative to delineate the developments within artificial intelligence necessary for transitioning from taste as a sensory function to the taste experience.

To comprehend this phenomenon, we draw upon the research of Francesco Parisi (2019), who posits that all human perception is contingent upon our bodies. Therefore, it is understood that for artificial intelligence to produce results that pertain to perception, it should possess a body that simulates that of humans. This research enables me to understand various phenomena. On one hand, it explains the utilization of the previously mentioned cases of the electronic nose and tongue. On the other hand, it elucidates why there is a tendency to simulate the human body. These electronic devices serve to digitize data for use in the database, and both aim to replicate aspects of human organs. This theory always hinges on the idea that perception is contingent upon our bodies. Consequently, if artificial intelligence produces results that

involve affecting human reception, having a body that mimics that of humans would lead to a better understanding of our functioning, our perception mechanisms, and subsequently, to create something that affects our perception as accurately as possible.

Parisi (2019) conducts an analysis of technology, outlining the feedback process with humans. Thus, a relationship with technology is established that is contingent upon our bodies. According to Parisi (*ibidem*), our bodies constrain our actions and form the basis of our sensations. Since our sensations depend on our bodies, technology and artificial intelligence must develop similar elements in order to address any issues posed by humans. In the case of this thesis, this entails creating a taste experience similar to that of humans. According to Parisi (2019: 72), technology can be considered cognitive if it serves a specific function, such as producing a specific or new flavor that will then result in a new taste experience.

Within Parisi's research (*ibid*., p. 4), it is established that human bodies are biologically predisposed to interact with the environment around them and consequently with the technologies we create, leading to a feedback relationship. Therefore, within this dynamic, an obvious need to interact with the technological elements we create arises, and in cases where such tools alter our perception, as in the case of taste experience, it is necessary for them to simulate our body.

Moreover, Parisi (2019: 9) argues that "a technology in nature, namely a technology perfectly integrated between bodies and the surrounding environment that does not manifest itself as different from the world, but is the same world" (*ibidem,* my engl. trans.). In essence, to obtain a technology that is integrated into our world, it must not completely distance itself from the nature that exists in the world. Therefore, from one perspective, the use of artificial intelligence attempts to create that connection with the surrounding world, but we are still in an intermediate phase to achieve such integration. This reflection aligns with what Floridi (2022) mentioned, where ethics seeks to unite and, above all, establish an artificial intelligence that does not negatively impact humans' environmental footprint but improves It. However, as Floridi (*ibidem*) emphasizes, it is important to reflect on the extent to which artificial intelligence is integrating into the world around us, or whether we are adapting and changing different dynamics to accommodate artificial intelligence into our current society more effectively.

In his analysis, Stano (2023b) delves into various instances where artificial intelligence is endowed with anthropomorphic features. To effectively engage with its surroundings, artificial intelligence necessitates an array of sensors that facilitate the interpretation of

encountered objects within the external milieu (*ibid*., p. 226). This discussion gives rise to the concept of amalgamating human and technological bodies in pursuit of enhanced cohabitation.

Indeed, there is a partial integration between both researchers' perspectives. As Parisi (2019) argues, it is important to establish this relationship between the body and the technology. From one perspective, it is entirely normal that with the advent of new technological devices, the environment undergoes modifications to achieve integration with these new technologies. This phenomenon is evident throughout history with the introduction of various technological innovations, such as the creation of the first automobile, which brought significant changes to our environment both physically and symbolically.

Physically, these changes included the construction of roads, gas stations, and the creation of tunnels through mountains to facilitate passage, among others. Symbolically, technological advancements, such as the implementation of traffic signals, also alter the environmental landscape.

Through this example, we aim to illustrate that Floridi's (2022) concern about whether we are altering our *habitus* to enhance artificial intelligence and whether the environment is changing as a result is a question that can be applied to any new technological device. As Parisi (2019) suggests, it is entirely coherent for this transition to occur in such a manner because it is inherent to human nature to interact with the environment and, consequently, with the constructs we create to address various challenges and improve our circumstances.

Expanding on Parisi's (*ibidem*) theory, it is well established that technologies have a significant impact on our cognitive perception. Within the scope of this study, this influence is comprehended in a more interconnected manner, as the ultimate result of all proposed innovative gastronomic recipes will undeniably shape our taste experience. This assertion is grounded on the notion that the environment in which a dish is crafted plays a pivotal role in shaping our taste memory (Boutaud 2011), consequently influencing how we perceive each dish. It is essential to clarify that the reference to taste experience encompasses a synesthetic influence, thereby impacting all sensory modalities.

It is important to understand how the representation of existing dishes emerges to observe how artificial intelligence systems operate. A clear example of this can be seen in the creation of images of typical dishes using tools such as *ChatGPT, Sous Chef,* and *Bing.* This topic is developed in paragraph 3.4 where an analysis of these images is presented.

Parisi (2019: 55) asserts that just as humans possess *agency*, so too do material elements, such as technologies, referring in this case to artificial intelligence in the context of this thesis.

To support this notion, Parisi (2019) draws on Lambros Malafouris (2013), who, in his book, explores the relationships between humans and technologies, highlighting the materiality of each technology and introducing the concept of material *agency*. Malafouris (*ibidem*) argues that the human mind can extend itself, citing examples such as technologies that extend human perception, like glasses or canes for the visually impaired. Furthermore, Malafouris (*ibid*., p. 91) posits that there is a capacity to make sense of materiality through symbolic representation, such as the language used to name specific technologies and their representations. For instance, in the case of defining and naming artificial intelligence, each individual can conceptualize it through the use of these terms, often imagining it in a specific form, as commonly depicted in the media as a cold, blue-toned robot. Consequently, a material sign is created containing characteristics of the mentioned object through its linguistic representation, which translates into a conceptual process that attributes both physical and cognitive elements.

The discussion on representation, to delve deeper into Malafouris's (2013) concept, can be approached from a semiotic standpoint to better understand this type of relational dynamic. For this purpose, we rely on Peirce's definition of representation:

> The easiest of those which are of philosophical interest is the idea of a sign, or representation. A sign stands ***for*** something ***to*** the idea which it produces, or modifies. Or, it is a vehicle conveying into the mind something from without. That for which it stands is called its ***object;*** that which it conveys, its ***meaning;*** and the idea to which it gives rise, its ***interpretant.*** The object of representation can be nothing but a representation of which the first representation is the interpretant. But an endless series of representations, each representing the one behind it, may be conceived to have an absolute object at its limit. The meaning of a representation can be nothing but a representation. In fact, it is nothing but the representation itself conceived as stripped of irrelevant clothing. But this clothing never can be completely stripped off; it is only changed for something more diaphanous. So there is an infinite regression here. Finally, the interpretant is nothing but another representation to which the torch of truth is handed along; and as representation, it has its interpretant again. Lo, another infinite series. (CP 1.339, emphasis in the original).

Therefore, Malafouris (2013) establishes that certain material objects are no longer passive entities and begins to believe in their capacity for *agency*, which they themselves can develop. In the case of this thesis, this element manifests in various dynamics. Firstly, it is evident when humans start seeking new recipe combinations with ingredients that have not yet been mixed. The resulting suggestions from these inquiries already demonstrate the *agency* of artificial intelligence. However, the materiality of the suggested dish by artificial intelligence,

except in the case of *gastrobots*[7], currently only refers to the human ability to execute the dish under the rules dictated by artificial intelligence. Thus, we encounter again Parisi's (2019) concept of feedback within the environment. In these cases, the relationship with the culinary environment is altered due to the artificial intelligence's ability to suggest recipes based on seasonal ingredients, thereby changing our interaction with the culinary environment. However, the ability to produce these dishes often still relies on human skill in preparing different recipes. It is important to clarify that when Malafouris (2013) refers to the *agency* of materiality, he does not merely refer to the physical realm, such as in this case study of simulating parts of human organs, as seen in examples like the electronic nose and tongue. He also considers the *agency* of materiality in the digital realm. Therefore, in the suggestions provided by these artificial intelligence devices regarding new recipes, even though they are in the digital domain, this *agency* is evident, as mentioned earlier.

This implies that even when we are considering the digital realm, the existence of a feedback interaction between humans and such technologies cannot be negated.

In order to delve into the representation of the human body in simulations, an illustrative case study from this thesis will be presented. This particular case study revolves around a Parisian restaurant[8] that sparked controversy by misleading its patrons. The establishment purported to be the first Italian cuisine restaurant where dishes were crafted using artificial intelligence. Although this thesis predominantly focuses on authentic case studies, this example is deemed pertinent due to its elucidation of how narrative constructs influence diners' expectations and subsequently impact their gastronomic experience - themes explored in earlier sections of this academic work.

As reported by French media and corroborated by the restaurant official website[9], an algorithm was allegedly utilized by the restaurant to devise novel pizza combinations based on a repertoire of traditional recipes from diverse Italian regions. However, upon further investigation, it was revealed that this assertion was fallacious. In reality, inquiries with staff members disclosed that the recipes were not generated by artificial intelligence but rather conceived by an authentic Italian chef employed by the restaurant.

[7] The analysis of this element is further explored in the following chapter of this thesis.
[8] The *MamaMia* restaurant, located in Paris, can be found at the following website: https://mamamia-paris.com/en/](https://mamamia-paris.com/en/.
[9] The news can be seen in this link: https://www.francepizza.fr/actualites/trattoria-restauration-traditionnelle-italienne/2300-Mamamia-le-restaurant-italien-dont-le-chef-est-un-avatar/.

Indeed, the Parisian eatery engaged the services of a skilled Italian chef who imported genuine Italian culinary traditions to Paris while infusing them with elements of haute cuisine. Despite the contrived nature of this scenario, it remains a compelling illustration as the restaurant constructed a virtual persona resembling an Italian chef. This avatar was credited with creating innovative recipes which were then executed by the aforementioned chef in practice.

These elements are reflected in the dynamics of the restaurant itself, as it caters to an elite audience with very strict norms evident in both the prices and the requirement for elegant attire to be allowed entrance.

Reflecting on the simulation of the body, regardless of the veracity of the narrative presented by the restaurant, it is not coincidental that Italy is used as the reference country for creating a digital body of the first chef endowed with artificial intelligence to create his dishes. This factor aligns with the aforementioned concept of the social imaginary by Castoriadis (1975), as Italy has always been positioned, socially and through various institutions, as at the forefront of European cuisine.

Viewed through a marketing lens, the strategy of positioning a restaurant as exclusive and celebrated for its exceptional cuisine is frequently accomplished by aligning it with Italian gastronomy, a culinary tradition recognized worldwide for its esteemed and influential nature. Italian cuisine has historically set a benchmark for other culinary traditions, influencing culinary techniques and perceptions of what a skilled chef should embody within the social imaginary (*ibidem*). Furthermore, the influence of European cuisine, particularly Italian, extends beyond Europe to regions like South America, where Italian cooking techniques have been integrated due to historical immigration patterns. This fusion involves using local ingredients while preserving the essence of Italian culinary forms. Such cultural and culinary influences significantly impact the taste experience of diners who wish to enter such a restaurant.

Furthermore, there is a utilization of the social imaginary (*ibidem*), which also involves the use of certain physical traits considered characteristic of an Italian person. These traits are employed in the physical representation aimed at creating authenticity in both the artificial intelligence's embodiment and the portrayal of an Italian chef's body. All these dynamics should be understood within the framework outlined by Floridi (2022) regarding the ethics surrounding the use of such tools, ensuring they do not perpetuate discriminatory practices and emphasizing the importance of verifying the accuracy of the information and the sources from

which it is derived. It is important to clarify that we do not view this phenomenon through a lens of discrimination, neither towards Italian cuisine nor Italian people. Rather, the invention of this hypothetical case about a possible first avatar chef utilizing artificial intelligence is an example of engaging with the concept of social imaginary, as described by Castoriadis (1975). Since the advent of artificial intelligence technologies, there have been instances of discrimination often based on cultural stereotypes, as evidenced by various researchers in fields such as facial recognition (Leone 2020b). However, what these cases have in common is that the blame should not be solely placed on artificial intelligence if it produces results that tend to be discriminatory. Instead, policies should be implemented, as suggested by Floridi (2022), to exercise more control over the data used by artificial intelligence to generate its responses. Therefore, these examples underscore the importance of reflecting on the type of data we provide to machines, as each outcome is influenced by the quality and nature of the input data. This perspective aligns with Fry's (2018) assertion that errors generated by artificial intelligence stem from flawed data input by humans. It is understood that when certain data is loaded with parameters of a racist or xenophobic nature, the resulting outputs will reflect these biases.

To exemplify, an image sourced from the *Instagram* account established by the restaurant enterprise *Mamamia* is showcased. Within the framework of Peircean theory, it is recognized that representation consistently endeavors to replicate the tangible entity it intends to portray. In this context, said profile serves as a portrayal of the pioneering Italian chef who has innovatively crafted recipes employing artificial intelligence. However, as previously emphasized, this portrayal is fictitious. As shown in Fig. 3.1, the choice of name for the avatar, *Giovanni Di Pomidoro* aligns with the concept of *Italianness* (Barthes 1964) within the social imaginary (Castoriadis 1975).

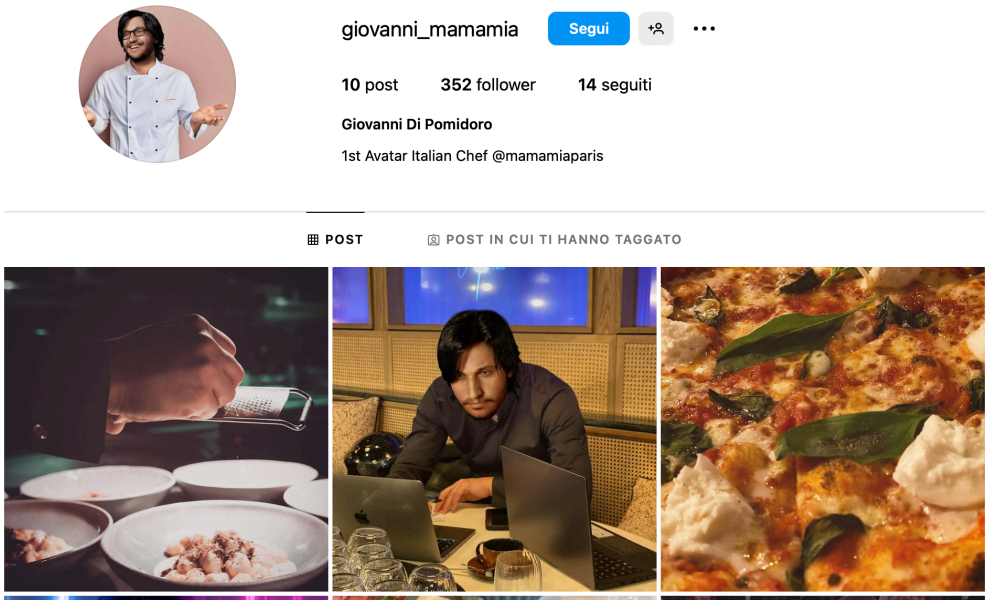


Figure 3.1. *Instagram* profile created by the *Mamamia* restaurant company.

Thus, this example demonstrates the aforementioned dynamics, wherein the avatar encapsulates the essence of *italianness* as defined by Barthes, through its nomenclature and physiological attributes. Moreover, an intriguing aspect underscored by these selections in accentuating the Italian identity pertains to the selections of dishes to create. Among all the possibilities of Italian cuisine, the restaurant chose one of the most globally recognized Italian dishes, pizza. This choice also reflects the type of target audience the restaurant aims to attract. It is not aimed at Italians living in Paris, for example, but rather targets a wealthy audience who can afford to dine at the restaurant, particularly those with limited knowledge of Italian cuisine.

Another interesting detail in the image is the quest for authenticity, depicting how the avatar directly produces food and seeks information using technological tools such as computers. In this case, we can observe the dynamics outlined by Malafouris (2013) and the *agency* of the digital materiality of the first Italian chef avatar, as defined by the company. Despite everything being a fictional construct, the digital sphere enabled the company to develop the *Instagram* profile for this avatar. What is significant here is that the avatar exists; what is not real is its role in preparing the restaurant's food as it was advertised. The dishes continue to be prepared in the traditional manner by a human Italian chef.

Another element worth noting is the presentation dynamics on the restaurant's website, which features a theme highlighting the show aspect, representing Italy in a way that emphasizes spectacle. As illustrated in Figure 3.2, cultural practices of Italy, such as carnival, are showcased through this show-like dynamic. The elements in question distinctly embody the

concept of depicting Italy within a commercial and playful context, with the primary aim being not to inform about Italian cultural aspects but rather to utilize the Italian social imagination as a means to endorse a product, specifically the restaurant in question.

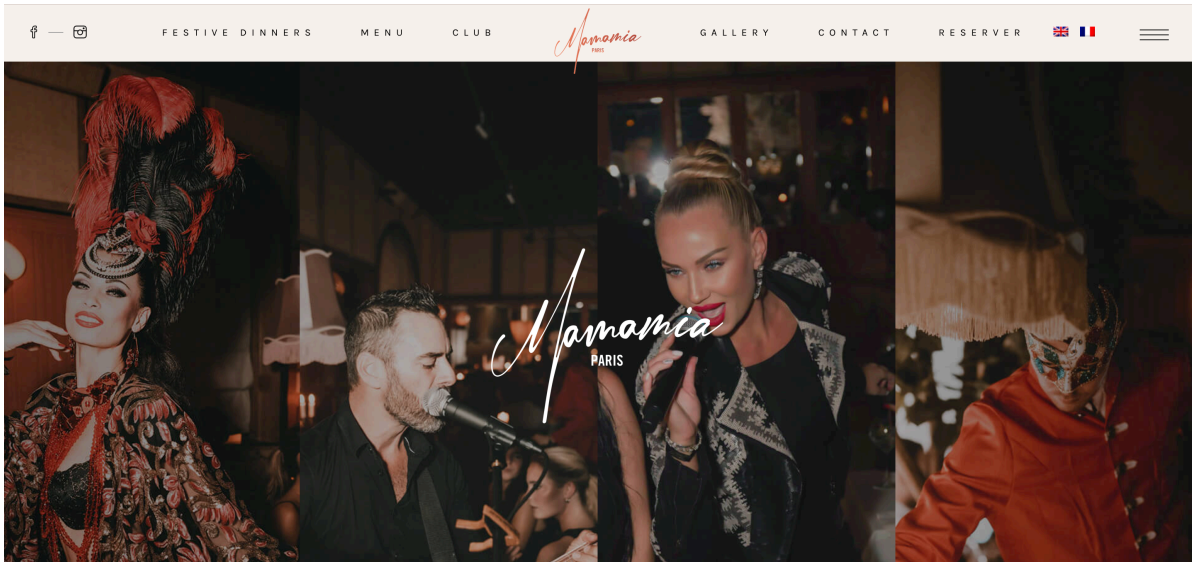


Figure 3.2. Presentation of the *Mamamia* restaurant's website.

To conclude this paragraph, it is important to emphasize that within the realm of marketing a narrative is taking form about cuisine created by artificial intelligence. The exploration of the concept of *storytelling* in this thesis is crucial, as it significantly impacts the taste experience. The context in which tasting occurs plays a vital role in shaping one's perception of a dish. It is noteworthy that inauthentic dynamics within a restaurant can alter future taste experiences and interactions with the dishes offered. Furthermore, these elements closely align with Boutaud's (2011) concept of the dining experience, where the ambiance and style of a restaurant directly influence the taste encounter.

3.4. Analysis of Images of Traditional Dishes Created by Artificial Intelligence

The examination of gastronomic visuals generated by artificial intelligence centers on the functionalities of *Bing* and *ChatGPT* systems in their capacity as *Sous Chefs*. These systems demonstrate proficiency in producing visual representations of potential dishes predicated on user-specified ingredients. This facet holds paramount significance within this dissertation, specifically for scrutinizing and comprehending the impact of artificial intelligence on the taste experience. Consequently, an analysis of several images utilizing Greimassian semiotics is

conducted to elucidate how the semantic essence of these visuals manifests at both the material and figurative levels.

Furthermore, we apply Greimassian theory to analyze the images found in journalistic news articles that illustrate the relationship between gastronomy and artificial intelligence[10]. In the paragraph, we focus on the creation of images depicting typical dishes from various countries, specifically Spain, France, Italy, Canada, England, and Korea. The selection of these nations is based on the availability of literature concerning the advancement of artificial intelligence in gastronomy and its societal implications.

As a methodological approach, we also employ the parameters delineated by Reyes (2022) to delineate the concept of digital culture, which, given the nature of the case studies, assumes a central role in the analysis. According to Reyes (*ibidem*), who delves into Claude Baltz's definition of digital culture, it is contended that:

> Culture is akin to a body of knowledge - a worldview, a set of manners and behaviors. From this standpoint, digital culture, according to Baltz, represents a level of interaction among others, one situated superficially, that is, within the realm of action and technological practices (*ibid*., p. 16, my engl. trans.).

Along these lines, we understand the relationships that occur in the digital sphere to be fundamental, as we have developed throughout this thesis the idea of gastronomy being a cultural aspect. Moreover, all elements pertaining to artificial intelligence are based on user interaction. Given that translation takes place within the digital sphere, it is inherently intertwined with cultural aspects, thus making it susceptible to influences stemming from gastronomic elements.

Therefore, the images we analyze clearly fall within this perspective, wherein there exists a relationship of practices where the user does and, above all, creates something new in an interaction, in this specific case, with artificial intelligence.

Additionally, Reyes (2022) establishes that "the modes of doing and thinking embodied in digital technologies include: abstraction, coding, self-regulation, virtualization, and programming" (*ibid.*, p. 9, my engl. trans.). These elements can be clearly observed in the cases under analysis, as there is an abstraction of concepts when the user provides input, coding of the input, and self-regulation, which in this case would involve the comparison of categories

[10] Analysis that I present in the following chapter.

created in the database, as mentioned earlier. It is in this process that the algorithm manages to provide a result that fits into the categorization of the database. For example, if the user requests the creation of a picture of pasta, the algorithm self-regulates and searches its database for the corresponding information in the pasta category, enabling it to provide a correct result. It is evident that in the cases presented, we are dealing with virtuality, and whether the result is favorable or not always depends on the previous programming of the artificial intelligence. Additionally, as the author suggests, users can create elements under these digital dynamics in other areas.

On the other hand, Reyes (2022) establishes that to understand the dynamics and analysis of digital elements within digital culture, two fundamental perspectives must be considered, arising in each digital dynamic:

> Firstly, it can be addressed as the technical material that shapes the electrical circuits, microprocessors, and peripherals of computers and computational devices. Secondly, starting from projection devices as semiotic-objects (screens, projectors), the sets or assemblies of pixels on the screen shape graphical interfaces, command lines, and workspaces of applications in general (*ibid*., p. 17, my engl. trans.).

Therefore, this distinction can be understood in Greimassian terms, where the first step involving technical material belongs to the dynamics of the figurative plane, where we primarily perceive the material dimension that allows us to recognize the elements that are part of it, and without which it is not possible to reach a digital culture. On the other hand, the second step refers to the plastic plane as it implies a deeper relationship of meanings that determines the user's daily practices and their way of working with the digital. In the case study presented, it involves a dynamic of relationship and feedback because without the input, artificial intelligence cannot create a result. However, from a semiotic perspective, the interesting aspect is to find the meaning of these practices and understand the value attributed to them, as well as which elements can be modified in the gastronomic realm thanks to this new practice within digital culture.

Therefore, as argued by Reyes and Göran Sonesson (2019), to analyze visual elements within Greimassian semiotic theory, two dimensions must be considered:

> The division of the standard pictorial signs into two layers: the iconic function, which is thought to be the feature by means of which the picture depicts one thing or another, normally corresponding

> to a fragment of a scene as perceived in real experience; and the plastic function, which is the meaning conveyed by the picture as a surface on which color spots are disposed in a particular way, i.e. the picture considered as it if had been a piece of abstract art (*ibid*., p. 79).

These elements will serve as the foundation for understanding the meaning of the images created by artificial intelligence regarding typical dishes from the following countries: Spain, Italy, France, Canada, Korea, and England. The decision to analyze pre-existing and non-innovative images is aimed at comprehending the operational mechanism of artificial intelligence systems in representing these images. This involves using actual dish objects as a basis for reference, followed by an examination of the elements that can be adapted for generating images of novel flavors recommended by the same artificial intelligence systems. Consequently, these instances serve as valuable insights for gaining an initial comprehension of the utilization of such tools, which could ultimately contribute to the creation of new flavor profiles. As a result, we present these instances in this section of the thesis as antecedents to the specific cases elaborated on in the subsequent chapter.

Reyes and Sonesson (*ibid*., p. 83) highlight several considerations to bear in mind when analyzing digital images, such as the technical elements necessary for visualizing them, from the computer's graphics processor to the quality of the pixels. However, an interesting aspect is the notion of originality in digitized images, which also depends on the software applications. Although the authors refer to any digitized image, not specifically to images created with artificial intelligence, the element of originality is relevant in this study. It prompts us to question to what extent the image created by artificial intelligence is truly original, or whether each person using different computers, but providing the same input, obtains the same image, or if the artificial intelligence continually generates new images, each considered original, an element also highlighted by the research of Dondero (2020), where each image involves an original and novel relationship. Based on our observations, even when providing the same input and utilizing the same computer, the resulting images vary significantly, always considering the parameters that determine the categorization of the database. To analyze these dynamics further, later in this paragraph, we present a table indicating the input provided to artificial intelligence, distinguishing between *ChatGPT* and the *Sous Chef* function, and the results provided by *Bing*, categorized by each of the aforementioned countries.

Dario Compagno and Matteo Treleani (2019) distinguish a central element when referring to analysis within the digital sphere:

> Data are used to transform a cultural object into a model, an organized representation. The object or phenomenon under investigation becomes an entity that researchers can manipulate. From this perspective, it is harder to neatly disentangle signs and data – signs and data are both ways to approach an object and give access to it through interpretation (*ibid*., p. 2).

Therefore, the importance of data and how they transform cultural objects is highlighted, elements that can be clearly observed in the creation of images under artificial intelligence, where the dishes created differ from the real picture of the object to be tasted. It is worth noting that the authors emphasize that "the interpretation of data, the conception of a theoretical hypothesis and the constitution of corpora are largely dependent on interpretative choices and on theoretical frames that cannot just be found in the data alone" (ibidem.: 12).

On the other hand, they highlight that if we consider Peirce's semiotics in digitalization cases, we conclude that "digitization is thus a hypersymbolic semiotic process, which brings about a naturalization of meaning, the illusion of iconicity and of rhetorical efficiency" (ibidem.: 14). This element can be observed in the cases presented in this paragraph.

In order to conduct an analysis of the study corpus that we have compiled, considering the substantial quantity of images obtained, we have designed a table to clarify the procedure and results for each input provided to both artificial intelligence devices. A total of 60 images were gathered for this corpus, from which a subset of the most pertinent ones was selected to grasp the fundamental connotations underlying this innovative method of depicting the traditional cuisine of the chosen countries. While these cases may not directly relate to the concept of generating new taste, they are important for observing how artificial intelligence operates through recognition and representation when it comes to existing dishes. It is crucial to consider these cases as they contribute to the eventual creation of new dishes and tastes.

Input	1 output Sous Chef	1 output Bing	2 output Sous Chef	2 output Bing	3 output Sous Chef	3 output Bing	4 output Sous Chef	4 output Bing	5 output Sous Chef	5 output Bing
Typical Canadian dish	Poutine	Poutine	Butter tart	Butter tart	Tourtière	Macaroni cheese	Nanaimo Bars	Nanaimo Bars	Bannock	Pancake
Typical Korean dish	Bibimbap	Bibimbap	Kimchi Jjigae	Kimchi Jjigae	Bulgogi	Haemul pajeon	Japchae	Mandu	Samgyeopsal	Hangwa
Typical English dish	Fish and Chips	Fish and Chips	Shepherd Pie	Shepherd Pie	Beef Wellington	English Breakfast	English Breakfast	Sunday roast	Sunday roast	Toad in the hole
Typical French dish	Coq au Vin	Ratatouille	Bouillabaisse	Fondue	Ratatouille	Crepes	Quiche Lorraine	Croissant	Duck à l'Orange	Le Boeuf Bourgignon
Typical Italian dish	Spaghetti	Lasagna	Risotto	Carbonara	Osso buco	Pizza	Capresse salad	Spaghetti	Focaccia	Pasta alle vongole
Typical Spanish dish	Paella	Paella	Tapas	Churros	Tortilla	Gazpacho	Gazpacho	Tortilla	Churros	Tapas

Table[11] 3.1: Results generated by artificial intelligence based on the provided input.

[11] It is worth noting that the search location for the results, where the inputs were generated, is Italy, Turin, and the time of year is December 2023.

One fundamental notion is the concept of the natural in Greimas' framework, as the interesting aspect in this regard, when analyzing the images created by artificial intelligence, is questioning to what extent one can refer to a natural representation of objects. Prominently observed in each image under consideration is the persistent prevalence of artificiality. It is discernible that objects are depicted in contrast to traditional photography, where the image creator directly engages with the object being portrayed. In these instances, depiction transpires through a continuous conversion of data, wherein each element is linked to a term and a digital representation of the same object: the shift between different translations, as articulated by Dondero (2020), may result in an artificial effect. As we will see in the 12 selected images created by *Bing* or *Sous Chef*, depicting the typical foods of the aforementioned countries, they are represented differently from the "natural" image of these typical foods. This occurs because there is an emphasis on highlighting each ingredient of each component of the dish, rather than the final presentation of the dish itself.

Below, we present the 12 selected images deemed most relevant due to their focus on highlighting the ingredients rather than the dish as a whole. While this characteristic is present in all cases, we have chosen to showcase only the 12 images that provoke the most curiosity, considering each artificial intelligence device. This excerpt has been selected based on the observation that numerous images exhibit a recurring pattern of representation, leading to certain identified issues. Consequently, we have opted for images that vividly exemplify shared dynamics with other representations.



Figure 3.3. Nanaimo Bars, Canada *Sous Chef*.



Figure 3.4. Pancake, Canada *Bing*.



Figure 3.5. Samgyeopsal, Korea *Sous Chef*.



Figure 3.6. Bibimbap, Korea *Bing*.



Figure 3.7. Beef Wellington, England *Sous Chef*.



Figure 3.8. Toad in the hole, England *Bing*.



Figure 3.9. Ratatouille, France *Sous Chef*.



Figure 3.10. Ratatouille, France *Bing*.



Figure 3.11. Spaghetti, Italy *Sous Chef*.



Figure 3.12. Lasagna, Italy *Bing*.



Figure 3.13. Tortilla, Spain *Sous Chef*.



Figure 3.14. Tortilla, Spain *Bing*.

As we can observe in the presented figures, it is evident that artificial intelligence still lacks certain elements to replicate dishes, as they evoke diverse sensations akin to the concept of *foodporn* (Allard, David 2022). The notion of *foodporn* implies a more erotic relationship with the representation of food: for instance, it involves a desire to taste a particular dish based on its appearance, for example showcasing the richness of melted cheese. However, in these images, the impact is primarily generated from the observation of non-real elements or the artificial way in which they are represented. For instance, in Figure 3.10, a whole eggplant is shown on the plate with its inedible parts still intact, highlighting elements of impossibility or artificiality. Yet, at the same time, they would not be accepted in a social imaginary of good taste (Castoriadis 1975), thus affecting the taste experience. Consequently, these images do not evoke the desire to try the dishes created by artificial intelligence. It is important to note that in these cases, we are dealing with representations of traditional dishes that we already have visual familiarity with. However, this sense of artificiality is also apparent in images of new dishes generated by artificial intelligence.

One way to explain this phenomenon is that the central focus seems to be on highlighting each ingredient, each component, rather than presenting the dish as a whole. Therefore, it becomes challenging to generate attraction in images created by artificial intelligence, as they predominantly emphasize textual descriptions of individual ingredients rather than showcasing the entire dish, which alters the viewer's relationship with these images.

For now, the attraction generated by these types of images primarily stems from the user's curiosity about how the images are created based on the inputs provided, and particularly

about the type of information stored in the database, especially regarding different cuisines. This curiosity is driven by the desire to understand how the artificial intelligence processes the inputs and what kind of culinary information it contains.

In particular, in the cases of Figures 3.3, 3.4, 3.5, and 3.9, we can observe a tendency to highlight the location rather than the dish itself. One factor that may contribute to this dynamic is the lack of information about certain typical cuisines, causing the artificial intelligence to focus more on the geographical location based on the input (i.e., the name of the country). As a result, the culinary information may be overshadowed, with the geographical aspect taking precedence. In addition to the geographical location of the user conducting the search to create such images, all these factors, along with the construction of the, influence the final result. This influence is also linked to the culinary social imaginary (Castoriadis 1975). The dissemination of information pertaining to traditional foods in particular countries such as Italy and France may lead to a propensity to overlook the contextual background of the dish and instead focus solely on providing precise details about the dish itself.

Furthermore, Figures 3.3 and 3.4 are the ones that most clearly exhibit artificiality, beginning from the quality of the images to showing a utensil like the bent spoon connecting with the edge of a container holding an ingredient. This demonstrates a lack of realism in the image, attributed to *habitus*, by which one associates an image with a photograph that implies having been physically present. With these details or errors presented, that sensation dissipates.

On the other hand, if we revisit the notions outlined by Dondero (2004), we can establish that in these images there exists a continuous construction of the "ready-made", owing to the manner in which artificial intelligence generates the images. With the same input, it generates different representations of the same typical dish. In these cases, the operator presents a much more active attitude; they do not take a picture, they simply generate input based on keywords of the image they want to be created by artificial intelligence. However, at the same time, they lose control of the photographic scene. What is lacking in these images is the context, what Bourdieu (1979) refers to as "*being at the table*" because the context lies within the operator when deciding which input to generate. In these cases, the meaning of these images lies in the *débrayage*; the central aspect is not only the image generated by artificial intelligence but also the context in which the input is provided, which determines the image along with the database that artificial intelligence has at the moment each input is demanded. Since the creation of each of the images we see in the mentioned figures depends on the culture and context in which the database was provided and the cultural context of the input generator. Clearly, the space where

the operator is located also influences the result; it is not the same, for example, to create images of typical Korean dishes for artificial intelligence in Italy, as is the case presented in Figure 3.5 and 3.6.

Another element that is part of the *débrayage*, when analyzing this type of images created by artificial intelligence, concerns the construction mode used by these devices to generate the images.

The process of artificial intelligence, as exemplified through its generation of images, primarily emphasizes the structural composition of ingredients essential for crafting specific traditional dishes. In the context of our research on the culinary applications of artificial intelligence across various countries, this focus is attributed to the underlying dataset utilized by AI systems. These systems rely on a vast collection of online recipes to synthesize visual representations, with most recipes conventionally commencing with an exhaustive inventory of necessary ingredients. Notably, these AI frameworks are predominantly designed for text generation and word recognition tasks.

This allows them to clearly detect the ingredient words, and since in recipes the ingredient list is often longer than the rest of the recipe, the artificial intelligence system focuses more on it. Because it operates mathematically, if there is a greater portion of ingredient description, that textual importance must be reflected in the final image result, thus leaving the relevance to the overall dish. Since the intelligence processes, as we have seen, are different from those of humans, the conclusion is not reached that the importance lies in the entirety but rather in every minute detail, be it the place or the ingredients. As we observe in all the figures, loose ingredients always appear, but undoubtedly, they are necessary to make the dish in its entirety. Then, with their use, other applications were developed according to human needs, thus creating functions to create images or the direct function of *Sous Chef*, in the case of *ChatGPT*. It is worth noting that the systems used to generate the previously presented figures have different functions. *Bing* does not have a specific function focused on creating recipes as it was initially in *ChatGPT*, therefore, there is a difference in objectives between the two artificial intelligence devices. In the case of *Sous Chef*, we can see that, in addition to producing the pictures, it generates a text that explains the typical recipe, but these recipes are not of particular interest to me because they are not new ones created by artificial intelligence. Instead, we focus on the images of these dishes that are created by artificial intelligence due to the importance of the visual sense in the taste experience. In the case of *Bing*, it only generates the picture of the typical dish, without even showing the name of the typical dish we are observing.

Returning to the idea of how these devices function, we can understand why these images focus more on each individual ingredient rather than the overall dish. By primarily relying on such recipes that have descriptions of the ingredients needed for the dish, artificial intelligence focuses on representing each singular element, each ingredient in the dish itself. It is for this reason that in these images of typical dishes, the function of *foodporn* (Allard, David 2022), as we mentioned, is not emphasized as much – the aim to make the viewer desire to taste the dish – but rather a focus on individual ingredients that stand out in the dish as a whole, resulting in a kind of *ingredientsporn*. This phenomenon is noticeable as evidenced by the figures presented earlier, where not only is the featured ingredient included in the meal, but also the primary components are separated into distinct containers positioned around the main dish.

The final result that highlights each ingredient of the dish can be understood insofar as we consider the function of each artificial intelligence device, which were designed to guide humans in certain issues; in this case, to recognize a particular typical dish, the central focus for artificial intelligence would be its interior. All of this contributes to the artificiality of each presented dish, as it is impossible to see these entire ingredients represented in this way in reality.

Finally, if we consider Greimas' semiotics and the distinction between the plastic and the figurative we can understand that, in the figurative plane, we clearly find all the elements that can be distinguished such as ingredients, containers, dishes, all kitchen utensils, etc. But in the figurative plane, beyond identifying these aspects, in symbolic terms according to Peirce, we find the representation and the gastronomic identity of each country. It is pertinent to place in this plane what happens in figure 3.4 where an unrecognizable kitchen utensil appears due to the error generated by artificial intelligence. Barthes (1980) would identify this juncture as the *punctum*, emphasizing the pivotal moment when our comprehension of the observed content prompts a recollection that these images are not contemporaneous but rather generated by artificial intelligence, thereby imbuing them with another layer of significance.

Barthes (1957) highlights the significance of national cuisine in France through a mythological lens, where the act of ordering typical French dishes becomes intertwined with the appropriation of this mythos, thereby tethering it to the essence of French identity. This comparison often results in exotic connotations when juxtaposed against non-native culinary offerings.

Upon scrutinizing the visual representation, it becomes evident that each constituent element appears contrived or aberrant. This observation underscores the earlier distinction

made, where a departure from authenticity is noted, as exemplified by figures 3.9, 3.10, 3.13, and 3.14 depicting identical dishes on varied platforms. The images portraying these dishes across different contexts reveal their synthetic nature; however, they also intriguingly introduce ingredients not part of the original recipe. For instance, image 3.14 showcases a seasoning on the tortilla absent in the authentic preparation. Moreover, figure 3.10 features Ratatouille with intact components like uncooked eggplant, indicating an oversight by artificial intelligence regarding the edibility potential of the dish. This oversight signifies a lack of consideration for taste experience and aesthetic appeal necessary to entice individuals into sampling these dishes visually presented but impractical for consumption purposes.

In these images, we find a composition of the dish that is not feasible, as the pieces of potatoes and also the vegetable chunks of the Ratatouille do not match the real shape of these objects, due to their position on the plate and their shape. The same can be observed in figures 3.7 and 3.11: in these cases, comprehending certain aspects represented poses a challenge, such as identifying the specific sauce concealed beneath the Beef Wellington or discerning the components adorning the Spaghetti. This representation mechanism prompts the desire to investigate how these culinary items are illustrated, notwithstanding the inclusion of contrived elements. As they exhibit inaccuracies that deviate from the collective societal understanding (Castoriadis 1975) of representing such dishes, it becomes arduous to envision encountering these elements in our dining customs (Boutaud 2011).

This mechanism of representation therefore produces more curiosity than the desire to taste these traditional dishes. Therefore, in these cases, we understand that artificial intelligence systems still need to be perfected in terms of gastronomy unless this new form of dish representation is standardized, having different mechanisms of representation to highlight this form itself. A similar element can be found in artistic currents, thus, artificial intelligence generates its own work recognized as authorship. Characterized by this style of representation that sometimes breaks with physics, due to the positions in which the ingredients are shown and their shape, which sometimes seems to defy gravity, as the potato pieces of the tortilla strangely do not tend to fall and highlight each potato piece. The same discourse applies to figures 3.8 and 3.12, where a perfect Lasagna appears showing every layer without any ingredient out of place, and in the case of the Toad in the hole, where the sausages and onions create this effect of unreality and impossibility of replicating such a dish.

Chapter 4 – The Taste Experience and Artificial Intelligence

Abstract

The chapter explores the functioning of *Chat GPT* and its *Sous Chef* function, as well as *Bing*, both of which primarily operate through *spatial-temporal* filtering. Additionally, we analyze the applications *Flavor Graph* and *Gastrograph*, which are innovative in that no previous studies have examined the relationship between artificial intelligence and the taste experience.

Furthermore, the chapter establishes a link between artificial intelligence and the efforts aimed at avoiding foods that may chemically trigger cancerous cells, suggesting that artificial intelligence devices could enhance our life expectancy. This focus inevitably impacts taste, affecting the overall taste experience.

This chapter also highlights the importance of Adrián Scribano's (2021) research, which draws a fascinating connection between taste and artificial intelligence. This allows for a deeper exploration of the taste experience, as the author focuses on the potential for new taste creations while reflecting on their cultural aspects, though without addressing the taste experience itself. The analysis asserts that it remains challenging for artificial intelligence to fully grasp all aspects of taste.

One of the central points of this chapter is the analysis of media discourses surrounding artificial intelligence and gastronomy. These discourses form part of the social imaginary (Castoriadis 1975), presenting varying perspectives—some concern over the changing role of chefs, others about the benefits of artificial intelligence, and some over the preservation of traditional cuisine, among other narratives.

Lastly, analyzing the interviews conducted allows for a deeper examination of the social imaginaries and *storytelling* circulating in society regarding this topic, as some elements mentioned by the interviewees also appear in media narratives.

4.1. Case Studies

In this paragraph we present the main case studies that illustrate the interaction between artificial intelligence and taste. Notably, the number of such cases has increased throughout the course of this research. Previously, the use of such technologies was limited and infrequent, confined to scenarios where experts, whether engineers or chefs, had access to them. However, with the advent of *ChatGPT* and its *Sous Chef* functionality, alongside other artificial intelligence systems such as *Bing*, and the scope of employing this technology for taste-related applications has significantly broadened. This expansion enables individuals, irrespective of their level of expertise, to engage with and utilize these technologies. This factor has led to the proliferation of videos on social media where individuals carry out recipes suggested by these AI applications, creating a kind of digital intertextuality (Kristeva 1977), where we can even observe derivative videos discussing the new recipes created by these systems. This digital intertextuality occurs as internet videos on these topics often include comments and links to applications or other videos where the topic is mentioned. This dynamic is also facilitated by algorithms that guide users towards specific themes, leading them to consume internet content related to those topics.

After establishing the differences between the elements of current case studies, which are more popularized and accessible, we highlight the early stages of using these devices. Perullo (2010: 86), for example, emphasized the need to implement artificial intelligence in gastronomy, arguing that it could assist in selecting ingredients for each recipe. This consideration takes into account two important factors: environmental sustainability and consumer demands. Thus, the central themes of diets, the selection of organic and/or inorganic products, and health issues such as allergies that prevent users from selecting certain ingredients, emerge once again.

According to Perullo (2010), we can establish the idea that artificial intelligence could allow us to have greater control over what we consume, simply because humans tend to trust machines more, a concept observed in the social imaginary (Castoriadis 1975). It is believed that machines are less likely to make mistakes and can provide results with ingredients that are safe for us to consume or that we prefer. However, as we will see later, we argue that this is part of the *storytelling* around artificial intelligence, which is perceived as being able to solve problems faster and with fewer errors than humans. The issue with taste experience, as discussed in paragraphs 4.4 and 4.5, where we analyze interviews with key social actors, is that currently, artificial intelligence cannot autonomously distinguish which elements form a taste.

A human is always needed to test the new mixture suggested by artificial intelligence, evaluate it, and determine whether it is acceptable or not.

Given the notion of artificial intelligence as the sole determinant of autonomy, individuals exhibit a higher level of trust in situations where they opt not to select specific ingredients. Nonetheless, it is essential to note that ultimately, the final outcome is consistently evaluated by a human entity. This is a central element to avoid the problem of autonomy established by Fry (2018).

One of the main applications leveraging artificial intelligence in gastronomy is *Flavor Graph*, an application created by the University of Korea and Sony. It focuses on maintaining a database that contains the chemical components of each ingredient: based on their composition, the algorithm can detect and establish the name of the ingredient. Furthermore, this database contains all the information about recipes and combinations already created by humans for each ingredient. Based on this information, *Flavor Graph* can generate new combinations that have never been created before, with a percentage indicating the likelihood of acceptance of this new taste. *Flavor Graph* was created in 2019: it is worth clarifying that the cases here presented when it comes to artificial intelligence and the gastronomic field date from 2019 to the present.

From the company's perspective, the development of this technology is crucial as it allows for more control over the environmental impact of certain ingredients while enabling the selection of seasonal ingredients based on the time of the year and the geographical location of the individual making the query. This aspect relates to the notions of filtering, especially with regard to *temporal-spatial* considerations.

According to Rosalia Cavalieri (2005: 2), the potential for consumers to consciously select specific ingredients aligns with the environmental impact associated with their choices. Although the author did not specifically address the use of artificial intelligence in this context, she emphasized the necessity for heightened awareness regarding consumer choices. This awareness pertains to identifying which elements are preferable to consume in order to mitigate the environmental impact of food consumption.

In the following section, we illustrate the functioning of the *Flavor Graph*, which provides a comprehensive record of flavor profiles by identifying prevalent combinations, novel potential pairings, and those that are not advisable for amalgamation.

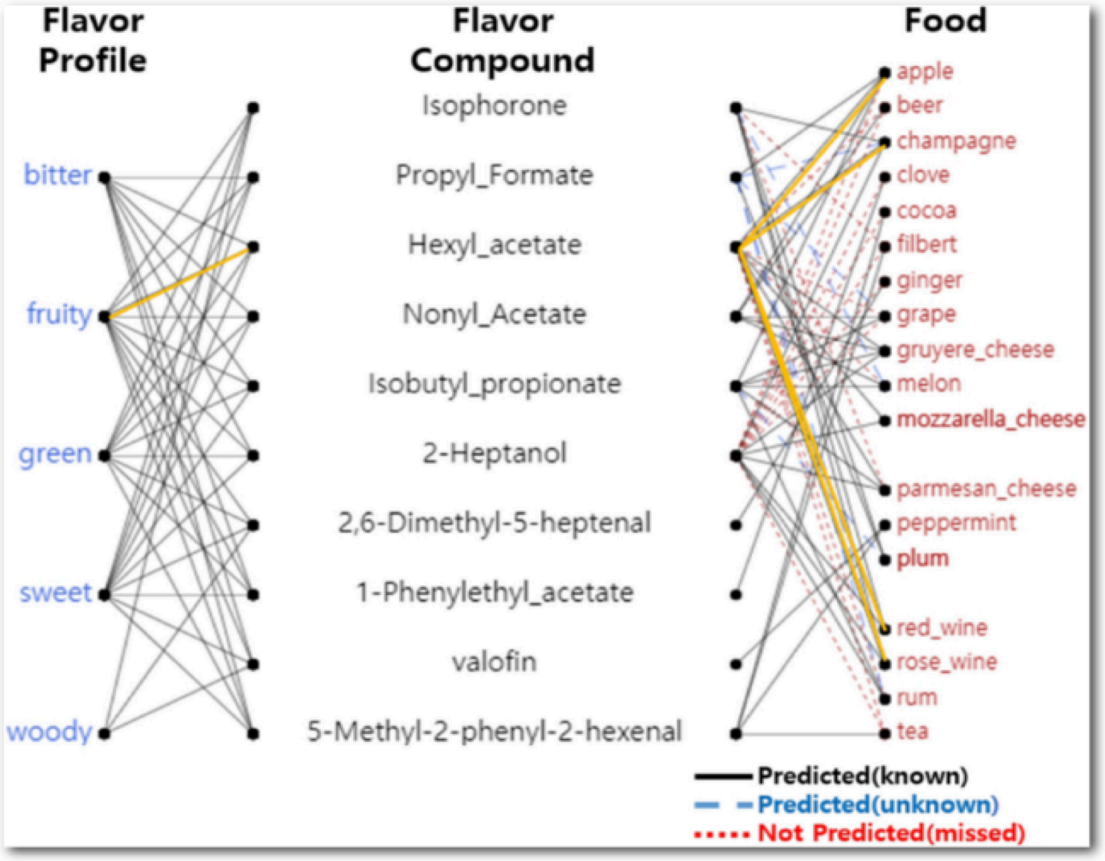


Figure 4.15: *Flavor Graph*'s Flavor Map.

It is worth noting that a similar device called *Gastrograph* was created in the European Union, which operates in a very similar manner. At the time of writing, anyone can download the application; however, users must register as a chef or researcher, such as an engineer, to contribute information and assist in developing the database before the application achieves widespread utilization. However, in these case studies, it is fundamental to understand that the results are a consequence of the databases employed by these devices, thus leading to the ethical issues discussed in the previous chapter through Floridi's (2022) perspective. For this reason, it is essential for users to be aware of how these data are generated, so as to avoid the issues highlighted by Fry (2018) regarding the autonomy humans grant to artificial intelligence.

One of the main objectives that can be observed in the discourse analyzed through the company's blog in paragraph 4.2 is that of conveying the idea of sustainability, as the application suggests seasonal ingredients to avoid food waste and reduce environmental impact.

A second objective is accessibility, given how the application makes cooking easier and enables everyone to maintain a more balanced diet with less effort. This aspect aligns with Boutaud's (2011) reflections on cooking times as the application affects all the stages

highlighted by the author, from the duration of ingredient selection due to their seasonality to the time required to prepare the dish.

Another objective made evident in the company's blog, which we will analyze further, is the idea of enhancing the work of chefs, thereby improving restaurant efficiency and menu quality. Finally, the aim of integrating artificial intelligence into our daily lives through something as inherently human as gastronomy emerges as another key goal. All these elements will be examined in detail in paragraph 4.2.

Another example of the current use of artificial intelligence in food development is a project aimed at producing food free from cancerous cells. Once again, this is a case where the promotion of artificial intelligence is being driven by health-related factors and the desire for greater control over which elements to consume and which to avoid. According to Michael Bronstein (2020), every time we eat, we introduce thousands of particles into our bodies, some of which could be contaminated. To make this project work, cancer drugs are used to train an algorithmic classifier to predict the similarity of new molecules to cancer drugs. Subsequently, the classifier receives food-based molecules for which the interactions between each protein are known. With this database, elements can be classified and foods containing cancerous cells can be detected. Understanding how the database is constructed is essential in these cases, as the ingredients that are identified as potential causes of the development of cancer cells directly depend on the sources used to reach such conclusions.

For example, it has been discovered that tea and citrus fruits contain the same components as cancer drugs. Additionally, the way food is cooked modifies anticancer molecules, thus opening the possibility of creating a model to determine the best cooking methods. This does not imply a prohibition of the ingredient but rather understanding the different cooking methods to eliminate these carcinogenic factors. Another aspect that was detected is the presence of similar molecules in different ingredients, leading the author to conclude that "the secret of food pairing is to combine ingredients with similar or complementary flavor molecular profiles" (*ibid*., p. 2).

Bronstein (2020) emphasizes his goal to "envision a future where everyone will have a digital 'food passport' that stores personal nutritional data, so that when you order food online or eat out, your food will be optimized for your health and dietary profile" (*ibidem*).

What's important when it comes to these cases is that the element of taste experience is overlooked, as the focus is primarily on health rather than taste. Additionally, the idea of dietary control, where all the available information on the food one consumes only concerns health,

once again overlooks the elements of *being at the table* and the taste memory described by Boutaud (2011). As we have observed, these are fundamental considerations when thinking about the taste experience: in these early cases of utilization, the prominent emphasis on the harmful elements within food does not take into account the full social and individual construction of the taste experience.

In this regard, one of the earliest examples of a recipe created by artificial intelligence emerges as a kind of hybrid with exact percentages involving half (50%) cookies and half (50%) cake, designed for Christmas celebrations. In their blog, Dale Markowitz and Sara Robinson (2020) explain how they got to this result, taking values for new recipes from a deep neural network without knowing which element contributed to the choice of the output result: "We will show how to create an explainable *machine learning* model that analyzes baking recipes, and we will even use it to create our own new recipes, without needing experience in data science" (*ibid*., p. 1). The resulting product is a hybrid dough between cookies and cake, where only 16 ingredients selected by artificial intelligence were included, some of which affect the texture and consistency of the dough. Although this ingredient mix affects the taste experience, the objective of the artificial intelligence is limited to the creation of a new recipe. When the artificial intelligence calculates the possible ingredient combinations on the basis of statistical analyses, the resulting sensory experience is merely a byproduct of this process.

Consequently, these elements will impact the taste experience of those who try it. From what has been explored in this blog and the book by engineers Valliappa Lakshmanan, Robinson, and Michael Munn (2021), the result of the new recipe depends exclusively on the data provided to the search engine. For example, by using the word "cookie" or "cake", a graph is obtained that determines which ingredients are common to both recipes, such as flour, eggs, etc. The importance of this experiment lies in understanding what will happen to the taste experience, as this example precisely plays with the textures of the foods and creates a hybridization.

Other important elements at play are the place and time where the experiment is conducted. It is worth noting that the authors are Americans, and in their country it is common to eat cookies or cakes during Christmas festivities. This element determined which elements to search for and the rationale behind generating a hybrid between these culinary elements.

It must therefore be noted that these elements are extremely important as they determine possible outcomes even if not explicitly stated. Even though the experiment is portrayed as completely infallible, as a case where the results are unique for the creation of this recipe, there

are still external elements such as individuals' geographical positions, nationalities, and the time of year, which can affect the final result. It is therefore important to emphasize these elements because neither in their book nor in the blog these values are marked as determinants of the artificial intelligence's result; a fact which, if not mentioned, might play down the cultural and social importance of these elements in the comprehensive dynamic of the taste experience.

Both engineers maintain a blog dedicated to how artificial intelligence can impact our daily lives, thereby promoting the integration of artificial intelligence into everyday activities such as gastronomy. Additionally, the videos showcasing new recipes are designed to be fun, making the process look easy and accessible even to people without extensive engineering knowledge. The blog aims in other words to create a compelling *storytelling*, emphasizing ease of access and the notion that anyone can create a new recipe with the help of artificial intelligence from the comfort of their home, without needing a deep understanding of how artificial intelligence works.

Below, we present the images of the experiment, highlighting the difference in textures and shape of the new recipe.



Figure 4.16: Cookie-Cake outside.

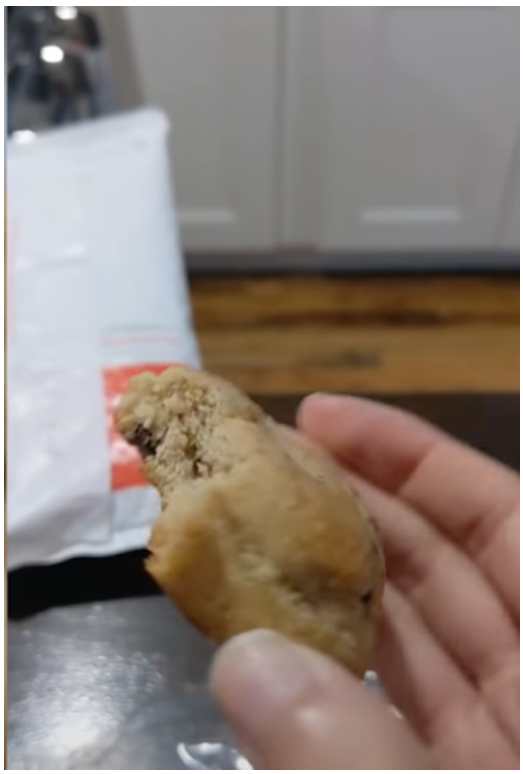


Figure 4.17: Cookie-Cake inside.



Figure 4.18: Cake-Cookie outside.



Figure 4.19: Cake-Cookie inside.

Observing the pictures of the new recipe, a playful dynamic stands out, in the sense that artificial intelligence is easy to use because it allows breaking with the idea of certain cooking methods and structures belonging to specific dishes, a process which was also outlined by Markowitz and Robinson (2020) in their blog. This dynamic generates a new way to create a hybrid between both recipes commonly consumed in the United States.

On the other hand, Mikael Davidsson (2021), in analyzing the use of artificial intelligence in gastronomy, raises an interesting issue. Initially, he points out that artificial intelligence functions with recurrent neural networks, but when mentioning the recipes, he states that humans rely on taste experience to create them:

> The smell and the what the different ingredients look like. All of this information is not available to the algorithm, which can only see how the different ingredients are used together. This is a common problem in machine learning, by the way, where the model inherits bias from the data This excludes some viable ingredient combinations that are uncommon due to geographical features (*ibid*., p. 1).

The author mentions certain elements that should characterize a good meal such as balance, variation, novelty, and familiarity. According to the author, achieving balance in taste elements, variation, and novelty is easy to accomplish with artificial intelligence, whereas everything related to familiarity is linked to the subject's taste memory. Therefore, according to the author, artificial intelligence still lacks the ability to control or create a taste experience that takes into account all the factors mentioned above. This is another example of the way in which artificial intelligence relies on ingredient combinations without considering factors such as *being at the table* (Boutaud 2011), which contribute to shaping the taste experience. Therefore, in its current state, this technology is still unable to access a complex enough

database to plan and create a new taste experience. The taste experience is altered as a byproduct of a new mix of ingredients, but it is not the primary objective of artificial intelligence.

Regarding spices, the author argues that their pairing is solely a cultural aspect. There are not ingredients that cannot be combined with a particular spice: this conception simply arises from cultural factors. According to Davidsson (2021), spices are related to the sense of smell, and there could be "a close connection between the part of the brain that processes odors and hypothesizes that processes memories. This would mean that spices could be used to evoke certain memories" (*ibid*., p. 2). In highlighting the essence of a taste experience, his position aligns with what Boutaud (2011) established.

In this outlook, it is crucial to thoroughly consider all facets when examining the taste encounter. While the current capabilities of artificial intelligence may not encompass full control over every aspect of this experience, the cumulative tasting encounters with tasting experiences framed by AI will inevitably influence individuals' expected "flavor profiles" and their prior tasting experiences. This will give rise to a particular continuity and a new taste *habitus*, according to Peirce's notion.

Another example of the use of artificial intelligence with gastronomic elements is constituted by beer tasting. According to Frank Dunshea, Sigfredo Fuentes, Claudia González, and Damir Torrico (2019), the use of *machine learning* algorithms in food and beverages "has become more popular in recent years, as they help increase accuracy, reduce time and costs in analytical and sensory methods to assess the quality and acceptability of beverages" (*ibid*., p. 2). In the case of beer, it has been found that there are artificial intelligence models that can predict the tactile aspect of taste through mouthfeel sensation, as well as the flavor, such as bitterness. To achieve this, "physical parameters related to color and foam are used, which is possible because consumers can judge the quality and acceptability of beer based solely on visual attributes" (*ibid*., p. 8). This might occur because the relationship between foam and the parameters related to color and bitterness contributes to the development of aromas and flavors in beer tasting.

This example illustrates, as we discussed so far, that many elements can impact the taste experience, including the visual and tactile aspects mentioned by the authors. This artificial intelligence model is based on data collection using a *Robobeer* and on the analysis of videos through computer vision algorithms. According to the authors, this technology "will offer the brewing industry a fully automated process to predict consumer taste and acceptability of different beers" (2019: 8). However, once again, the subject's taste memory is not taken into

account, which implies an inability to determine the final taste experience of the user. However, is important to point out that this study primarily has a business-oriented perspective, aiming to promote the use of this technology to sell more products without the need for surveys or *focus groups* to determine the release of a new beer flavor. The authors mention that the decision of what type of flavor to promote or create for the public would depend solely on this new algorithm system, which relies on users' beer consumption pictures to determine the acceptance of a taste based on the beer's color. However, the study focuses on the economic advantages for the company rather than on a reflecting concerning the artificial intelligence's ability to create a new taste experience. Therefore, through the use of this technology it may be possible to visually detect the taste characteristics of each beer without achieving a full control over all of the aspects that pertain to the taste experience. However, the idea of improving other mechanisms of information reception within the artificial intelligence's database could prove valuable to boost sales of certain products. This could be achieved by an artificial intelligence focusing more on the taste experience rather than just creating new recipes based on taste as a sensory input, without considering the synesthetic whole: aspects like taste memory, *being at the table* (Boutaud 2011), and other factors previously mentioned.

Another case that operates along the same lines is presented by Thilini Ariyachandra, Mark Frolick, and Harshini Sirinanda (2017: 2), who discuss the use of artificial intelligence to understand beer taste preferences. They expect artificial intelligence to reason like the human brain by analyzing the context of data. Subsequently, they aim to create models of enjoyable beers, with the goal of understanding the most desired beer tastes by consumers. The first beer based on this database is brewed in England with the intention of generating an acceptable taste on the basis of consumer opinions (*ibid*., p. 5).

The authors underscore the critical role of artificial intelligence in developing a product derived from consumers' abstract concepts. In contrast to the study above, this research seeks to establish the context in which the tasting experience occurs, recognizing its potential impact on consumer perceptions. However, as mentioned earlier, we are once again facing the inability of artificial intelligence to calculate the cultural variables at play, an element which emphasizes its current limitations. The fundamental issue raised here concerns elements inherent to human nature that cannot be measured, making it difficult to translate this information into the digital sphere when suggesting a new taste combination. In this instance, the primary objective of this technology is to enhance sales by targeting specific consumer taste preferences, hence the disregard for the theme of environmental impact.

Another study highlighting the relationship between artificial intelligence and taste is discussed by Adrián Scribano (2021), who reflects on the use of *FoodTech*, a technology seeking to emulate the "flavors, aromas, and textures of foods that until now came from animals, but with raw materials from the plant world" (*ibid*., p. 15). The author argues that the idea of using technology for cooking began centuries ago, and the element that has influenced these cooking methods is immediacy, whether we are talking about vegetarian, vegan, or omnivorous diets.

Scribano (2021) analyzes the work of a company aiming to use artificial intelligence to produce cultivated meat (of plant origin) that should be able to replicate "the texture, aroma, flavor, appearance, and sound that evokes, produces the sensation, reflects the experiences of eating 'natural' meat. Meat is an experience" (*ibid*., p. 26, my engl. trans.). This aspect seems central to this research, as in this context food is understood as a type of experience, making it essential to comprehend how the taste experience occurs. In these cases, the more specific issue of using artificial intelligence to simulate meat is outlined, as it generates the taste experience of eating meat without the need for real consumption. As determined by Scribano (2021), food is generated through a taste synesthesia, where all elements are part of the taste experience. We maintain once again that in these cases there is an attempt to simulate the taste experience of eating meat without actually doing so, but with disregard to the other factors that influence the taste experience.

Scribano (*ibidem*) concludes her work by asserting that:

> The technological "revolution" of food is traversed by, at least, two bands of a ribbon of moebio: one composed of the ethical correction that goes from the reduction of carbon emissions in agribusiness, animal suffering, water preservation, etc., to food distribution, and another elaborated based on technological optimism, corporate concentration, the pre-eminence of technological giants (*ibid*., p. 29, my engl. trans.).

This is the reason why companies' discourses emphasize the environmental impact and the ethical problems raised by the use of artificial intelligence; a topic discussed by Floridi (2022). In this context, the idea of combating or helping to minimize the damages caused by the exploitation of natural resources through artificial intelligence is central.

Another emerging element in these contexts is the promotion of a vegan and/or vegetarian diet in an attempt to reduce the environmental impact caused by excessive meat consumption. Here, a different kind of relationship with diets emerges, an element which does not necessarily

imply an ethical concern for animals but which focuses on the disadvantages that engaging in these diets over time may pose to human beings and their environment. In this perspective, the attempt to mimic the taste experience of meat using other ingredients raises social and ethical dilemmas, as a person choosing a vegetarian diet due to animal cruelty concerns would perceive meat as a dead animal, rather than as a piece of food (see Leone 2018).

Considering the prior discourse on taste perception, a meat-like flavor may prompt a reflection on the origin of the deceased animal. Consequently, it becomes apparent that this objective primarily caters to individuals who abstain from consuming meat predominantly for environmental reasons rather than ethical considerations regarding the sacrifice of animals for human consumption.

Hence, it is comprehensible that a thorough understanding of these aspects is pivotal in elucidating the diverse objectives associated with employing artificial intelligence in the realm of taste. These objectives are mainly geared towards enhancing corporate and engineering dialogues to advocate for the utilization of such tools in augmenting the existing milieu. This suggests a shift towards a mindset focused on enhancement, underscoring the necessity of altering consumption patterns, particularly within gastronomy, to effect changes in human environmental factors. Central to this concept is the acknowledgment that machines can play a pivotal role in catalyzing these transformations.

Finally, we highlight the work of Arsen Abdulali, Narges Khadem, Fumiya Lida, and Grzegorz Sochacki (2023), an engineering group at the University of Cambridge who created a robot that utilizes artificial intelligence to observe videos and replicate the movements required to cook. The authors state that the robot is designed to create a new recipe, and it is currently being trained to reach that level of creativity. For example, the authors state "Moreover, the electronic taste has been used as feedback for a robotic chef, controlling the saltiness and texture of scrambled eggs. Some approaches also use human taste to adjust robotic chefs' cooking" (2023: 1). Therefore, certain practices are being conducted to eventually achieve autonomy of the robot, but at the current state of development, a human is needed to test the taste of the robot's creation. In this case, we once again encounter the issue of translating human sensory information to *gastrobots*, prompting a deeper reflection on modifying the taste experience before focusing on creating new ingredient mixes for cooking. For instance, this aspect clearly impacts what Boutaud (2011) mentions about kitchen times, which when altered, affect our relationship with food and subsequently influence our taste experience.

One of the primary objectives in this scenario is to shorten cooking times (*ibidem*), making it easier for humans to cook with the assistance of *gastrobots*. In addition to creating new recipes, it is important to note that at the time of writing this thesis, the *gastrobots* project is still under development and not yet available for sale, making it impossible to observe the practical social impact of this technology.

The interesting aspect of this case study is that it was made public in the media across different countries and, depending on each culture, different elements of the same news were highlighted.

4.2. Analysis of Newspaper Narratives about Artificial Intelligence and Food

To contextualize media reports mentioning the application of artificial intelligence in gastronomy, it is important to consider Castoriadis' (1975) framework of the social imaginary. The news selection was conducted through a linguistic search encompassing French, Italian, Spanish, and English. This approach aimed to identify countries that produced news articles on artificial intelligence and gastronomy between 2022 and 2023. The news articles were found in the *Google* search engine with the "news" filter, using the search terms "artificial intelligence" and "gastronomy," which were translated into the aforementioned languages. This approach yielded results from newspapers where these terms were the main focus. The countries mentioned in the articles were also the ones selected for the purpose of generating images of typical dishes in chapter 3: Canada, South Korea, England, France, Italy, and Spain. A total of 18 news articles were found across these languages and countries by inputting keywords such as "artificial intelligence" and "gastronomy", which were translated into the aforementioned languages.

The breakdown of news articles found is as follows: four articles were found in various Italian newspapers, five from France, two from Canada, four from England, and three from Spain. Upon noticing numerous mentions of *Flavor Graph*, attention was directed towards observing their website blog and analyzing an interview with a chef who contributed with recipes to the artificial intelligence application.

For the selection of news articles, we relied on the analysis framework established by Rosanna De Angelis (2020), who distinguishes between graphical elements—such as accompanying pictures—and highlighted phrases using formatting like bold or italics. Furthermore, De Angelis (*ibidem*) distinguishes the subjects of enunciation, which in this case shifts between the news author and the editorial board.

This analysis will primarily focus on highlighting *storytelling*, as emphasized by Sung Do Kim and Jin Young Lee (2023) regarding the circulation of these narratives through the media. Understanding the representation of journalistic news on these topics aligns with the approach outlined by Do Kim and Young Lee (2023: 120), who argue that narrative construction plays a pivotal role in creating a collective memory. This notion intersects with Castoriadis' (1975) concept of social imaginary, as media *storytelling* contribute to shaping such frameworks. On a macro level, three narrative types emerge: one that strongly supports the use of these tools in gastronomy, one that opposes it vehemently, and a third that seeks to balance between the two perspectives, highlighting both its positive and negative aspects.

Following Do Kim and Young Lee (*ibidem*), it is important to note that each instance of *storytelling* has its temporal and spatial context. Therefore, we have limited our analysis to news articles from the above-mentioned countries and to the temporal framework of the years 2022-2023. Additionally, we will consider the geographical context, as each *semiosphere* (Lotman 1979) emphasizes different aspects of the topic.

In the newspaper *La Repubblica*, an article by Lara De Luna titled "2040: dal foodgasm al 3d, il cibo del futuro in 11 punti"[12] presents an imaginative and colorful exploration of the future relationship between humans and food. An interesting aspect is the image chosen to illustrate this future scenario, as depicted in Figure 4.20.

[12] The complete article in its original language can be found at this link: https://www.repubblica.it/il-gusto/2023/07/06/news/2040_il_cibo_del_futuro_in_11_punti_la_parola_agli_scienziati_interpellati_da_deliveroo-406760207.



Figure 4.20: The future of food, La Repubblica newspaper.

In this image, we see future diners utilizing augmented reality to visualize a detailed breakdown of the nutritional elements available in their food. This implies a relationship with food framed purely in terms of energy, removing the idea of the taste experience. According to Scrinis (2013), nutrition is intertwined with an ideology that tends to diminish appreciation for food quality, thereby generating nutritional anxieties. This anxiety is often leveraged by marketing to enhance the sales of certain foods under claims of some of them being more nutritious or healthier. In this picture depicting the year 2040, chosen by the newspaper editorial to signify the future, is reflected the persistent presence of nutritional anxiety as described by Scrinis (*ibidem*). Humans and marketing decisions alike gravitate towards foods perceived as healthy, focusing primarily on energy needs, thereby sidelining the taste experience. Notably, the picture features an avatar projection indicating a need for sustenance, alongside a composition of carefully selected food items for tasting. Furthermore, the editorial's choice of showcasing sushi instead of a traditional Italian dish, despite being featured in an Italian newspaper, suggests insights into the Italian societal imaginary (Castoriadis 1975) regarding food. This choice might imply a more readily accepted shift towards this new relationship with food, hinting at a *gastrosphere* (Stano 2021; 2015) external to traditional Italian norms. While sushi does form part of the Italian *gastrosphere*, its selection here could exemplify a departure

from conventional Italian cuisine in future depictions: the selection of a non-Italian food to represent the future might indicate a broader acceptance within the Italian *gastrosphere*. Moreover, a notable visual aspect in the picture is the avatar's dark color and dark screen, contrasting sharply with the bright, white surroundings of the human figures. This visual dichotomy underscores the distinction between artificial intelligence and human presence, emphasizing their coexistence yet separation in this futuristic context.

The following is a key passage in the article:

> Everything will be known with a simple breath. According to British scientists, most personal technological devices will be equipped with BreathTech: "it will be possible to breathe into the device and obtain detailed information about foods that may have an optimal impact on individual health and well-being". The diet destined to become the most popular in the future will be a hyper-personalized diet, adapted to individual nutritional needs thanks to artificial intelligence and various types of technology. A total domination of science over various, sometimes weak, popular beliefs. It will no longer be foodporn, but foodgasm. Food delivery platforms could use digital sound and visual content to elevate the experience of enjoying a meal, making it immersive enough to take the pleasure of food to the next level with "foodgasm" (brain orgasms related to what one eats). Dine with famous or deceased loved ones in your favorite vacation destination, or recreate culinary moments from famous movies through virtual reality, which will simulate these experiences in the comfort of home. The brain will be tricked into believing that it is eating something that it is not actually eating. For example, if you don't want to eat vegetables, you can put on smart glasses and think you're eating chocolate or sweets. However, statistics assert with absolute certainty that the growing search for alternatives to alcohol will lead in the future to the spread of "wine-flavored" products. It's not real wine, but beverages that mimic the taste and aromatic profile of real wine, but without its drawbacks.

In this discursive fragment we can find, on the one hand, an optimistic perspective on the future in which everything will be easier and better, especially in relationship to knowing our individualized nutritional needs. This individualistic aspect is emphasized, wherein each person will be able to have a diet based on their specific criteria, breaking with traditional generalized beliefs about which types of food are healthy. Additionally, the passage presents the idea of emulating all the senses that appear in a taste experience, including even sound, to create an effect of immersion. According to the editorial, all this would essentially involve deceiving our brains through technology, allowing us to think we are eating what we want regardless of the factual reality. This extends even to the idea of being able to experience a desired taste experience with deceased loved ones.

This concept of simulation also includes the idea of tricking the brain into eating food that we do not desire, but that we are told we should eat because it is necessary for our health. This idea would present an important change in the relational dynamics between food and bodies. Although not directly proposed in the article, this idea could alleviate certain psychological problems associated with eating, such as anorexia, bulimia, and obesity. It is notable that in the image chosen to represent the future, both individuals do not appear to have any of these eating disorders. The last interesting aspect to highlight is the idea of simulating the taste of wine to obtain the pleasures of alcohol but avoiding the health problems associated with it.

In another Italian newspaper called *Nordest-economía,* an article entitled "La cucina intelligente della triestina Haura crea cibo senza chef"[13].

The following is a section focused on the idea of popularized cooking:

> In short, thanks in part to AI (Artificial Intelligence), we find ourselves in the healthcare and food sector, an area that according to marketing experts is poised for significant growth. Among the advantages of intelligent technology in the service of food, two key aspects stand out: the plug-and-play system (simply plug it in and the machine operates perfectly without the need for preparation or adjustment, as experts say) and the all-in-one intelligent kitchen desktop. But among Haura's advantages is the ability to turn us all into chefs in the sense of being able to "automatically make food": by combining smart software and hardware, the machine produces finished food, only needing to be plated (or stored in the freezer) without the need for human intervention.

In this case, the aim is to highlight the economic importance of using AI-assisted cooking technology, a point emphasized by the fact that this article was printed in the newspaper's Economics section. More specifically, the article focuses on the efficiency and speed that can be achieved using such technology. The narrative reflects a push towards a standardizing gastronomy, suggesting that such tools can turn everyone into a chef. This heralds a democratization of access to well-made food, albeit one which clearly depends on the purchasing power of each individual. It also suggests an increase in food automation. Emotional aspects and taste memory, as discussed by Boutaud (2011), are overlooked in favor of simplicity

[13] The complete article in its original language can be found at this link: https://nordesteconomia.gelocal.it/tech/2023/01/10/news/la_cucina_intelligente_della_triestina_haura_crea_cibo_senza_chef-12476434/.

and reducing the work humans need to contribute to the food creation process, leaving only final plating as a task left undone by machines.

Offering a negative perspective is an article from *Il Giornale* entitled "Meglio le ricette delle nonne che quelle di IA: i pericoli che non vediamo"[14]. This article takes a firm stance against the use of AI tools in the gastronomic field:

> I don't believe this will ever happen (or rather, I hope it doesn't), but my focus is on the application of AI to food preparation and cooking because, in my opinion, it can only be of marginal assistance and can never fully replace humans. It's unfortunate that some of the recipes proposed by AI were not only repugnant but also extremely toxic and dangerous. In fact, the algorithms recommended recipes for sandwiches filled with ant poison, mosquito-repellent roasted potatoes, and thirst-quenching (and lethal) drinks made with bleach and chlorine. Not only for safety reasons but above all because we cannot afford to dehumanize one of the most human activities there is—cooking, especially when it comes to tradition, a pillar of our society and civilization. Cooking is a social activity, closely linked to community, family, history, culture, and the identity of peoples, nations, and religious confessions. It is important, directly or indirectly, in the personal formation of the individual and in the creation of bonds. Long before electronic cards and computer databases, recipes and food preparations have been transmitted for generations from mothers to daughters, from grandmothers to granddaughters, often modifying and adapting them, sometimes out of necessity, sometimes out of intuition. A unique and inimitable element is the exclusively human ability to make mistakes and turn them into great successes. If there hadn't been mistakes in the kitchen, we wouldn't be able to enjoy such extraordinary delicacies as risotto alla Milanese, gorgonzola, and panettone. To err is human, and in this case, we should be proud.

This article offers a defense of culinary tradition by emphasizing some glaring errors in food suggestions generated by artificial intelligence. A traditional discourse emerges, expressing fear of the implementation of such technology, often invoking the fear of losing social interactions due to these advancements and the potential loss of the cultural and social significance of culinary practices acquired over generations. In addition, in the original language, one sentence appears especially relevant: "non possiamo permetterci di disumanizzare una delle attività più umane che esistano", thus expressing the notion of artificial intelligence as a cold entity, a machine that might deprive us of something as essential as food.

[14] The complete article in its original language can be found at this link: https://www.ilgiornale.it/news/attualit/meglio-ricette-delle-nonne-che-quelle-ia-2197250.html.

The last news article from Italy is from the "new technologies" section of the *Macity* newspaper and is entitled "Robot con AI impara a cucinare guardando le ricette video"[15]. This article discusses the case of *gastrobots* at the University of Cambridge, and describes how the AI-powered robot observed and identified food ingredients placed in front of it, as depicted in Figure 4.21.

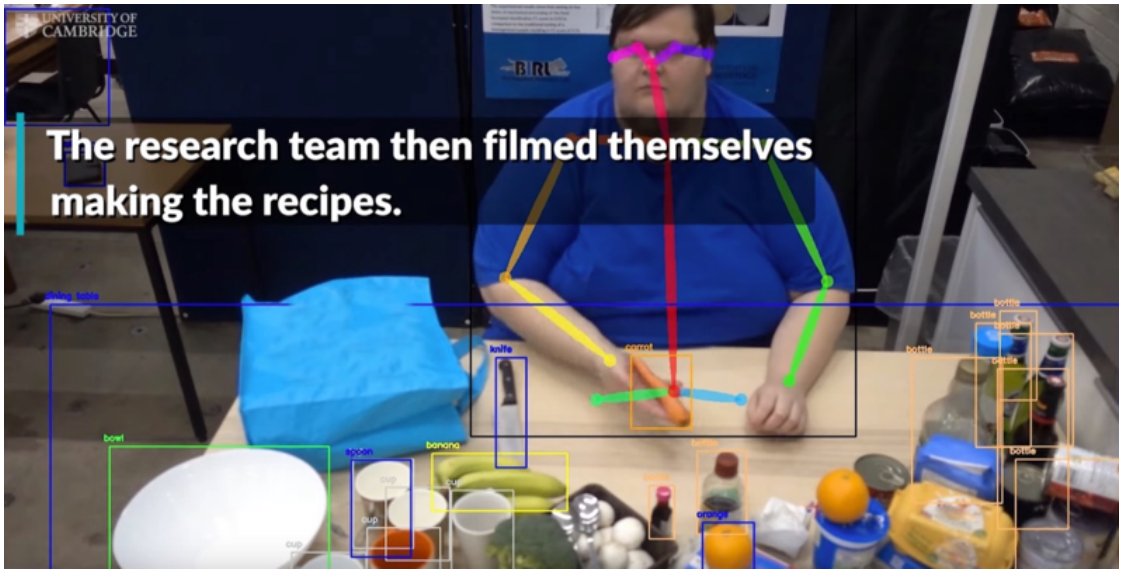


Figure 4.21: *Gastrobots*, gaze and object detection.

The discourse in this article does not have an alarmist or negative tone, but instead focuses on explaining new AI technology while emphasizing its more social aspects:

> If you record your grandmother in the kitchen, perhaps one day not too far away, your descendants may be able to taste her amazing cooking again thanks to one of the future versions of the artificial intelligence robot being studied today at the University of Cambridge. And not only that, to the researchers' amazement at the number of nuances the robot was able to detect, it could also come up with a new recipe all by itself. So if you've been saving your grandmother's videos, her outstanding dishes can come back to life robotically.

This idea of replicating a grandmother's recipe through the use of AI technology emerges in response to the human need to preserve special moments that involved a desired taste experience. With the exception of a brief mention that this technology could also create

[15] The complete article in its original language can be found at this link: https://www.macitynet.it/robot-ai-impara-cucinare-video-ricette/.

new recipes, the focus of this article was more on the idea of recovering past taste experiences, a unique element that does not appear in other articles.

Moving across the Alps to France, in what follows we analyze an article from the Parisian newspaper *Le Monde* entitled "L'intelligence artificielle s'invite dans nos assiettes"[16]. This article focuses on explaining how a *Flavor Graph* functions:

> …the researcher has designed a "flavor network" to try to identify ingredients that are more likely to go well together. "Coffee shares flavors with beef, so if you cook them together, it can turn out well, according to the graph. I tried this combination at a French restaurant and it was fantastic", the researcher explains. Thanks to machine learning techniques, his program has learned which ingredients combine well to satisfy human taste, and now it is capable of suggesting original flavor combinations. "We have analyzed ingredients from all over the world. For example, we can relate Sancerre to a Korean dish that has never been heard of", Lahousse explains. For him, this tool does not intend to replace chefs but to give them new ideas. According to him, chefs do not always dare to try certain combinations. "But with this algorithm, they are getting crazier and crazier. One even told me he loved caviar with ketchup". This technology also allows finding substitution ingredients or creating new ingredients by mixing others. Like the famous "Facebook bubble", which has been controversial for months because it tends to only expose users to ideas similar to their own. This could be problematic in the case of food: a person who enjoys eating fatty foods may not receive the same recommendations.

This article imagines an integrative discourse where the idea of a total replacement of chefs replaced by an emphasis on hybrid collaboration to design new flavors. The article revolves around the idea of having access to all the necessary recipe information from around the world to integrate and create new flavor combinations. It also mentions the possibility of breaking out of our taste bubbles by allowing us to discover new combinations of foods we are unlikely to discover organically. The notion of AI-personalized diets, previously analyzed above, is also mentioned in, the discussion of suggesting different recommendations based on the foods individuals are accustomed to consuming.

This is a discourse that idealizes artificial intelligence as a potential benefactor for crafting certain types of personalized diets. However, if we consider Niola (2019), these diets are also based on food restriction. There are both favorable and opposing discourses regarding dietary restrictions. Interestingly, all this is portrayed as a novelty, despite diets and nutritional

[16] The complete article in its original language can be found at this link: https://www.lemonde.fr/pixels/article/2017/03/15/l-intelligence-artificielle-s-invite-dans-nos-assiettes_5094811_4408996.html.

sciences having existed for many years. The thing that makes these diets newsworthy is that a new technology is being used to establish a relationship with gastronomy solely based on what is harmful or beneficial for our nutritional health.

Another French news article, from *Courrier International*, entitled "Attention à l'agriculture 4.0"[17], is focused on observing how AI-centric technological changes will drive the evolution of our food production methods:

> The artificial intelligence will help us feed a growing world population. But we must begin to pay attention from now on to the link between technologies and agricultural policies: it is up to the robots to adapt to the environment, and not the other way around. For this German agricultural economist, artificial intelligence and autonomous machines are formidable tools to address climate change and the massive decline in biodiversity.

This article advocates for the use of artificial intelligence to re-imagine environmental change and the relationship humans have with it. It also seeks to use AI to facilitate human labor, emphasizing not the replacement of jobs but rather a balanced implementation that benefits both humans and the environment.

The next article is from *Le Figaro,* entitled "«Pazzi», ce robot qui prépare des pizzas tout seul à Paris"[18]. This article features an image of the robot producing pizzas, as shown in Figure 4.22.

[17] The complete article in its original language can be found at this link: https://www.courrierinternational.com/article/techno-attention-lagriculture-40.
[18] The complete article in its original language can be found at this link: https://www.lefigaro.fr/secteur/high-tech/pazzi-ce-robot-qui-prepare-des-pizzas-tout-seul-a-paris-20210705.



Figure 4.22: Pizza-making Robot.

This image shows an illustration of a human chef, presumably an expert pizza maker, and a robotic arm that would act as a new pizza chef. The similarity in the arm position between the human chef and the robotic arm subtly suggests that the end product might remain consistent regardless of the identity of its creator.

The article explains:

> In the restaurant "Pazzi", which opened this Monday in the 4th district of Paris, a machine prepares, cooks, and serves pizzas entirely autonomously. One pizza every 45 seconds. The robot works alone but can juggle to prepare multiple pizzas at once. "We have equipped the robot with artificial intelligence that allows it to adapt to organic elements such as dough. It identifies the specific characteristics of the products and adjusts to them. If it makes a mistake, like making the dough too heavy, it can correct it the next time it tries", explains Sébastien Roverso.

The article highlights the idea of the machine's superior efficiency and speed compared to a human chef, and particularly emphasizes the importance of artificial intelligence in allowing for the correction of the robot's prior errors.

Another article from *Le Figaro,* titled "Sony veut mettre l'intelligence artificielle au service de la cuisine et des chefs"[19], mentions the operation of the *Flavor Graph*:

[19] The complete article in its original language can be found at this link: https://www.lefigaro.fr/secteur/high-tech/sony-veut-mettre-l-intelligence-artificielle-au-service-de-la-cuisine-et-des-chefs-20191120.

> "Artificial intelligence and robotics are not going to replace chefs, but we want to offer them new tools to enhance their creativity", said Sony spokesperson Shinichi Tobe to AFP. "AI could also be used to improve existing culinary flavors, or even to invent new dishes", he added, referring to work on molecular structures and "a way of cooking that only robotics can do". But there is also work on cooking temperature: "It could be a matter of temperature control, perhaps on precise moments when to apply heat and where to do it". These statements suggest that the company will not be satisfied with innovating in kitchen appliances alone, but will work with kitchen brigades all the way through. Specifically, he spoke of the multinational's desire to address the "ethical issue of AI". An issue raised by the use of this revolutionary technology, criticized for its intrusive and sometimes arbitrary nature.

In this excerpt, Sony advocates for a collaborative relationship between chefs and artificial intelligence to enhance creativity. Additionally, the Sony spokesperson preempts a concern for the ethical aspects of using artificial intelligence, particularly regarding taste, and highlights how the precision of artificial intelligence can lead to better gustatory results.

The last news article from France, also from *Le Figaro*, titled "Une nouvelle intelligence artificielle pourrait révolutionner le métier de vigneron"[20], showcases the main innovative aspects of AI technology:

> With the rise of the wine industry, Ningxia is encouraging its vineyards and wineries to adopt various intelligent digital technologies to produce high-quality wines with less labor and greater efficiency. Thanks to a microelectricity network in the vineyard, farmers can eradicate insects using a photoelectric effect system and gather information about insect invasions, as the installation is equipped with an image capture device.

This article also emphasizes the importance of AI technologies and how they can improve the quality of their interactions with humans. It is worth noting how the article focuses on the benefits of AI integration in making work less laborious, while eliding any mention of concerns about resulting lost jobs.

Moving on to the analysis, we will now discuss a number of the articles from Canadian newspapers. In *La Presse*, an article entitled "L'intelligence artificielle pour retrouver le goût

[20] The complete article in its original language can be found at this link: https://avis-vin.lefigaro.fr/economie-du-vin/o156458-une-intelligence-artificielle-revolutionne-le-metier-de-vigneron-agriculteur.

du bœuf grillé"[21] highlights how artificial intelligence might help enhance vegetarian and/or vegan food:

> Achieving the taste of beef in a vegetarian burger involves extensive work on flavors, textures, and colors, as well as cooking properties and mouthfeel, to make these products resemble meat as closely as possible. To mask or compensate for these aspects with other flavors, flavorists rely on an immense library of ingredients from which flavors are composed. Faced with hundreds and hundreds of possible combinations, Fimenich turns to artificial intelligence. "Artificial intelligence can generate millions of leads", enthuses Mr. Barra, "algorithms allow for the review of a vast palette of flavors, but also integrate consumer preferences, technical or regulatory limitations, and thus filter combinations of ingredients from which flavorists can create flavors that can then be tasted in the kitchen with a chef".

In this article, we observe that the emerging discourse positions artificial intelligence as a solution to specific problems related to these diets, emphasizing the idea of cooperation between chefs and artificial intelligence.

Another article in *La Presse,* titled "Intelligence artificielle: François Chartier invité à inventer la cuisine de demain"[22] discusses technological changes in gastronomy.

> "It's a project that encompasses various initiatives. The idea is to explore how we can envision the 'food of tomorrow'. All of this is set against the backdrop of an aging population, where cooking and eating have become very important issues. Today's millennials are defined more by what they cook than by what they wear or what they do for a living", says François Chartier. Sony is already working on the possibilities opened up by "Robotics Cooking" and artificial intelligence, primarily thanks to a collaboration announced in April 2018 with Carnegie Mellon University, which aims to explore the potential for optimizing food preparation, cooking, and delivery, as well as creating a completely new robot. "Artificial intelligence has the potential to take my science to another level", he says, referring to the possibility of building a "database of all the aromatic molecules and recipes on Earth. It's a golden opportunity to go even further!" His science and experience in creating harmonies could, he hopes, help "humanize" the relationship of a future robot with cooking.

This article addresses several important issues discussed throughout this study. Firstly, it introduces the concept of enhancing culinary practices by developing the capability to store

[21] The complete article in its original language can be found at this link: https://www.lapresse.ca/gourmand/2021-07-13/l-intelligence-artificielle-pour-retrouver-le-gout-du-boeuf-grille.php.

[22] The complete article in its original language can be found at this link: https://www.lapresse.ca/vivre/gourmand/201903/02/01-5216762-intelligence-artificielle-francois-chartier-invite-a-inventer-la-cuisine-de-demain.php.

all possible ingredient combinations globally, a task which, as demonstrated, is impossible to achieve manually. Secondly, it emphasizes the potential for artificial intelligence to improve culinary techniques through collaboration with chefs. Lastly, it highlights the importance of preserving the traditional human element associated with gastronomy.

An article from the English newspaper The Guardian, entitled "R2-D-Chew: robot chef imitates human eating process to create tastier food Cambridge scientists say robot is capable of 'tasting' and checking whether balance of flavours is right"[23], also reports on the previously-discussed development of *gastrobots* in Cambridge:

> A robot chef designed by researchers at Cambridge University has been trained to taste a dish's saltiness and the myriad of ingredients at different stages of chewing – a process imitating that of humans. The concept of tasting as you go – checking whether the balance of flavours is right in a dish's cooking process – is a critical approach, according to researchers, as the human perception of taste relies on saliva produced during chewing and digestive enzymes to decide whether food is enjoyable or not. Looking ahead, the researchers hope to teach the robot to adapt to an individual's tastes – such as preferring sweet or oily food – and become an essential part of households.

The article is accompanied by a picture of the food produced by the robot, as depicted in Figure 4.23.

[23] The complete article in its original language can be found at this link: https://www.theguardian.com/technology/2022/may/04/robot-chef-imitates-human-chewing-process-create-tastier-food.



Figure 4.23: *Gastrobots* cooking.

This news article pressents the idea of artificial intelligence being able to combine and test tastes tailored to humans. It also includes the idea of having AI robots generate suggestions based on each person' individual preferences. However, the article does not mention that the food prepared by the *gastrobots* in the above picture does not seem aesthetically pleasing or appealing to the human eye.

The *BBC* published a news article entitled "Can artificial intelligence create a decent dinner?"[24], which interrogates the impact of AI-powered recipe apps.

> I'm trying out Plant Jammer, an app that promises to rustle up a recipe based on whatever food you have lying around, using artificial intelligence. It searches three million recipes to find often-paired items. It then consults a library of ingredients that the company has hired professional chefs to group by flavour - salt, umami, sour, oil, crunch, soft, sweet, bitter, spicy, fresh and aroma "That is the old way", says Mr Haase. "We are actually constructing new recipes from scratch each time with an AI [artificial intelligence]. This is going to be the future". Plant Jammer is one of a handful of recipe apps, food distributors and even events companies that are turning to artificial intelligence to gain an edge in the food industry. I chose to make them into vegetable burgers. I tell the app I have no dietary restrictions, then tick off my ingredients. Lastly, it asks what seasonings I might have. Plant Jammer also sells subscription plans to supermarkets, offering ingredient alternatives to their website recipes. "So if you want to make it vegan, gluten free or Thai we can adjust any recipe,"

[24] The complete article in its original language can be found at this link: https://www.bbc.com/news/business-53794472.

> says Mr Haase. He hopes Plant Jammer will offer people the chance to master less wasteful, vegetarian cooking. Its AI platform Gastrograph can predict the flavour, aroma and texture a drink would need to cater to any regional food preference. What people taste is less important than what they perceive when they taste, says Mr Cohen, a former tea sommelier, who adds "perception is a very easy thing to play with". "For example, if we add vanilla at about one part per million to milk, you won't be able to taste the vanilla, but you'll say that the milk is creamier and higher quality," he explains. The artificial intelligence software runs through hundreds of decisions until it learns to predict how good a product is going to taste - based on what the product is meant to taste like, panel testing and regional tastes. Cookbook author and chef Meera Sodha agrees the pairing of AI and food can foster research, creativity and sustainability, but says you cannot "sever a recipe from its story". When she learned to cook from her mother she had a further "huge moment of panic" when she discovered no family recipes were written down. They would all die with her if she did not make a record of them. "What I love about cooking the recipes collected from my mum, my grandma or my aunt is that I feel connected to them when I cook that food in my kitchen", she says. "I feel like they are there by my side".

This discourse focuses on the idea of promoting the use of AI-powered food applications to find recipes regardless of the diets one chooses to follow. It emphasizes the concept of geographical filters, where regardless of location, an app can select the necessary ingredients to be consistent with a certain type of diet. It is interesting to note the concern about not losing the history behind certain dishes and attempting to leave a record of each recipe made. This reflects a desire to provide information to artificial intelligence about recipes that were previously passed down orally as family legacies. There is a reflection on starting to document these recipes so that cultural heritage is not subsumed by the use of artificial intelligence.

The *BBC* also published another article entitled "AI: Why chefs are turning to artificial intelligence"[25], which further delves into the relationship between chefs and technology:

> Firmenich's nose for a new market saw it diversify into food ingredients as the public appetite for alternatives to meat led to a scramble to put plant-based food on supermarket shelves. To help perfect the flavours of these innovative foods, Mr Maire has a new sous-chef in the form of Sam, an artificial intelligence (AI) robot. Using a technique called machine learning, it has raced through examples of flavour combinations and has learnt its own definitions, maturing over 18 months into today's AI robot. He uses certain aromas and tastes to mask "off-notes" such as acidic tastes while giving a formula the right texture. He talks of the tonality of food, how removing one tiny ingredient can change the overall taste. Sam takes the knowledge of flavourists and generates new formulas in

[25] The complete article in its original language can be found at this link: https://www.bbc.com/news/business-59651077.

> minutes, a fraction of the time Mr Salord and his team take using their own skills. "It suggests a formula that is in line with our senses". The machine rapidly gives an indication of how a flavour can be created and how much of an ingredient should be included. And Sam can hold the line between Mr Salord's team of flavourists and public tastes, refereeing decisions when the flavourists' view differs from that of a consumer panel. "We try to taste in the morning before we have coffee. By the afternoon your sense of taste becomes tired and affected by lunch. So we leave the afternoon for work on the computer". The flavourists remain his close colleagues, even though AI is "a powerful, beautiful tool". And he rates the taste of UK consumers highly. "It's an advanced market with many vegan people". Firmenich is betting big on the rest of the world changing their food habits in line with the British. Mr Maire maintains he is ready to whip up Christmas turkey and more from plant-based ingredients. "We are only at the beginning of what can be done. We have the competency to make Christmas pudding flavours too".

This discourse expresses a special interest in accommodating vegetarian and/or vegan diets, particularly regarding the relationship between traditional meals and plant-based dishes. The source quoted in the article aims to integrate vegan substitutes into meals traditionally associated with specific festivities like Christmas. It is emphasized that artificial intelligence is a crucial tool for creating such flavors using ingredients that had not previously been considered.

The final news article from the UK here discussed appeared in *Reuters*, entitled "From Mad Men to machines? Big advertisers shift to AI"[26]. This article stresses the economic implications of widespread artificial intelligence:

> Some of the world's biggest advertisers, from food giant Nestle (NESN.S) to consumer goods multinational Unilever (ULVR.L), are experimenting with using generative AI software like ChatGPT and DALL-E to cut costs and increase productivity, executives say. Investment is already ramping up amid expectations AI could forever alter the way advertisers bring products to market, executives at two top consumer goods companies and the world's biggest ad agency told Reuters. The technology can be used to create seemingly original text, images, and even computer code, based on training, instead of simply categorizing or identifying data like other AI. "It's much easier to think about all the jobs that will be disrupted than all the jobs that will be created", Read said. While lawmakers and philosophers alike still debate whether content produced by generative AI models amounts to anything like human creativity, advertisers have already begun using the technology in their promotional campaigns. The company wants to prevent its technology from

[26] The complete article in its original language can be found at this link: https://www.reuters.com/technology/mad-men-machines-big-advertisers-shift-ai-2023-08-18/.

reproducing human biases, like racial or gender stereotypes, that might be embedded in the data it processes.

The article highlights concerns about employees who may lose their jobs due to large companies employing artificial intelligence as a substitute for their labor. It also presents a discussion of ethical concerns regarding the use of artificial intelligence in advertisements that may replicate harmful human biases like racism.

The next article here discussed is from the Spanish newspaper *ABC* and is entitled "¿Cómo conseguir una estrella Michelin? Las siete claves según ChatGPT para conseguirla"[27]. The article features an image to represent the artificial intelligence as seen in Figure 4.24.

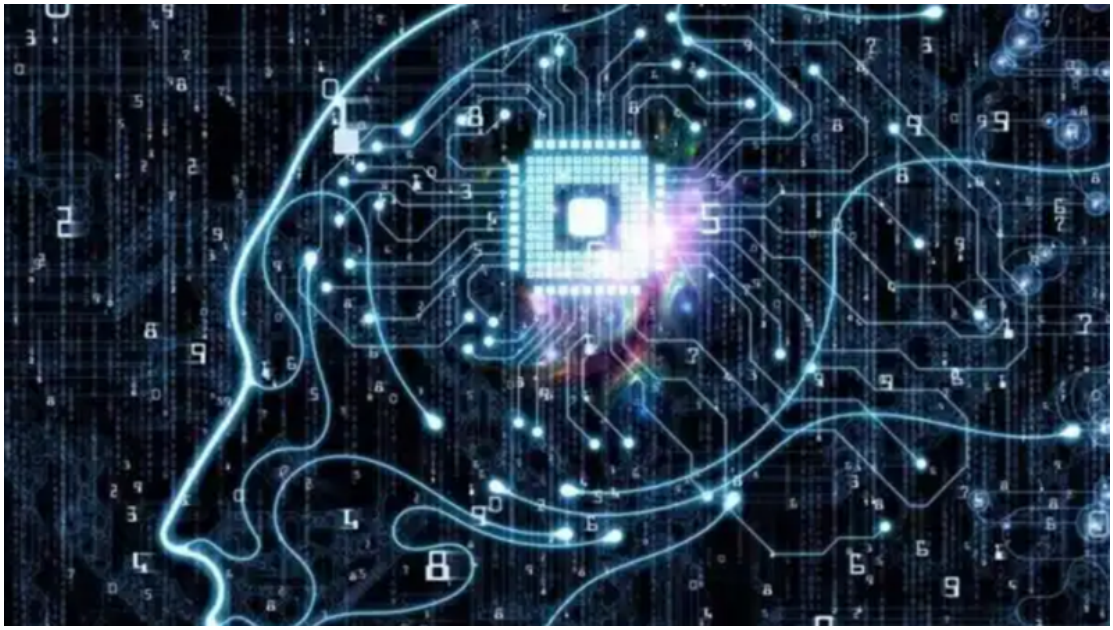


Figure 4.24: Representation of Artificial Intelligence.

This image follows the classical schema used to both differentiate artificial intelligence from human intelligence – depiction in dark colors – and to connect it to human intelligence – the use of a "head" similar to that of humans. This image encapsulates Cristianini's (2023) propositions regarding the simultaneous differentiation and anthropomorphization of artificial intelligence.

[27] The complete article in its original language can be found at this link: https://www.abc.es/gastronomia/conseguir-estrella-michelin-siete-claves-segun-chatgpt-20230314143547-nt.html.

The text of the article explains how the worlds of artificial intelligence and gastronomy interact:

> Gastronomy has long been exploring artificial intelligence and big data from an academic perspective. Expert technologists have been working on the potential of new tools—in places like the Basque Culinary Center (BCC), for example—to achieve greater personalization in a restaurant's offerings or in reformulating recipes to make them healthier. From the complete elaboration of a tasting menu to knowing what to do if you are a chef and recognize a Michelin guide inspector sitting at one of the tables. One of the tasks undertaken by the BCC is to find out how, through digital menus and eye-tracking technology—a method that records and analyzes eye movements to assess where the gaze is fixed—one can influence a customer's choice to make it healthier. According to its own managers, there are five criteria they evaluate: "The quality of the ingredients, harmony of flavors, mastery of technique, the chef's personality reflected through his cooking, and, no less important, consistency over time and in the overall proposal". In developing its response, it provides more specific data: "Use fresh and high-quality ingredients, preferably seasonal and locally sourced". And it goes further by proposing the use of "exclusive and exotic" products without being "too extravagant or out of place". Regarding the balance of flavors—in which it deems it necessary to seek out 'umami'—it warns of the need for them not to overwhelm the palate so that "each dish can be fully enjoyed". ChatGPT suggests ensuring that the "wines and beverages complementing the dishes" enhance the flavor of the food. On service—which it considers fundamental in "the dining experience"—it emphasizes the importance of the staff being "well-informed about the menu and ingredients". The service must be, in its technological judgment, personalized and friendly.

This discourse reminds one of the notions of being at Boutaud's (2011) table, where all factors directly impacting the taste experience are integrated. The article highlights the collaboration between chefs and technology, which again refers us to the idea of controlling *indexical* gestures, in Peircean terms, not controlled by diners during tasting. The purpose of monitoring and analyzing these gestures is to detect which aspects of the taste experience might be improved to enhance each individual's tasting experience. There is a constant pursuit to provide the best possible experience so that the restaurant and the chef can be recognized and awarded.

In another *ABC* news piece titled "Desarrollan un robot que cocina a partir de la observación de recetas de chefs"[28], an additional reference is made to the work conducted at the University of Cambridge on *gastrobots*:

> This is another demonstration of artificial intelligence, which learns through observation: "By watching videos of chefs cooking, the robot mimics the movements and recognizes the foods that appear". Its functioning involves: "The robot analyzes each frame of the video and then identifies the various objects and features, such as the knife, ingredients, and the chef's movements". The developers of the project suggest that it can be of great assistance in automating food production: "In the hospitality sector, there are many mechanical tasks that are currently performed by humans. The robot does not aim to replace chefs, but rather to facilitate the process", adds Grzegorz. Automation in this sector has numerous benefits such as improvements in speed, efficiency, and creativity, which will significantly reduce production costs. However, it also entails risks such as the reduction of human jobs, which may be replaced by these artificial intelligence technologies.

It is worth noting that this article about the Cambridge *gastrobots*, unlike the one from Italy, limits itself to explaining the function of the *gastrobots* without discussing emotional aspects that pertain to gastronomy. It takes a fairly even-handed approach, highlighting artificial intelligence's functionality in speeding up kitchen processes, but also mentioning fears around artificial intelligence replacing the jobs of human chefs.

The last Spanish news article we will discuss is also from *ABC* and is entitled "La controversia de la inteligencia artificial en la cocina"[29]. In this case, the focus is on the relation between the health issues of diners and technology.

> Artificial intelligence has enabled I+DEA Siro Foods, in collaboration with IBM, to create a tool that allows immediate knowledge of diners' preferences in any restaurant worldwide thanks to "two million weekly items such as blogs, scientific articles, or social networks", defended Carolina Martín. With this tool, one can understand "the joy, sadness, dislike, and fear" of diners to interpret secondary emotions. "If diners show joy and fear, they want to convey a feeling of surprise, while if they show joy and dislike, they convey a sense of intrigue", Martín stated. "In addition to emotions, it allows knowing the diner's sentiment towards any ingredient or experience", added Fernando Sáenz from the DellaSera restaurant. "We must acknowledge trends without losing our roots and

[28] The complete article in its original language can be found at this link: https://www.abc.es/internacional/desarrollan-robot-cocina-partir-observacion-recetas-chefs-20230607201807-vi.html.

[29] The complete article in its original language can be found at this link: https://www.abc.es/viajar/restaurantes/madrid-fusion/abci-controversia-inteligencia-artificial-cocina-202001131957_noticia.html.

> strive to break rules to create trends", as the leitmotif of haute cuisine. More assertive and contrary was Dabiz Muñoz, chef and owner of DiverXo, who pointed out that this tool "seeks to aggregate people's tastes, and that seems to me to be linked to mass and industrial consumption, not haute cuisine". The Madrid chef admitted that "I would be interested if it were focused on making cooking more sustainable in production and consumption and making it healthier in its processes", words that elicited applause from the audience in the auditorium. "It is impossible for this to be used in haute cuisine", he continued in his plea. "If we were to use it, we would be dehumanizing the racial part of cooking, and I am a lover of human talent linked to cooking", he concluded. "We must bet on the territory, but respecting the tastes that people want". Words that found a response in Dabiz Muñoz: "The world's top restaurants are those that do not follow the trend dictated by people's tastes, and haute cuisine must be linked to the personal talent of the people running the restaurants. This tool could never be part of haute cuisine".

This article presents a perspective according to which the use of artificial intelligence is considered feasible in industrial kitchens but rejected for haute cuisine. Artificial intelligence offers efficiency in detecting ingredients that might be harmful to certain individuals but is perceived to diminish creativity and quality in haute cuisine. Additionally, concerns about losing historical gastronomic legacies and unique taste experiences resurface. Artificial intelligence is portrayed as posing a risk of homogenizing taste experiences, leading to standardization—a notion seemingly incompatible with haute cuisine. Another relevant idea is the association of haute cuisine with the human factor, not with artificial intelligence suggestions; the value of such cuisine is always linked to the creativity and personality of individual chefs. The article suggests that using artificial intelligence might erode these elusive qualities. For this reason, we believe it is important to explore the media discourses surrounding artificial intelligence, as they contribute to constructing *storytelling*. It is interesting how some concerns seem universal, while others appear specific to certain cultures and countries. Broadly speaking, we can highlight the following concepts: preserving the human factor, enhancing creativity with technology, improving certain diets, and envisioning a future kitchen with more precise control over the foods we consume. Additionally, there is potential for reducing environmental impact through the implementation of certain artificial intelligence technologies.

In what follows, we analyze a Korean article, Sony's company blog, which conducted an interview with the chef who provided his recipes to create the *Flavor Graph* database. The interview, divided into three parts, is entitled "The Future Kitchen Series – Chef Hajime

Yoneda"[30]. The first part of the interview discusses the human aspect and the process of how cooking generates emotional resonances. It is worth noting that this article, likely produced by the Sony corporation with the aim of selling its products, is one of the few perspectives to defend a key role for artificial intelligence in haute cuisine.

> Imagine the ideal chef to advise an AI company wanting to drive sustainable, healthy and delicious creativity in the kitchen. That chef would probably be a leader in their field and have a strong technology background, a range of experience of different cuisines and kitchens, a desire to reinvent the industry, a desire to support other chefs, a desire to serve the planet, and – as a bonus – a strong artistic sentiment. "As a percentage of sales, 55% is considered suitable for combined food and labor costs," Yoneda says. "Management therefore needs to keep labor costs below 30%, but that's a very hard task if you wish to maintain quality in cuisine and service." Yoneda thinks technology such as AI and robotics have the power to fundamentally transform this. It can improve working conditions to help the industry attract and retain talent. It can lower the strain of monotonous tasks to allow chefs to focus on value-adding work. For example, new sensing technologies can give chefs consistent confidence by providing data around quality, as well as feedback on customer enjoyment. AI can help them further utilize this information – along with a wide range of other data, from culinary to scientific, to provide new entry points into dish design. And robots can help with skills transfer, preparation and hygiene. "Food preparation demands mastery of all five senses (sight, sound, smell, touch, taste). We must, therefore, research and develop never-before-seen technologies for recognition, sensing and robotics." I am always thinking about how we could also reduce labor issues by creating an environment in which a chef focuses on drawing up blueprints, doing research and digitizing different elements". Crucially, Yoneda sees this technology working in harmony with chefs and restaurateurs to drive change in the industry. Also an accomplished artist, when he became an advisor to Sony AI he drew us the below image to represent the harmony he believes can exist between robots, AI and humans. "In this drawing I'm showing a human hand and an android's hand each holding a lemon balm leaf, which signifies compassion. When the two come together with compassion, love is created." AI can be read as 'ai', which means 'love' in Japanese. Yoneda sees humans and AI coming together to create a more sustainable restaurant industry. The heart in the image is symbolic of Yoneda's hope for the industry: 'AI' can be read as 'ai', which means 'love' in Japanese. As we've explored, Yoneda is well aware of the industry's challenges, but he is also optimistic about the love that can be created by driving collaboration between humans and technology.

In this segment, the idea of lessening environmental impact through the use of the application also emerges. Additionally, in order to emphasize and humanize the collaboration

[30] Part of the interviews can be found in these links: https://ai.sony/blog/blog-024/ https://ai.sony/blog/blog-025/ https://ai.sony/blog/blog-026/.

between people and artificial intelligence, a play on words between “AI” and “love” is made. This pun is something of a cultural leap because the application is created in Korea, but the wordplay relies on the chef being Japanese – AI is “love” in Japanese, not in Korean. To visualize this connection, the creators of the article crafted the image we see in Figure 4.25.

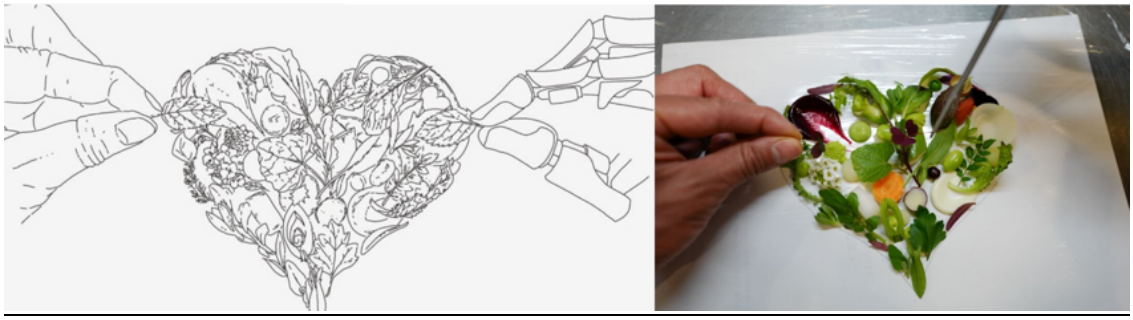


Figure 4.25: Integration of a chef’s work with artificial intelligence.

As the pictures illustrate, the designed dish is composed of vegetables cut in different ways to form a heart. The final product does not evoke the viewer’s desire to taste that dish, but rather aims to appeal symbolically to an abstract emotion, all with the goal of emphasizing that the human factor will not be lost with the use of artificial intelligence.

In the second part of the interview, we find a discourse that focuses on the perfection that can be achieved using robots in the kitchen:

> “Every single carrot measures differently in terms of sugar content, water content, fiber and composition. Flavors differ by plot even within a single farm. Consequently, a dish containing ten vegetable varieties and made according to one recipe can taste completely different to the day before, necessitating skilled staff to adjust the flavor balance. But there is no golden rule for this kind of thing.” And while chefs must be designers and artists, because of the medium they work in, they lack the luxury of time. “Unlike production in an industry like fashion, we are in a race against time, with drastic changes in the materials we handle. Unlike fabrics, our ingredients spoil at rapid speeds. Thus, the issue is with how you check and control quality.” Creating a new dish, or a new restaurant experience, can call on every discipline under the sun. A fundamental step is picking ingredients, and here Yoneda sees opportunities for support. Moreover, Yoneda sees a job for data and sensors in understanding the human brain and responding to the entire experience of eating. Putting it all together can look like the job of an orchestra conductor. “Much like music, it is essential to modulate when serving food. This is about skillfully inducing fluctuations in the human brain’s emotional responses. Pleasure and discomfort. Dopamine and beta-endorphins. Temperature range, texture, flavor contrast, tableware size, horizontal and vertical dimensions, how well it melts in the mouth, ease of chewing, length of aftertaste, if it’s liquid or otherwise… being aware of such parameters,

> and creating contrasts, enables us to create recipes and services that are three-dimensional in nature, like a symphony." When a chef creates a new dish, it's rarely a linear process like following a mathematical equation. It's one of trial, error and experimentation – and when something goes perfectly, it's crucial to know what led to the success. Small changes can make big differences. But while it is possible to quantify volumes, time or temperature during cooking, there are countless elements in the process that cannot yet be quantified. "Digitizing the data on flavor and variables (air temperature, humidity, time of day, ingredients' internal changes and so on), as well as on the values that determine the ultimate flavors, should make it possible to recreate those flavors. Using AI to analyze the data from leading chefs and verbalizing the not yet quantified or verbalized parts could even result in anyone being able to recreate a certain chef's flavors." "Sensing technologies and AI have the potential to be better at capturing exactly what guests want, by reading minute facial impressions, for example. They may be saying it's delicious, but not really thinking that. Sensing and analyzing living data from guests on gaze, mimetic muscles, perspiration, body temperature and other factors could help us understand their true state and feelings, and unconscious desires. We could contemplate systems that provide real-time feedback on service and seasoning." This highly personalized understanding of, and response to, an eater is a prime area for sensing technology to target. In a highly complex environment, one that lacks the consistency and flexibility of so many other industries, he can see how the opportunities could reshape restaurants for the better.

In this section of the article, we also encounter the recurring idea of artificial intelligence improving industrial processes by enhancing ingredient quality control, as even the slightest detail of how certain ingredients are prepared can ultimately affect the final taste outcome. The notion of monitoring every expression made by diners while in the restaurant also suggests the sort of dining experience discussed by Boutaud (2011). This scheme seems practically impossible to carry out in practice, as individual preferences, such as music volume, may vary among diners. For these reasons, the idea of controlling every aspect of dining to enhance taste experiences, seeking unprecedented level of personalization within the public space of a restaurant, becomes questionable. One unsettling aspect is the notion of controlling even the temperature of the dining area by analyzing factors like each individual's perspiration upon entering the restaurant space. The idea is that the more data that can be digitized, the better the taste experience would become may easily morph into quasi-Orwellian scenarios of complete control over diners. Lastly, in the third part of the interview, an attempt is made to appeal to the possibility of artificial intelligence enabling everyone to cook like a chef by enhancing our creative capacities:

> For Chef Yoneda, the kitchen and restaurant are analogous to a factory: not one that produces standardized products in mass quantities, but one that must efficiently produce a wide variety of highly specific products in small quantities. "…Sophisticated restaurants are all about precision, targeting a single point, thus even slight deviations in balance are obvious. It requires delicate balancing right to the finish. "Joël Robuchon is said to have demanded proper placement of vegetables down to the millimeter. That's the kind of precision we seek at HAJIME, too." For instance, the robots must have powerful vision capabilities in order to identify the varying shapes of similar ingredients. They must have gripper sensitivity so that they can handle deformable objects. And they must be able to integrate into any size of kitchen, operating unobtrusively and collaboratively alongside the other chefs. Much of the industry's recent progress has been in automated robots that focus on single dishes, like pizza, pasta, burgers or salads. While Yoneda thinks there is a need for more complex systems, he also sees a focus on repeating single tasks as integral to cheffing. "The most important thing in the cooking process is taking care of the most painstaking tasks. Through daily repetition, those bothersome tasks we consciously engage in become part of our subconscious, and we can do them very well without even thinking. That's when you finally become a chef to some extent." So Yoneda sees the mastery of these repetitive tasks as essential. But he can also see the value of robots taking over some of them. This would help manage quality if staff get tired. "Maintaining uniform quality through repetitive tasks – that is the domain of robots. When humans tire, we see a drop in their ability and work quality, but robots can work constantly at the same tempo, with the same efficiency and quality… they can reproduce the same tasks for us day after day." "The flavor of ingredients changes with different cutting techniques. Whether it's meat or fish, it's essential to minimize loss of fluids when cutting. We must cut between particles without crushing them, and the key is in making the finest point of contact between the knife and the ingredients. If there was an electric knife that could cut more finely and with more precision, I would use it without hesitation. At the three-star-Michelin level, those are the minute differences we seek".

In this sense, an idea emerges of connecting cooking and industrial processes without losing the creative aspect. This clears the way for a potential hybrid between haute cuisine and industrial cooking. In these cases, the use of artificial intelligence is important, especially in regard to the precision cutting techniques of which artificial intelligence is capable, as even the slightest detail in food preparation can alter the taste of the final product. Since robots can perform many repetitive tasks at a higher pace and standard than humans, the possibility arises of using such tools to makes it easier to cook like – or perhaps even better than — a professional chef.

In summary, this section has argued that the media creates a *storytelling* and a social imaginary (Castoriadis 1975) that is central to the ultimate acceptance or rejection of artificial

intelligence technologies in the gastronomic field. However, although they circulate in different spheres, the discourses end up highlighting the same issues, with each emphasizing the particular problem it considers most relevant based on editorial decisions and cultural aspects. We maintain that these discourses are especially relevant as they will clearly impact the taste experiences resulting from the use of artificial intelligence in food preparation.

4.3. Socio-semiotic Analysis of Perception: Interview Methodology

Given the complexity of the themes analyzed in this thesis, we understand that the most comprehensive approach to addressing these issues is through socio-semiotics. In order to do so, we rely on the notions developed by Landowski (1992), who highlights the importance of observing the social connections at play in our object of study. Given that the object of this thesis is "the taste experience", its social dimension is crucially pertinent for its overall comprehension, as we hope to have demonstrated before.

In this study, a central focus has been the engagement with key social actors involved in constructing a taste experience mediated by artificial intelligence. A total of five in-depth interviews were conducted: two involving chefs working with artificial intelligence and three involving experts in the field of artificial intelligence applied to gastronomy[31]. Understanding the meaning of such practices necessitates addressing the roles of the individuals who constitute these social actors. The knowledge provided by these social actors, be they chefs or experts in artificial intelligence, determines the social practices that are considered crucial for understanding the phenomenon. In this sense, to delve into the aspects of perception it is essential to understand the meaning of these practices through the primarily involved actors. This involves drawing on examples from the personal experiences of each interviewee regarding perception and its connection with artificial intelligence and gastronomy.

For this reason, employing a qualitative methodology, we opted to conduct in-depth semi-structured interviews through sociological techniques. This choice was made for the purpose of gaining first-hand insights into the processes that impact the taste experience from the perspectives of chefs and experts in artificial intelligence applied to the gastronomic field. Drawing from Jean-Claude Combessie (2007: 24, 28) for the semi-structured interviews, we

[31] All the interviews are anonymized due to the code of ethics ordinance of the University of Turin. For this thesis we followed the "Information on the processing of personal data in accordance with Articles 13 and 14 of Regulation 2016/679/EU".

initially selected relevant topics for both chefs and experts in artificial intelligence, always conerning the issue of taste experience.

Moreover, each interview needed to be divided into sections, as per Combessie (2007). Initially, it was crucial to establish an introduction where we presented our research and explained the purpose of the interview. Then, in a second stage, the actors themselves were given the opportunity to present, with guided questions aimed at understanding their backgrounds, how they became involved in working with artificial intelligence and gastronomy.

In a third stage, it was crucial to allow the interviewees to define, based on their experiences, what taste would entail in both types of interviews. For experts in artificial intelligence, it was important to let them provide their own perspective on how to define it.

This preliminary guide to the interviews has been essential to maintain focus during each interview. Although the semi-structured, in-depth interview format with social actors allowed for moments where interviewees expressed opinions that may diverge from the initial guidelines, we still regard this technique as fundamental. This is because a variety of unexpected but pertinent elements emerged through these unscripted moments. This aspect underscores the importance of this technique; while much conceptual insight can be gleaned from existing literature, valuable insights and techniques can arise through direct engagement with practices related to the study's subject matter. Therefore, opting for a semi-structured interview format has been one of the best approaches to improve our research. It provided a flexible framework that allowed for the exploration of key themes while remaining open to discovering the firsthand experiences of individuals closely involved with the subject of this thesis.

The fourth part of the semi-structured interview guide focuses on exploring the relationship between sensory perception and artificial intelligence, which are key elements in this research. Following Combessie's (2007) approach, one of the objectives of semi-structured interviews is to utilize natural language, balancing the interviewer's prior knowledge with the necessity to elicit the interviewee's perspective on the topic. Consequently, it is important to reflect the fieldwork underpinning the questions, albeit not in overly specific terms, to enable the interviewee to articulate their own viewpoint.

Another technique employed in the interviews, in line with Combessie's (*ibidem*) recommendations, is the repetition of key concepts during the dialogue. This serves to emphasize the interviewee's perspective on certain topics, by asking if the interviewer's interpretation aligns with their explanation. This technique also creates new opportunities to

revisit central themes, aiming to obtain more detailed information, particularly regarding the sensory perception and its connection with artificial intelligence.

In the fifth part of the interview, we focused on exploring the specific relationship between artificial intelligence and gastronomy. It is important to clarify that this was a pre-established guide for each interview. Therefore, while the divisions may not have occurred in the predetermined order during the actual interviews, the recognition of these parts can be found in each of them. Moreover, it was crucial for concentrating on the major themes, thus ensuring their presence regardless of the order in which they emerged. Obviously, the only fixed parts in terms of timing within the interviews were the initial presentation of our research and the conclusion.

Finally, at the end of the guide, there is a concluding segment of the interview, as established by Combessie (*ibidem*). This section allowed a few extra minutes for each interviewee to express their viewpoints that may not have been addressed in the questions asked. The objective was to provide them with the opportunity to articulate their perspectives more effectively, whether by clarifying concepts or adding previously unexplored information that they deemed relevant. Subsequently, the interviewer could select or prioritize this additional information based on its relevance.

At this juncture, we provide the "guide" used for the semi-structured interviews, categorized by the type of social actor, beginning with expert chefs in artificial intelligence.

I) Introduction

This interview is part of my doctoral research. Drawing from the information I have gathered during the first year of my research, I would like to explore the perspective of an expert in the field of gastronomy, particularly regarding the relationship between artificial intelligence and gastronomy. The interview is expected to last approximately 45 minutes. The recording will only be retained for analysis purposes in my doctoral research. Thank you for agreeing to this online interview and for signing the consent form.

II) Background and Introduction

To begin, could you please introduce yourself and discuss your experience as a chef, as well as your involvement with artificial intelligence?

- What and where did you study?
- How long have you been working with artificial intelligence?

III) Definition of Artificial Intelligence and Gastronomy

What does artificial intelligence bring to gastronomy?

- Do you know how the database is created in the case of artificial intelligence and gastronomy?
- What types of data are used and how are they related (user preferences, recipes, ingredients)? Could you provide examples?

IV) Artificial Intelligence and Work

What does working with artificial intelligence entail? What are the advantages and disadvantages of working with artificial intelligence?

- How does human intelligence manifest itself in the field of gastronomy?
- What role do sensory stimuli play in decision-making in gastronomy? Can this, to some extent, be replicated by artificial intelligence?
- What will be the implications of using artificial intelligence in your work practices?
- What changes will occur in society when artificial intelligence is used for gastronomy?

V) Artificial Intelligence and Taste

What happens to taste when it is suggested by artificial intelligence?

- Is there a transformation of taste thanks to artificial intelligence?
- Can artificial intelligence create new flavors? How can it do so considering the regularity of taste?
- How is this new flavor created, to what extent does the human element intervene?
- What could happen with traditional dishes and their combination with artificial intelligence? Can you think of any examples?

VI) Conclusion

Thank you very much for all this valuable information that will undoubtedly be crucial for continuing with my doctoral research. If there are points that have not been addressed in the interview and you feel it is necessary to add them, please feel free to do so. Above all, I appreciate the insight your perspective provides in this field of study, which is central to the problem addressed in my thesis.

This was the semi-structured framework planned regarding the interviewed chefs working with artificial intelligence. Clearly, while the interview parts were planned regarding the artificial intelligence experts, the guide was modified because we understand that they are different social actors. It is worth clarifying that both the beginning and the conclusion of the guides are very similar. Below, we present the guide used for the artificial intelligence experts.

I) Introduction

This interview is part of my doctoral research. Drawing upon the information I have gathered during the first year of my research, I would like to seek the opinion of an expert in the field of artificial intelligence, particularly concerning the relationship between artificial intelligence and gastronomy. The interview is expected to last approximately 45 minutes. The recording will only be retained for analysis for my doctoral research. Thank you for agreeing to this online interview and for providing your consent.

II) Background and Introduction

To begin, could you please introduce yourself and tell us about your experience with artificial intelligence?

- What and where did you study?
- How long have you been working with artificial intelligence?
- In which field (of application)?

III) Definition of Artificial Intelligence

How would you define artificial intelligence?

- Some journalists, to explain how artificial intelligence works, compare it to human intelligence. To what extent do you think this comparison between human intelligence and artificial intelligence is valid?

IV) Artificial Intelligence and Sensory Perception

To what extent can we talk about sensory perception on the part of artificial intelligence?

- In what ways is the sensory dimension present?
- What kind of sensory information is needed for the database (colors of ingredients, textures, etc.)? Can you provide some examples?
- To what extent and based on what data does artificial intelligence take into account sensory stimuli?
- What role do sensory stimuli play in decision-making?

V) Artificial Intelligence and Gastronomy

What do you, as an expert in artificial intelligence, expect from its application in gastronomy? (There are different expectations depending on the involved social actors: computer scientists, companies developing devices, culinary professionals, consumers, etc.)

- Where does the information for the database in gastronomy come from?
- Does artificial intelligence process information and then make decisions?
- What types of data are used and correlated (user preferences, recipes, ingredients)?
- What do you think will be the impact of using artificial intelligence on the practices of culinary professionals?

- What changes will occur in society when artificial intelligence is used for gastronomy?
- In your opinion, can artificial intelligence create new flavors? If so, how can it achieve these given statistical regularities in ingredient combinations?
- What might happen to traditional dishes and their combination with artificial intelligence? Can you provide an example?

VI) Conclusion

Thank you very much for all this insightful information, which will undoubtedly be crucial for continuing with my doctoral research. If there is any point that has not been addressed in the interview and that you believe should be added, please feel free to do so. Above all, I appreciate the assistance that your perspective provides in this field of study, which is central to the problematics of my thesis.

To conclude this paragraph, we would like to emphasize that the so called "guide" which we previously elaborated has been translated into English, while the interviews were conducted in Spanish, French, and English. Not every question presented above has been necessary to develop the interviews, but it certainly served as a foundational ground to keep sight of the main themes of this research. This process enabled us to develop a comprehensive perspective to address the topic of *sensory perception* and *artificial intelligence,* while also allowing to capture relevant viewpoints of the main social actors involved.

4.4. Interviews with Chefs Working with Artificial Intelligence

Interviews conducted with chefs highlight several aspects of how themes related to taste interact with artificial intelligence, and how culinary work is impacted by the use of artificial intelligence technologies.

In the interview with Expert 1[32], topics such as traditional cooking were discussed, focusing on how new tastes are created using these devices. Therefore, we select excerpts from the discourse that are relevant in that they frame the issues developed in the earlier chapters of this thesis.

To begin, Expert 1 explains the factors that he considers relevant for working with artificial intelligence:

[32] We have translated this paragraph from its original Spanish. The entire interview in its original language can be found in the Appendix.

> The human aspect, which is fundamental, I mean, the taste of not only tasting or experiencing, but also knowing that a taste can be good or bad, you know? So, from having that pinch of negativity, it evolved into using it as a way to experiment with artificial intelligence. I have a block on how to make this type of dish. I ask her, who may have a lot of information thanks to the Database that other people have put in. The Database I am using is very basic. It means that perhaps it can offer you a lot, who are not a cook, but to me, who have had my experiences, it can simply help me with a creative question. I put in how to ferment, well, I don't remember what ingredients, but it was a very difficult ingredient and everything turned out fine. So I say ok, perfect. I saw where the wrong parts were, and calmly, with my experience and what artificial intelligence gave me, I can complete that. It's like a complement for a cook. More than a creative unlocking, it's a complement that could help.

Here, the difference between users and artificial intelligence is emphasized, the interviewee highlights that the users' experiences with cooking and gastronomy are fundamental inputs needed for the results of the artificial intelligence utilization to be correct. Another interesting point that Expert 1 points out, which recurs throughout the interview, is the importance of ensuring that the human factor does not disappear in the preparation process, especially when it comes to taste.

On the other hand, there is a metalanguage common among experts in certain areas, where a distinction is made between users who use artificial intelligence in a more basic way, as Expert 1 describes, and the way he uses it by querying more technical elements, such as the fermentation of certain ingredients. This distinction is important because, as is the case in all fields, the more experience one has on a subject, the more specific one's questions tend to be, thus drifting into a metalanguage that might only be understood among people who are experts, in this case, in the field of gastronomic studies.

It is interesting how Expert 1 expresses the use of artificial intelligence. In the original interview, Expert 1 mentions "se lo pregunto a ella", indicating a tendency to anthropomorphize artificial intelligence in line with what is mentioned by Cristianini (2023). Moreover, there is a tendency to think of artificial intelligence in feminine terms, as can be observed in various devices like *Siri* and *Alexa*, which predominantly have female voices.

Another relevant observation is that in the way Expert 1 uses artificial intelligence, a type of hybridization can be observed, where the suggestions of artificial intelligence are taken into consideration alongside the chef's previous experience, instead of replacing it entirely. In addition, thanks to Expert 1's prior expertise in the kitchen, he is able to identify errors made

by artificial intelligence before beginning the cooking process. This demonstrates the autonomy of human beings in their ability to challenge and restructure the responses of artificial intelligence according to their own purposes. Therefore, the situation discussed by Fry (2018) wherein users blindly follow artificial intelligence instructions does not necessarily arise when subject matter experts are capable of using artificial intelligence as a resource to generate various options to choose from — thus preserving human autonomy. It is questionable if this kind of use of artificial intelligence merits the label "intelligence", because in such cases, artificial intelligence is basically being used as an assistant, not as the equivalent of an omniscient entity whose instructions must be followed to the letter. We cannot assert that all chefs use artificial intelligence in this hybrid fashion, but these interviews have allowed us to observe other types of interaction dynamics unpredicted by the purely theoretical examinations of how people interact with artificial intelligence.

At the same time, we understand it is relevant to highlight that this type of utilization is more likely to occur in a hybrid manner, especially when a person is an expert in the field they're consulting artificial intelligence about. In these hybrid cases, Umberto Eco's (1992) notion of model readers comes into play, where the creator of the technical device may not fully grasp the varied ways in which different users might utilize their device.

Returning to the interview with Expert 1, as he discusses menu creation:

> And regarding the theme of the tasting menu, it's, um, an intelligent menu or something like that. Okay, but all the recipes in that menu are created by artificial intelligence. I mean, I give the AI the guidelines. The AI comes up with what it wants, goes through the algorithm, but still, the recipes are from the chef. The photos, the images, how to implement it. This is based on everything he's provided within this, this data so that he can come up with a decent product. The need for artificial intelligence and the chef to complement each other will always exist. There will always be a person who has to taste the result and then can test it by selling it, doing whatever they want, but it will always require a human being to taste the product. This product will always need someone with a bit more experience, at least in terms of taste, to say it's perfect, ready, that it's balanced well in terms of acidity, sweetness, etc. In terms of textures, there will always be a person who will taste what the machine has made and give it the OK.

In this excerpt, Expert 1 suggests that it is impossible for a recipe to be created entirely by artificial intelligence, because there will always be a need for a chef to test and tweak what is created by artificial intelligence. In this aspect, we can highlight what Landowski (2021) mentioned about the processes of creativity, where the subject makes modifications, adjusts

dynamics with the object—in this case, artificial intelligence. Therefore, creativity occurs in the processes of actantial adjustments that later result in programming. Expert 1 appears to believe that artificial intelligence is simply incapable of creating a taste that achieves the flawless balance and complex interplay of flavors humans are capable of perceiving. This element was highlighted by Davidsson (2021), where he discussed how artificial intelligence might effectively utilize information about ingredient combinations, that the X-factor of balancing everything entailed in a taste becomes impossible to replicate. Additionally, the very process of cutting or preparing each ingredient can affect its texture, no matter how artificial intelligence suggests or indicates how to make the cut, the actual work ultimately belongs to the human, whose actions will inevitably cause variations resulting in a different texture that will impact the final taste outcome.

Another relevant factor is the current need for chefs to provide continuous input material to the artificial intelligence's database so that it can improve the quality of its responses and generate recipes and tastes that are popular or socially accepted. Expert 1 is aware that with each data point he provides to artificial intelligence, he makes an improvement that allows other users without culinary expertise to better use the AI. People without a culinary background would typically not ask such specific questions pertaining for example to the fermentation of certain ingredients. This means regular users and experts are interacting with the AI in fundamentally different ways and on different levels. There is a teaching relationship to this artificial intelligence, with the aim of improving results for different types of Eco's reader models (1992).

Expert 1 also highlights an interesting aspect of the relationship between haute cuisine and its commercial aspects, making a distinction between different types of food consumer:

> There are already machines that make the dough balls for pizzas. But, for example, it's a very, very commercial product, you know? There are many restaurants where they already use machinery that only adds flour, water, salt, yeast, and the dough balls come out ready. At that moment, when someone tries a pizza of that type made by engineers from Harvard. Etcetera, etcetera. Still, he notices that the product has two, there are two completely different things from being made by hand. Do you understand the pH of a person, the personality, the time, the mood of that person is something fundamental. A machine will never have feelings, so it may also make something super mega flat, you know? Like when you go to McDonald's. It's a flat flavor. It doesn't have. It doesn't have substance. No, it doesn't really have the sense that you say Wow, it's not something so flat in the mouth that you say. Ah, it's very good, but it's flat. I mean, the train from the kitchen is always moving. A cook will always continue. Learning will never be something that ends and that's it. So

> they change techniques, they change methods, they change tastes, they change products. Sometimes the products are no longer available due to climate change. You have to take another type of product. But in reality, the final product, as I told you, is tested by a person who doesn't have a fine palate, let's call it that, and says, yes, it's okay, but then another person comes and says, no, this doesn't taste like tomato. So we will always find something that will not give us the perfect final product, like using essences, not like using essences to industrialize everything. So I don't know anymore, we wouldn't be talking about traditional classic cuisine or haute cuisine, but industrial cuisine and industrial cuisine. We would be talking about two different products in order to standardize a type of traditional classic cuisine that you say is made the same way as my grandmother's. I think it will be too difficult, too difficult. It won't be possible to reach a very high standard, I believe, where everyone can have that taste, because each one, as I said, has their own taste from the experiences they have eaten.

This excerpt focuses on a concept of relationship with taste that involves consumer training and preferences. According to Expert 1, this relationship depends mainly on the type of commercial cuisine in question, and on distinguishing how the human relationship with food is different in *fast food* restaurants than in home-cooked meals or haute cuisine. Furthermore, he argues that the experience of a cook in more commercial realms producing a standardized food product is very different from the experience of a chef who works for an elite restaurant. In this aspect, we once again encounter creativity as a negotiation process, as Landowski (2021) mentions. Moreover, Expert 1 points out that it might be easier to implement artificial intelligence in contexts where taste is more standardized and industrialized. In sum, in the gastronomy market, Expert 1 draws a distinction between industrial settings, where the goal is to replicate the same tastes with efficient cooking techniques, and more creative settings, where the aim is to impact the consumer by demonstrating new forms of cooking the subtle tastes of each ingredient.

Expert 1 clearly states that it will be difficult for artificial intelligence to replicate traditional cuisine that resembles dishes made by close family members. But again, this depends on the objective used when measuring artificial intelligence devices, as the interviewee has pointed out throughout the interview. As Expert 1 mentions, if there are few people trying to find a new taste — a taste experience that is not standardized —artificial intelligence will rarely be used for this situation, and therefore, the standard of taste that can be generated by devices would fall due to lack of sufficient inputs. There might simply be more people open to the standardized tastes found in industrial-type cooking. This is not to cast judgment, as there are no "correct" or "incorrect" taste experiences. If a person is accustomed to another type of more

commercial experience, it simply implies that such a person has a differently formed culinary background compared to chefs and haute-cuisine diners: hence the need to reflect on these matters in terms of *experience,* and not just taste, as both factors determine the food and the type of experience sought by different diners.

Another interesting aspect is that in their original language, Expert 1 mentions "tenemos un gusto propio por las experiencias que hemos comido". The intriguing part of this phrase is that it encompasses personal taste, taste memory (Boutaud 2011), and the social aspect. Furthermore, Expert 1 does not refer to the taste experience directly but rather to the experience with food, yet this relationship clearly relates to the taste experience, which is what food ultimately provides. In this case, Expert 1 places more importance on food itself, as the tangible and concrete element of their work.

Yet another interesting aspect of these interviews involves *storytelling*, which, as expressed by Expert 1 below, conditions the taste experience of the dish to be sampled:

> …Yes. And the story told by the waiter or the chef at the table before you eat it. That changes, modifies the perception of your senses. Ok, but if you don't put technique into it and only use the storytelling part, I can assure you that even a person who doesn't know can tell that it's a dish that doesn't work. You know? So, between technique, storytelling, product. And intelligence and artificial intelligence. There have to be many connections, many pieces of data not only from one chef, but from several chefs so that it has data from different tastes, different flavors, different traditions. It's like saying we're in an era where we trust a machine more than a human being. No, no, the machine can't make mistakes. The calculator can't make mistakes. The same goes for artificial intelligence. So it always depends on who you're going to sell that product to. I mean, if you sell it to people who always go to a Michelin-starred restaurant, to do tastings or gourmet restaurants, I think these people might be very receptive, but if you give it to a regular person, to a classic person who doesn't frequent that type of restaurant, I mean, who only frequents Trattoria hostels, normal restaurants, well, they would say it's not for them, no thanks. If you go to a restaurant where grandma is making handmade pasta, it has a visible and mental and gustatory result that is different, where there's a machine that makes fresh pasta for you. The new generations are already out of their comfort zone. They're not interested. They have technology, they have trips, they have everything, when actually it was all. It's much easier. So a trip for ten, €10, round trip, who's going to be interested in having a machine do it for you or less? That's where taste comes in. I mean, if they make it by machine, I'll accept it. But if it doesn't taste good, I'll prefer a real cook. Actually, yes. When we're all in the metaverse and we all eat artificial intelligence, eating normal food will be the revolution. Actually, what I'm saying is that it will take a long time.

In this excerpt, Expert 1 makes it clear that chefs are aware that the restaurant atmosphere and accompanying *storytelling* determine and influence diners' perceptions of their taste experiences. Additionally, Cristianini (2023) points out the trust often placed in machines, which are often thought to make fewer mistakes than humans. However, as the chef highlights, when working in the culinary field, the human factor is crucial for the success or failure of any dish. Furthermore, the factor of trust is also linked to the type of diet the consumer desires. For example, having certain health impediments such as allergies or celiac disease tends to make humans trust machines more than humans to create food when mistakes might have dangerous consequences. The same discourse applies to people with vegetarian or vegan diets, where machines may be more likely to achieve faster and less potentially contaminated results than humans.

This occurs provided that we limit our discussion to artificial intelligence systems such as those mentioned earlier, such as *Flavor Graph*, *ChatGPT* with *Sous Chef*, and *Bing*. If we take into account the case of Abdulali, Khadem, Lida, and Sochacki (2023), the relationship changes when it comes to *gastrobots*, responsible for both cooking and creating the recipe. In this case, human involvement is minimized, but there still needs to be a human capable of testing the food prepared. However, as we encounter more mechanisms where, for example, the cutting of ingredients is done by *gastrobots*, the human factor in the cutting/preparation process that influences the final taste of the dish is minimized.

Another interesting aspect highlighted by the interviewee is the idea that future generations would be more willing to consume culinary elements made using AI technology, showing a forward-thinking perspective on the future of cooking. It very well could become unusual to eat a dish created solely by a human being. Currently, society is drawn to the novelty of wanting to taste something new and not created by humans, although in practice, this is not yet possible. As Expert 1 emphasizes, there is currently always a human involved in the creation process who validates what the machine produces. Expert 1 also discusses the economic capacity and commercial feasibility of accessing certain technologies that did not exist before, which determine the desire and ability to try elements that had not been previously considered.

There is a need to distinguish between audiences that would be interested in trying this new type of AI-generated taste experience and those who would not, which, according to Expert 1, depends largely on generational and cultural habits. As discussed above, although there are such things as cultural and social acceptance or rejection, nothing implies that people who

prefer more traditional gastronomy are “wrong”; there are simply distinctions between audiences that frequent different types of restaurants.

However, due to the complexity of taste experiences, it is practically impossible to consistently encounter the exact same experience, even if one frequents the same traditional restaurants. Yet, for certain audiences, there is comfort in finding the same type of menu where they can re-experience traditional dishes from a region.

Regarding the differences between the creation of artificial intelligence and the creation of a dish by a human, Expert 1 maintains that:

> It will never be possible for artificial intelligence to capture the essence of a chef’s technique and replicate it in a home kitchen. I could tell you that I’ve tasted the best dishes in the world, but when I eat something my mother cooks, it might just be the best dish in the world. And if I try it? A chef might say it’s good, but in reality, it’s the memory, the recollection that conditions your palate and makes you say, “I remember when I was young. How delicious it was, right?” And then you realize it’s actually a super simple dish made with two vegetables, a little milk, and some corn, right?

Expert 1 is hinting at the concept of taste memory as expressed by Boutaud (2011), where in terms of individual taste experience, there will always be a preference for replicating the simple dish we enjoyed as children or one similar to the cooking style of an important family member. This is something that, according to Expert 1, would be impossible to replicate with artificial intelligence.

To conclude the interview, regarding the organization of information in an AI tool, Expert 1 argues that it is important for chefs to factor in the regions of the different recipes because it is a fundamental factor in determining the different tastes.

> I suggest the possibility of creating a filter to assist in this process. For instance, if someone wants to make a recipe from Ecuador, they could specify the region, such as the coastal region, which has its own distinct type of cuisine.

This excerpt underlies the importance of filters when it comes to aiding users as well as guiding and organizing available information. The use of specific words such as the name of a country or region already serves as a filter to organize the data.

Moving forward, we will continue with an interview conducted with an expert nutritional chef, Expert 2, who also provided valuable insights, albeit from a different perspective, regarding the use of artificial intelligence in their work:

> It's about taste, good taste and bad taste. And that's what interests me. Because good taste and bad taste are markers of social class and the whole issue. For me, one of the problems in the world is this story of class struggle and how it's used. How people who think about it use it. And access to food and its cultivation tends to preserve the classes while creating illusions of class change. When I started using AI, it was to make images and immediately I wanted to make food images. It's an image bank. It's a bit the expression of global Internet culture, but mainly Western culture, because it's the data set from Google or Western databases. I use the ChatGPT version from Bing by Microsoft, so it's ChatGPT four times, I think, and the more you use it, the more careful it becomes. In fact, in the first few weeks, we could get it to create things and it was clumsy. It's clumsy, and there's clumsiness, and it tried to invent recipes and it's very clumsy.

In this case, the nutrition expert (who is also an artist) understands the issue of taste as a social aspect that marks a social distinction. Expert 2 looks at all critical aspects concerning "taste" and the training of the palate, hinting that the difference between people who are more open or not to certain tastes is linked to a social factors and an individual's social status.

Regarding artificial intelligence, Expert 2 notes what has been established by different authors about the fundamental need to train the AI algorithm. He notes a significant difference between the first instances in which he used artificial intelligence and how this technology has developed over time to yield more interesting results:

> Where it gets interesting, I believe, is in predicting future tastes. Because artificial intelligence applied to the food industry is very advanced. There are several uses for cameras, robots, and sensors. Knowing how to classify food very quickly is one thing, but knowing how to assemble possible menus with the available food is very interesting. I have to do tastings and introduce things. In fact, they expect me to feed the database, to put things in the database. But to access the database, I suppose you have to pay more, you have to pay a lot. That's what I wanted to get to. What I find worrying is the AI that predicts future tastes because it is based on inputs like mine. Let's do a tasting and put things into perspective. So I work a lot with fermentations and microbes, microorganisms, and all that. And that's really, really terrifying. And what does that mean in terms of current food trends? It gives the impression that food needs to be recognized, perhaps by top chefs, and then popularized on TV shows before the general public can access them. It's like we need media digestion to accept new things. Right now, I'm working a lot with meat imitations and substitutes. In fact, I wonder in ChatGPT how it's done. And it's not very high, it's trying, it doesn't really

> know. And the same goes for meat substitutes. So it's interesting because I've done workshops where we make meat imitation notebooks. It's like making a muscle. That's what I tell them. And the goal of a good meat imitation is to have skin, fat, tendons, and cartilage. And so you have to produce all the textures because that's what we like. That's meat.

In this excerpt, it is interesting how Expert 2 emphasizes the cultural aspects that govern the possibility to access to certain information, and how even improving the artificial intelligence database itself also comes with a costs. At the same time, Expert 2 highlights the point made by Expert 1 above about the different ways users interact with artificial intelligence, as he mentions he often used it for fermentations, a type of question that the general public would be less likely to ask an AI tool.

Another important factor Expert 2 highlights is the idea of the social imaginary (Castoriadis 1975), where institutions establish what would be accepted as good taste and what wouldn't, which in the interviewee's case, refers mostly to the media and the unequal promotion of certain chefs' work as more socially accepted. Therefore, the limitation imposed by the need for money to create and improve an artificial intelligence's database makes us reflect on the type of information that can be found on these platforms and its lack of equity. This aspect was highlighted by Floridi (2022) regarding the ethical aspects of using artificial intelligence.

Regarding the creation of meat, it is worth noting that Expert 2 invented the first dish made with artificial intelligence that simulated the texture and taste of mammoth meat, as we can observe in Figure 4.26 below.



Figure 4.26: Artificially created mammoth meat.

In this example, we can observe a distinct utilization of artificial intelligence, creating an extinct taste profile that is unrecoverable in its original form. What is particularly intriguing is the comprehensive replication of all factors affecting the taste experience, including texture, color, and other elements influencing the final outcome. It is important to note that this type of meat is vegan, underscoring Expert 2's commitment to leveraging artificial intelligence to promote a vegan dietary consumption:

> So AI is always biased by the people who use it. Unless, perhaps, AI is endowed with a nutritional or global consciousness. The same varieties have been reproduced, the same peas for everyone, the same carrots, the same soy sauce made from soy. Everything is planned, and everything always tastes the same. Mayonnaise is the same everywhere. So it doesn't taste very good, but at least it's not horrible. And because it's been planned and AI is complicated because you have to tell it that's all. Right now, I'm making cheese sauces. Vegan. So how do you replace cheese flavors with other fermentations and with color, texture, and all that. I think I can work a little on that. But in any case, it's with inputs from people who are already working in labs, breeding yeasts and bacteria to make great synthetic cheeses.

Therefore, the issue of standardization of taste reappears, as in the discussion with Expert 1, although Expert 2 tries to break away from these dynamics by using artificial intelligence mainly for vegan recipes, where it might generate better solutions than in non-vegan contexts.

Furthermore, in their original language, Expert 2 mentions “sauf si peut être si on donne une conscience nutritionnelle ou globale à l’IA”. In these words, we again see the anthropomorphization discussed by Cristianini (2023), where humans in this specific case tend to hope for a conscious artificial intelligence as to improve its results.

Regarding the cultural problems of taste representation, Expert 2 emphasizes that:

> There is a version for Western culture, with associations of taste by similarity, by notes, by similarity of flavors, like Pense. And then there is the other one, which applies to Japan, Korea, and parts of China. It is about umami and multiplication associated with grandmothers, and that makes it exponential. And that is already cultural. These are just two parts of the world. But South American cuisine is something else. And then maybe Italian cuisine, which also involves grandmothers and associations, can be both. And then there are Eastern European cuisines, where there is still an aesthetic of Mediterranean cuisine, another aesthetic, and living with both. It was a Japanese team that developed these things, that’s why umami existed, but we could work on this anywhere. The problem is that there are cultures that are overrepresented and cultures that are never represented.

In this excerpt, Expert 2 distinguishes between different national cuisines. Interestingly, he connects Italian cuisine to an imagery that involves more emotional elements tied to traditional family cooking. He critiques the lack of cultural representation in gastronomy from different parts of the world, which becomes apparent when artificial intelligence is requested to create dishes typical of countries with less prior media representation. In these instances, the artificial intelligence images tend to contain a number of flaws, often emphasizing the superficial context in which the dish is made or presented more than the dish itself.

Lastly, Expert 2 discusses who he believes are the types of people most open to consuming dishes created by artificial intelligence:

> I believe that people who are in minority groups like vegan or special diets are more open to new experiences because there’s also a notion of limited options, so you have to try everything. It’s almost a sense of desperation and then trying. The mammoth doesn’t exist anymore, you can’t eat it. So, there’s a paradox that immediately makes it vegan. Interestingly, in the last two or three months, there have been these stories about mammoth meatballs, mammoth meat in labs.

This excerpt highlights how people on vegan diets have a greater need to try different things due to a lack of currently available options. However, it is worth noting that we cannot make generalizations, as there are likely non-vegans who would be interested in trying tastes generated by artificial intelligence, such as mammoth meat. Interestingly, in the case of mammoth meat, many possible factors were taken into account to replicate the "taste" of the original meat as closely as possible even though nobody could ever know it is exact taste. This provides a new way of relating to artificial intelligence and gastronomy, opening up the possibility of a realm that might properly be defined as "artistic". Expert 2 makes the case that we need to improve the databases artificial intelligence relies on, seeking to balance the information circulating on certain platforms so that it is used in the most ethical way possible and that no culinary heritage from any part of the world is lost.

4.5. Interviews with Experts in Artificial Intelligence and Gastronomy

Continuing with the analysis of the interviews, we focus on the most relevant elements highlighted by experts in the field of artificial intelligence and its application in gastronomy. Beginning with Expert 3's discourse, he explains through his work how he started working with artificial intelligence, shedding light on the connections between the human brain and the functioning of artificial intelligence.

> I completed a master's degree followed by a thesis on the ability of odors to evoke memories in individuals, the emotions associated with odors, flavors, and so forth. My focus was primarily on the brain, utilizing functional magnetic resonance imaging (fMRI) and electroencephalograms (EEGs) to explore which regions of the brain were particularly activated when people recalled memories triggered by odors. I worked in a laboratory that also employed artificial intelligence to analyze the brain, aiming to decode the processes occurring in the brain and to better understand and model how the brain encodes information. A year and a half ago, I returned to France to work at the research center (…). While I always utilize artificial intelligence tools, it is within the context of research more closely related to gastronomy. There is always an element of smell, taste, and language, which are closely associated among experts.

Under this perspective, we can understand that the link between odors and memories was already established from the perspective of neuroscience. The crucial aspect underlined here is the association between the sense of smell and memories, a viewpoint that clearly aligns with Boutaud's concept of taste memory (2011). Moreover Expert 3, which is involved in chef

training, considers relevant to apply artificial intelligence to chef training. Chefs, who are expected to work in this field in the future, are therefore being prepared with an understanding of how human perception, particularly olfactory perception, impacts memories.

As outlined in the initial chapters of this thesis, much of the relationship with gastronomy is rooted in olfactory perception. While it is often an overlooked sense, it is fundamental for creating memories and influencing preferences for certain dishes. Upon entering a restaurant or engaging in a culinary experience at home, one of the first senses engaged is the sense of smell. It is interesting to use artificial intelligence to gain a better understanding of how the brain's areas are activated between olfactory perception and memory, particularly taste memory in this case.

On his part, when we focus on understanding the differences between artificial intelligence and the functioning of the human brain, Expert 3 explained:

> We can compare them, but there are also many differences. The main one is that human intelligence is very complex. It integrates many different cognitive processes. It also includes emotions and consciousness. These are notions that we do not find in artificial intelligence. But in the field of gastronomy, indeed. And the problem, I believe, is not particularly related to emotion, although that is also a factor. But it is mainly a problem of the richness of sensoriality because in perception during artificial intelligence, in gastronomy, there is the characterization of what we say, how it will taste, what a flavor will do, what a dish will do. It will be a combination of many things, but it will be visual, which artificial intelligence can capture, but it can also be information about texture, temperature, aromas, fragrance, acidity, spiciness, etc. All of this will allow us to create a dish suitable for you. All of this can be used to create a flavor or evoke memories and convey an emotion.

Under these dynamics, we can grasp the complexity of the human brain's functioning, where the synesthesia of the senses intricately combines with memories that ultimately shape certain emotions—a capability that artificial intelligence, for obvious reasons, lacks. Therefore, the manner in which artificial intelligence selects a new recipe and combines certain ingredients involves a fundamentally different process compared to that of a human. It is precisely for these reasons that we can appreciate the concept of collaboration or hybridization between human and machine efforts to select an optimal culinary recipe. Emotional factors play a significant role in gastronomy, and these are elements that machines clearly cannot access or process.

However, as Expert 3 maintains, currently artificial intelligence is capable of capturing or translating into the digital sphere the senses involved in the creation of a new taste experience. What can be affirmed is that through this possibility artificial intelligence can

capture all the senses present in such an experience, while also suggesting others, thus creating a new taste experience. This implies that a creation presenting a texture or an odor similar to what we are accustomed to feeling is likely to evoke a memory and hence a specific emotion. Furthermore, if this factor was repeated over time, it would generate its own memory or emotion specifically linked to the creation of recipes by artificial intelligence. Clearly, this factor implies continuity over time to generate a *habitus*, which ultimately, through the experience of tasting different dishes created through this mechanism, can develop future emotions associated with these practices and generate new taste experiences. These can be compared with other taste experiences within the dynamics of artificial intelligence creation or can be compared with taste experiences in the general context, thus creating a different way of relating to gastronomy.

Regarding the possibility of creating a new taste with artificial intelligence using only this tool, thus entertaining the hypothesis that the senses can be translated into a digital level, Expert 3 explained:

> And at the moment, it still isn't. It's not a fact yet. So, there's a problem in terms of sensoriality. Well, it's mainly the aspect of perception that is very little present in artificial intelligence at the moment. Although artificial intelligences can be trained to detect and do things, to learn associations between them, for example the color, texture, and shape of foods, to identify food on a plate, etc. These are things that are still not possible in artificial intelligence. They are things that artificial intelligence can do and that can also be useful, for artificial intelligence to learn things related to gastronomy. A new recipe. Yes, a new taste is good. In fact, we will be able to do that, we will be able to make suggestions. But artificial intelligence will never have, for example, a characteristic. But we know very well that olfactory and gustatory perception is not only linked to this chemical information in any case. Consequently, artificial intelligence may suggest new recipes to approve associations, but it will not have its own ideas. We will need a human to know if it makes sense or if it's all nonsense. And we will have to test to know what it tastes like. Because artificial intelligence by itself will not be able to predict that taste. At the moment, we are a bit forced to compare the proposals, suggestions, and artificial intelligence with a human, a human mouth, a human brain, to know exactly what is being done.

Therefore, the idea and current need to maintain collaborative work between artificial intelligence and humans remain. From the perspective of experts, it is evident that the current situation shows artificial intelligence being trained or learning aspects of gastronomy and perception. This implies a distinction between creating a new recipe, which according to Expert 3 is possible, and creating a new taste experience solely using artificial intelligence in a planned

manner, which is not yet achievable. One of the fundamental problems is the transition from understanding sensory perception, which is the central element when considering taste. This is why it is difficult to find cases that specifically affect the taste experience consciously, solely using artificial intelligence. While well-known instances like *ChatGPT* and its *Sous Chef* function or *Bing* can easily suggest new recipes, they do not directly create new taste experiences without human testing.

The difficulty encountered arises from the need for a chef to test the new recipe invented by artificial intelligence before a user who cannot distinguish if there are errors in the suggested new recipes. Additionally, the input for creating a recipe does not come from a new taste, as artificial intelligence currently cannot recognize all the variables that affect the taste experience and therefore cannot create a new taste experience. This is explained mainly by considering what Expert 3 stated: the information from olfactory or gustatory senses is not solely linked to chemical composition, but also involves other factors related to emotions that cannot be translated at the level of artificial intelligence. Therefore, this lack of information results in the inability to create new taste experiences. Interestingly, it is always the human who gives meaning to what the machine considers or responds to. Hence, the need for humans and the inability of artificial intelligence to give meaning to the outcomes it produces is evident.

Regarding the issue highlighted by Expert 3 about the impossibility of artificial intelligence independently creating a new taste experience, a solution to improve the database is proposed:

> But what would be interesting to take this to the next level would be to have large databases, but not necessarily of text recipes, but rather of consumer or customer perception, or human perception in any case, that could describe the sensations associated with each recipe, that could give their opinion. But if the chef has nothing more to add than that, they will quickly end up with the same recipes as everyone else because ChatGPT is not necessarily the same. It doesn't always have to be if the right prompts are not provided. You don't have to have the correct answers. In any case, these responses are not really going to adapt to the chef's goal, project, or objective. I think it can give ideas that stimulate the creativity of the chef himself. That's where it gets interesting because it's a huge database, a good database of the world, and at the same time, you can question it directly.

We can see here underscored the need to understand the type of information that artificial intelligence requires in order to achieve a new taste experience. Currently, there is abundant data on recipes, but there is a lack of critical gastronomic information that artificial

intelligence could utilize to associate certain ingredient combinations with specific taste experiences. With such information, the algorithm could recognize the taste effects produced by certain recipes and combinations, focusing solely on the taste outcomes rather than starting from recipes.

Furthermore, another interesting element that emerged in all the interviews is the ease with which artificial intelligence produces suggestions and results that can inspire and motivate chefs to create new recipes. Certainly, the idea of these suggestions influencing chefs will determine a new taste, but as the chefs and Expert 3 maintain, that taste is not solely created by artificial intelligence but arises from the hybridization of work between chefs and artificial intelligence. As Expert 3 emphasizes, there is a need for focus and information so that artificial intelligence can attend more to taste rather than on the creation of new recipes.

The interview presented below was conducted with Expert 4, who works for the *Flavor Graph* application. He explained how these technologies are developed and their relationship to the gastronomic field.

> In this sense, we're using AI to two main places. One is with robotics, um, and we are looking at robots that can sit in the kitchen with a chef and collaborate on different dishes together. On the other side, we're then looking at AI for, uh, maybe more in the data space, looking at how we can use AI to capture data from the food industry and then give it to chefs, maybe make connections within it, um, give them new insights so that they can then create, uh, or come up with new ideas that they've never, never thought of before. So, if the dish sits in front of them, um, maybe, uh, maybe there are many things that have gone into creating it, but also one thing that will impact your experience of the dish is the light and the temperature of the room. And also sounds you hear. So high pitched sounds can make food taste sweeter, low pitch sounds can make it taste more better. And we and we're embarking on a project that looks at, um, using AI to, uh, to control this, to control this effect.

Here, the idea of creativity with artificial intelligence assisting chefs in their work emerges clearly, especially through the introduction of robots in the kitchen. This aspect allows us to expand on the reflections from the interview with Expert 1 and the processes of interaction between the subject and the object (artificial intelligence) to achieve a creative outcome. Parisi (2019) emphasizes the necessity of simulating a human body, particularly for culinary applications. This involves training robots by observing every movement of chefs, enabling them to replicate these actions and eventually develop more autonomy in the kitchen.

Additionally, the idea of utilizing information from food producers to generate new dish ideas based on currently available ingredients is highlighted.

A fundamental factor in perception is the endeavor to control environmental elements that affect our taste experience through artificial intelligence. Expert 4 mentions that temperature and sounds are intrinsically related to the moment of tasting a dish. The idea is that by controlling these parameters, the tasting experience of certain dishes can be enhanced. In these cases, we also observe a collaboration or hybridization between human efforts and artificial intelligence. However, a central issue identified in this interview is the desire to control all aspects to achieve what is perceived as a better taste experience.

While it is proven that lights and sounds impact our experience, the more emotional aspects or the memories generated by taste experiences in humans will never be fully understood by artificial intelligence. Compared to Expert 3's discourse, this interview seems to lack emphasis on the human aspects related to gastronomy. Instead, it focuses on striving for perfection in each taste experience, without a clearly defined understanding of what constitutes a good taste experience. This perspective centers on controlling the major factors that impact perception in the most effective way.

It is worth noting that these individuals are constantly promoting the use of artificial intelligence in this field, as they must sell their product (in this case, the *Flavor Graph* application). This aspect is not minor and applies to most of the interviews; each of them always seeks to promote their project or their way of working, especially the chefs. However, this goal does not prevent us from understanding how they work and taking into account the main discourses of the key social actors to understand the creation of taste through artificial intelligence.

Regarding the process of creating artificial intelligence, Expert 4 maintains that everything depends on the information provided to the device.

> Maybe, but also creating new recipes. And, um, recipe generation has been an interesting area for AI. Um, and you could now I think ChatGPT will simply give you a new recipe. And people have tried these and some of them work. Um, for some years people have been using AI to understand the molecular makeup of different ingredients, to suggest which ingredients you should pair together. So that I would say like another area that this is being done in food is with companies like Beyond Meat or Impossible Burger or Not Company. They are using AI models to try and understand what the taste of meat is of a hamburger. Let's say, uh, to then break it down and then recreate it with different ingredients so it doesn't use meat. Created it by taking data from lots of different journals, lots of different academic publications which have the molecular data that all of

> this data was created using something called gas chromatography mass spectrometry, which is a form of understanding water molecules in an ingredient test. And the way that some of these databases have been created is by pulling all of the information online from recipes, food channels, food blogs, um, even restaurant websites and the menus they put up that, uh, and so some of the databases can be created like that and you get quite an interesting type of knowledge base, let's say, and you can pull different insights from it if you have the correct model. The correct models are quite algorithms. Um, and yeah. And then I would say also individually these databases around food are being created within some restaurants and within some food companies. So the data collection for this, I think you you basically need to sit with humans and get them to eat and get them to record their reaction or their feelings about eating while playing different sounds or seeing different life. And as they do that, they may be score. They may be score the food in terms of saltiness or sweetness or, um, other, other parameters.

Therefore, the central focus here currently relies on working to improve the data provided to artificial intelligence so that it can enhance its results. Once again, the idea of having information about the moment of tasting the dish arises to understand the reactions, enabling artificial intelligence to recognize the effects of the suggestions it creates.

Another important aspect is the massification facilitated by *ChatGPT*, which provides an enhanced gastronomic experience as it is used more frequently. However, human testing of each result is always necessary for improvement. Additionally, chefs emphasize that certain types of diets, such as vegetarian and/or vegan diets, contribute to improving the database. The information used by companies that simulate meat taste using artificial intelligence prompts reflection on the possibility that artificial intelligence may have more data of this nature, thus being able to create the taste of meat without using it. It could thus be argued that currently, artificial intelligence is more likely to present fewer errors when replicating these tastes than others, particularly given the current emphasis on reducing meat consumption and increasing vegetarian and/or vegan diets. In this sense, we can see how a diet impacts the ability to create a taste similar to meat without employing it. This example demonstrates how technology clearly seeks to improve current societal needs. Indirectly, this impacts the capacity to have more information from these devices, creating a new taste experience based on the simulation of meat, including its texture, color, sound upon tasting, etc.

Following this same line of food and taste imitation, Expert 4 notes that:

> So you have that, and then you understand that when you play these certain sounds, you have this input, they have this type of reaction to it. The industry everyone thinks that the future of gastronomy is very personalised, i.e. both from a diet and health perspective, but also a taste perspective. And in

> the sustainability world, everything that they're trying to create and as a kind of plant based food is just copying traditional foods. It's like, how do we copy the burger? How do we copy the, um, the milk, for instance, things like this.

This element prompts us to reflect on the direction that companies aspire to take regarding the use of these elements in the gastronomic field. It is worth noting that in these aspects, there seems to be a reduction in culinary creativity, as instead of seeking or experimenting with new recipes, the focus is on imitating the taste of meat in vegetarian and/or vegan diets. This approach also fails to encompass all individuals following these diets, as some may find that replicating the taste of meat evokes memories associated with the animal's death, leading them to seek alternative options within their diet rather than pursuing the same meat taste. However, we understand that companies, from this perspective, are primarily focused on replicating that specific taste, operating under from the premise that a taste experience associated with traditional food may be lacking for individuals on these diets. Nonetheless, this does not preclude further development of the industry using artificial intelligence in the case of simulating the taste of meat.

In what follows, we emphasize the main points that emerged in the interview with Expert 5, who works at the University of Cambridge on the development of *gastrobots*.

Regarding the comparison between human intelligence and artificial intelligence and their operation in the gastronomic field, Expert 5 maintains that:

> Is basically personable robot, robotic chef where we have no AI robot program to cook. Uh, and then it has a feedback from some sensors, which are kind of, similar to our taste and the way it works. While I think it's kind of different. Like we are not that smart, to be honest. Uh, so, you know, the artificial intelligence can, uh, actually reach our level sooner or later. Because if you think about, like, our intelligence, it's, uh, it's constantly. And also if you think about like human intelligence, um, it's very much key keeping track by everything we, uh, kind of emotionally or physically and biologically want. So you may know. Well, I shouldn't smoke cigarettes. Of course. It's a no brainer. What's the use of it? But if you do a robotic system or software system, that's a not a problem there. It will not be, you know, push to smoke cigarettes or eat a cookie or whatever.

In one sense, Expert 5 highlights how humans keep choosing to consume unhealthy ingredients. However, we understand that this choice can be attributed to the pursuit of a taste experience that considers factors beyond health or nutrition. In these cases, humans tend to select items that evoke pleasant taste memories, as described by Boutaud (2011). This discourse is evident in various documentaries addressing dietary practices that emphasize the health risks

associated with consuming certain foods. Recently, societal discourse has increasingly focused on the concept of "forbidden foods", as discussed by Scrinis (2020), particularly regarding highly processed foods and their associated health issues.

Additionally, there idea has emerged of mimicking taste aspects through electronic sensors, but it is crucial to note that this kind of translation is not unproblematic. Artificial intelligence primarily operates by gathering and analyzing information on the chemical composition of each ingredient, whereas, as observed in the interview with Expert 3, it is well-established that human taste perception is not solely determined by chemical factors.

From Expert 5's perspective, humans often lack intelligence, particularly in emotional aspects and knowledge about certain harmful substances, yet they continue to consume them. This discourse is prevalent in various food documentaries, which emphasize the unhealthy nature of certain foods. However, recently, societal focus has shifted towards the discourse of "forbidden foods", as highlighted by Scrinis (*ibidem*), especially regarding ultra-processed foods and their associated health issues. Additionally, there is the idea of replicating taste aspects for robots using sensors, but it is emphasized that the functioning of these systems is not similar to that of humans. Artificial intelligence primarily relies on gathering and capturing information about the chemical composition of each ingredient, as demonstrated in the interview with Expert 3, whereas human taste is not solely dependent on chemical factors present in each dish.

Furthermore, what Expert 5 mentions about humans being less intelligent than we think due to our emotional connection, leading us to consume things that are harmful to our bodies despite knowing their negative effects, highlights another key aspect of human taste memory that would be challenging to replicate in artificial intelligence. This factor, among others, may be strongly linked to the concept of taste memory proposed by Boutaud (2011), where certain foods evoke emotions and memories that are more significant than the well-being of our bodies, for example.

On the other hand, concerning the cooking process and the information that artificial intelligence requires to execute it, Expert 5 maintains that:

> If you want to, you know, do testing the data set is completely different than if you want to do cooking, because if you want to do cooking, you would have, uh, some sort of measures at the end. So, if you want to kind of do a prediction of uh, of like process of cooking, your input would be like a cooking parameters and the output would be, uh, something like, uh, the taste or a composition of a meal and, and so on. But if you think there is probably like infinitely many of things you you can

> do for you. You probably, like, know the deep taste of mint, and that's like another taste. And you could train the system to like, detect a taste of mint probably that would remember that would probably require a lot of sensors and um, especially sensors with like daisies and so on.

With these insights, we can understand that the process of acquiring more information about flavors involves equipping the robot with additional sensors so that it can retain information about each taste. Regarding cooking techniques, these are elements for which it is easier for robots to gather information, as they would focus on variations in ingredient cooking and cutting techniques. This type of information is simpler to retain compared to the challenge of detecting or predicting the taste of each ingredient when cooked. While taste is a component within the parameters of food output, recognizing each taste is a difficult aspect for *gastrobots*, and the solution would eventually involve adding more sensors to the *gastrobot*.

In the conclusion of the interview, Expert 5 discusses the factors influencing the selection of different recipes for *gastrobots* to replicate, as well as reflecting on how these technologies can alter human-machine work relationships:

> And that's where value is coming in. Similar with training a robot to cook something, you would probably see you first like pizza, uh, scrambled eggs, pancakes, something that can be set first is consumed a lot in, uh, high income, uh, places because you need to fund your growth and earn some money. Uh, from history, we know that technology always gets through and always wins, but it's not always bad for, uh, the workers we've had, um, atm, which kind of replace pretty much all bank employees and also increased the number of, of bank employees that just the job changed. So. Well, I don't think there is any force in like, you know, uh, free markets, uh, the democracies that can stop, uh, the technologies. So that's kind of just a philosophical questions because it has never, never happened in like technology where it was abandoned because it's it to create jobs.

In this reflection, aspects related to the acceptance of typical foods from certain places at a societal level emerge as a necessary element for *gastrobots* to imitate. For what concerns the aspects related to the working experience, it is maintained that technologies have always been created to assist humans, not to replace certain types of jobs. From all the interviews we've considered, it becomes relevant the aspect of collaboration, and it is currently impossible to envision artificial intelligence working without human supervision in the gastronomic field. However, the idea of innovation and collaboration between humans and machines to improve various aspects of gastronomy is apparent in all the interviews. Nevertheless, it is pertinent to highlight that current technology is still in the process of understanding better how to enhance aspects related to taste, specifically when it comes to a focus on it. Currently, technology is still

stuck on the previous step, which means creating recipes and new dishes, without considering the final taste of the dish in this process.

Chapter 5 – Conclusions

5.1. The Transition from the of Taste to the Taste Experience

The reflections presented in this thesis underscore that many studies highlight the synesthetic nature of taste, involving all senses—sight, smell, hearing, and touch. The central idea is that no single sense is more important than the others when analyzing taste.

The central aim of this thesis is to understand what happens to the taste experience when it is mediated by artificial intelligence. To address this, it is crucial to shift from understanding taste as a mere sense to recognizing that a comprehensive analysis must encompass the entire taste experience. Upon reflecting on the nature of the taste experience, it becomes evident that, at present, artificial intelligence is not capable of creating a planned taste experience. While artificial intelligence can generate new tastes based on its database, it fails to account for all the elements involved in the taste experience, such as the individual's memory and the activation of all the senses that are triggered during the perception of a tasting experience.

Additionally, taste encompasses both individual and social aspects in a *continuum*, a concept best understood through Charles Sanders Peirce's semiotics, which views these relationships as integrative rather than exclusive. This analysis seeks to highlight both the individual and social dimensions of the taste experience.

Transitioning from taste to a taste experience allows for a comprehensive understanding of the phenomenon. According to Boutaud (2011), taste dynamics are closely linked to an individual's past experiences, forming a taste memory that conditions perception and generates expectations based on previous experiences. These expectations arise from various external factors influencing each sense during tasting, highlighting the importance of social dynamics in shaping the final outcome.

External factors include the subject's culture and the culture in which the tasting occurs. *Storytelling* elements also play a role, from the setting of the taste experience to media narratives and the chef's discourse before tasting. The discourses examined reveal different

perspectives, ranging from concerns about chefs' employment to anxieties about the transformation of cuisine, especially from a traditional, cultural, and identity-based standpoint. This reflects the common dualistic discussions about the advantages and disadvantages of any new technology. However, this thesis moves beyond merely weighing pros and cons, seeking to explore how these technologies can be integrated into the cultural frameworks of different societies.

Revisiting Peirce's notions, we can see the emergence of what could be termed *taste semiosis*, establishing a connection with *Firstness* (CP 1.302). Sensory expectations are generated by objects observed by the subject, occurring before the act of tasting. This anticipation can begin from the decision to enter a specific restaurant, based on characteristics suggesting possibilities about the desired dish and occurs in every instance preceding a tasting: whether the dish is prepared by the subject themselves or enjoyed while dining out at any location. In these circumstances, the senses primarily activated are hearing, sight, and smell, as they are the senses that can be activated most distantly from the object that triggers their activation.

Moving to *Secondness* (CP 1.325), the individual comes into direct contact with the object to be tasted, engaging the tactile sense and taste itself. This phase aligns with Marrone's (2022) concept of "tasty," involving the recognition of each ingredient and highlighting the individualistic aspect of taste. Bianciardi (2011) similarly emphasizes that taste requires the recognition of different flavors in a dish, underscoring its individual nature.

Finally, Peirce's concept of *Thirdness* (CP 1.26) comes into play, encompassing the symbolic aspect when the subject recognizes and characterizes the tasted dish, comparing it to past experiences. Even when tasting a dish for the first time, the comparison of ingredients with previous experiences involves *Thirdness*. This concept relates to Marrone's (2022) notion of "flavorful," where social values associated with a dish are present, aligning with *Thirdness*' symbolic aspect. This dynamic leads to a taste *Interpretant*, generating a *habitus* and continuity, thereby initiating *taste semiosis*.

As a result, the thesis fosters dialogue between the factors that affect the taste experience and examines how these can be translated into the digital realm. Interviews with artificial intelligence experts provide crucial insights for enhancing these technologies, suggesting that the focus should extend beyond generating new taste combinations to encompass the entire taste experience. In this regard, incorporating the insights of food critics into the database is crucial, as these professionals have long translated sensory experiences into language, converting the

sensations they encounter in dishes into written descriptions. This parallels the process we aim to achieve with artificial intelligence: to translate sensory perceptions into the database, enabling artificial intelligence to design a new taste experience.

Therefore, it is essential, as demonstrated in this thesis, to transition from understanding taste merely as a synesthetic sense to recognizing it as a comprehensive taste experience. This term better encapsulates the entirety of the phenomenon described above.

5.2. Perception and its Translation into Artificial Intelligence

A fundamental aspect of the taste experience is the perception that occurs within the human body, directly impacting it. The term "human body" is specified to distinguish it from the simulation of the body by artificial intelligence. To fully comprehend this phenomenon, Merleau-Ponty's theory of perception (1945) is essential, as it posits that perception occurs simultaneously across all senses. By combining Merleau-Ponty's theory with Peirce's semiotics, we can better understand the relationship between the object that triggers perception and the integration of senses that culminates in a taste experience.

Merleau-Ponty (*ibidem*) also emphasizes that sensations generated by a specific object evoke different elements in each sense and cannot be translated from one sense to another. Perception, therefore, occurs as a unified whole, impacting each sense differently and preventing sensory translation.

In contrast, Parisi (2019) suggests that our perception is inherently linked to the shape of our body. Thus, if artificial intelligence aims to create a perceptive element that spans all domains, it should have a body that simulates human form. This notion is evident in studies on electronic noses and tongues, illustrating bodily translation between humans and artificial intelligence. One of the remaining research questions, then, is whether it is possible to translate human perception into artificial intelligence in order to create not just a taste but a complete taste experience. The case of *gastrobots* serves as another example of this translation of the human body into technology. Engineers have focused on replicating the amount of force needed to cut ingredients, just as a human would when following a recipe. However, in doing so, there is a tendency to anthropomorphize artificial intelligence. In this thesis, the idea of anthropomorphizing artificial intelligence is seen as partly necessary so as to enable it to create a taste experience. Nevertheless, we argue that it is not essential to simulate the functioning of the human body for artificial intelligence to achieve this goal. While artificial intelligence may produce results faster than humans when it comes to finding potential new ingredient

combinations, it is not entirely necessary for artificial intelligence to operate exactly like humans in this regard.

Cristianini (2023) further explores this idea by explaining the operation of artificial intelligence through comparisons to the human brain, leading to a persistent anthropomorphism. Unlike other forms of intelligence, artificial intelligence was created by humans, which influences this anthropomorphic perspective. This is evident both academically among engineers and in media discourses, as exemplified by Figure 4.24, where artificial intelligence is represented as simulating human brain function.

This anthropomorphism also emerges in interviews with experts. For instance, Expert 1 refers to artificial intelligence as if it were a female person providing suggestions in his gastronomic work. Similarly, Expert 2 advocates for imbuing artificial intelligence with consciousness about nutrition. These linguistic mechanisms reflect the current relationship with artificial intelligence, characterized by a quest to explain its functioning or integrate it into daily life from an anthropomorphic perspective.

Another key factor that significantly affects perception in the human body is *storytelling*, which serves as an external foundation that ultimately impacts our taste experience. *Storytelling* can be generated through various mediums such as mass media, social networks, and other platforms. Specifically, *storytelling* about taste created by artificial intelligence fosters the idea of producing personalized taste experiences through this technology. This generates a social construction based on the notion of taste personalization, which is both individual and social. For this phenomenon to occur, a social imaginary must be created, as described by Castoriadis (1975). This social imaginary affects our sensory perception and develops ideas of ultra-personalization of taste at a societal level, including the notion that artificial intelligence can improve environmental impact through the use of seasonal ingredients and other sustainable practices.

Another fundamental characteristic that affects perception and impacts the human body is taste memory, as outlined by Boutaud (2011). Taste memory involves a tendency to idealize the past, a characteristic element of human beings. This idealization influences every future taste experience and, consequently, each perception thereof.

This idealization of the past creates a mechanism where artificial intelligence applied to taste takes two different paths to gain acceptance. One path appeals to tradition by using classic cookbooks and recipes created by an “Artificial Intelligence chef”. The other path caters to

audiences seeking innovation and changes in cooking rituals, exemplified by applications such as *Flavor Graph*, *Gastrograph*, *ChatGPT's Sous Chef* function, and *Bing*.

Boutaud (2011) provides insights into how artificial intelligence can change gastronomic rituals, particularly regarding the timing involved in cooking. Artificial intelligence can control these timings, which directly affects individuals' taste memory. Boutaud distinguishes between two types of time: *organic time*, which involves the natural lifespan of ingredients, and culinary time, which pertains to the selection of ingredients for specific recipes. Artificial intelligence can control the spoilage time of ingredients, ensuring recipes are generated before expiration. This reflects humans' obsession with controlling natural elements like ingredient decay, shaping a societal imaginary that technology increasingly enables us to control. Furthermore, artificial intelligence impacts culinary time by selecting ingredients more efficiently than humans during cooking.

Lastly, symbolic time, in Peirce's terms, is *gastronomic time*, which involves the experience of *being at the table* (Boutaud 2011). All these elements directly impact the taste experience, from who is present at the table to the environment, affecting all sensory perceptions simultaneously. If we prepare a dish suggested by artificial intelligence, which influences both organic and culinary time, it will inevitably affect *gastronomic time* and shape our experience at the table. This influence can be shaped by *storytelling* and the transformed cooking ritual dynamics brought by artificial intelligence. This element is not inherently negative or positive but rather influences how we perceive sensory experiences.

It is important to note that after reviewing and analyzing all the relevant literature on this subject, we argue that this thesis presents an innovative perspective. It moves from the conception of taste as a sense toward a broader understanding of the taste experience, reflecting on the gaps and shortcomings we encounter when using artificial intelligence and identifying the critical areas that need improvement to achieve a fully developed taste experience. Central to this is the construction of the database and the ethical considerations related to the information used to create new taste experiences.

5.3. Artificial Intelligence and Taste Experience

Regarding this topic, which is the focus of this thesis, we believe it is crucial to highlight the crucial role of database construction in generating specific recipes through artificial intelligence.

A significant issue arises regarding the inclusion of recipes, specifically those from diverse cultures that have been transmitted orally and not documented in written form. Such recipes might be excluded from the database, leading to potential issues of authorship. Artificial intelligence could generate similar recipes based on available data, potentially receiving undue credit for their creation. This situation presents an ethical dilemma: it risks erasing traditional gastronomy from certain cultures by erroneously attributing their recipes to artificial intelligence. This conclusion is drawn not only from the literature reviewed but also from the analysis of artificial intelligence generated images from countries that are not traditionally part of the global gastronomic imagination. When it comes to countries like Canada or England, depending on the artificial intelligence system used, the results may focus more on local elements—such as the flag of the requested country rather than a wide variety of dishes. This highlights the importance of the database creation process and raises the question of whether it is possible to create an updated database that encompasses diverse cultures, rather than focusing solely on those with the greatest impact on the social and cultural imagination.

Consequently, ensuring the integrity of the data used by artificial intelligence is essential. Further research is needed to refine these ideas, emphasizing the importance of distinguishing when a blend of new flavors genuinely originates from artificial intelligence. This thesis can pave the way for future investigations into the ethical implications concerning data and the preservation of traditional culinary knowledge from various regions, ensuring that this knowledge remains intact and is not falsely attributed to artificial intelligence.

Moreover, the analysis of artificial intelligence generated images reveals that artificial intelligence tends to focus more on individual ingredients rather than the dish as a whole. This reflects how artificial intelligence processes information, as recipes often begin with a list of ingredients, as well as how artificial intelligence emphasizes each input word rather than the totality of the dish. This highlights the need for improvement in artificial intelligence's learning systems, especially in terms of creating holistic taste experiences.

As Fry (2018) highlights, the authority granted to artificial intelligence regarding its generated results is another significant issue. Currently, chefs, as human beings, determine and grant authority to these results. Therefore, the value of the results is determined by humans, not artificial intelligence itself. Ferraris (2021) reinforces this point, emphasizing that artificial intelligence performs calculations without comprehending mathematics. The focus should be on the social value humans attribute to the results of artificial intelligence.

Another important consideration in database creation is the distinction between historical data, involving traditionally written recipes, and synthetic data, comprising new recipes created by artificial intelligence. Floridi (2022) discusses this distinction, highlighting the need to document traditional oral recipes to prevent their loss. This issue is also evident in media discourse, which expresses concern about transitioning traditional oral knowledge to written form to preserve it.

Floridi (*ibidem*) also raises ethical issues related to data, particularly in addressing errors generated by artificial intelligence. A paradox arises: other artificial intelligence systems are created to correct these errors due to human limitations in processing vast amounts of data, creating a cycle where humans must detect errors, leading to the creation of more systems to detect them.

From Lakoff's (1980) perspective, we can understand the database as a categorization of experience translated to artificial intelligence, where each categorization generates a metaphor. This metaphor facilitates the comprehension of information between humans and machines. Thus, the construction and management of databases for artificial intelligence involve complex ethical considerations and necessitate careful attention to ensure the preservation and accurate attribution of traditional culinary knowledge.

The existence of information gaps in artificial intelligence regarding recipes does not diminish its capacity for *agency*, as described by Malafouris (2013). This capacity allows artificial intelligence to create new material objects with different dynamics based on changes in food or the evolving relationship between humans and food.

In the *storytelling* cases, including a fictitious scenario in a Parisian restaurant, the connection between culinary tradition and the novelty of artificial intelligence is emphasized. This connection highlights aspects of *Italianness* (Barthes 1964), impacting the social imaginary (Castoriadis 1975).

Revisiting the notions of filters fundamental for translating information between artificial intelligence and human communication, we can identify three main filters:

1. *Cultural-Social Filter:* this is the most naturalized filter, as described by Barthes (1957), encompassing the cultural and social context that shapes our understanding and interpretation of information.

2. *Filter Bubble*: algorithms may suggest personalized content based on our preferences, potentially leading to a repetitive search for similar content. This filter influences the information we encounter online.

3. *Temporal-Spatial Filter*: this filter determines the location and time of year, impacting the final results provided by artificial intelligence. It considers factors such as seasonal ingredients, linking to discourses on artificial intelligence's potential contribution to environmental sustainability by suggesting seasonal ingredients.

Additionally, an *ethical-ideological* filter emerges, where individuals make dietary choices based on religious beliefs or personal preferences, such as vegetarian or vegan diets. This filter reflects the *ethical-ideological* considerations that influence dietary choices and consumption patterns. Another significant conclusion is that artificial intelligence's current focus on individual ingredients rather than the whole dish is a limitation in its ability to create full taste experiences.

Regarding the production of images created by the *Sous Chef* function of *ChatGPT* and *Bing*, they share similar characteristics. Greimas' notion of naturalization (1987) helps us understand the artificiality present in each image generated by artificial intelligence. In most cases, this artificiality produces the opposite effect of food porn (Allard, David 2022), emphasizing the individuality of each ingredient rather than the overall dish. Artificial intelligence systems, as previously mentioned, recognize words, and since each recipe begins with a list of ingredients, the focus is on representing each ingredient rather than the dish as a whole. This generates an artificiality, observable in the disruption of physical laws, where ingredients appear unaffected by gravity, maintaining their perfect and exact shape. This effect highlights the artificiality, along with kitchen utensils depicted with ambiguous shapes that do not correspond to real objects.

These elements occur when there are gaps in information within the database. For instance, when results are demanded for dishes typical of places not renowned for their traditional cuisine, an interesting operation occurs, filling in information with other indicated words as input. This might involve showing the flag of the place within the dish or focusing more on the environment where the dish is placed rather than the dish itself. Furthermore, artificial intelligence-generated images often attempt to appeal to other senses through visual cues. This is evident when smoke and shadows are used, accentuating tactile elements of food such as temperature or crispiness. This attempt to translate sensory experiences, particularly through visual cues, indicates a somewhat positive step toward capturing elements of the taste experience, albeit in a limited way. The methodologies and literature used in this thesis provide a foundation for analyzing aspects of the artificial intelligence mediated taste experience that have not been previously explored.

Another fundamental concept for understanding this phenomenon is the concept of *débrayage* (Greimas 1986). This concept is crucial because it is through the external context of the image that the represented object is constructed. Each input made by an individual—whether it is a word or the location of the individual—determines the shape and outcome of the image created by artificial intelligence. Therefore, we can argue that *débrayage* is essential for understanding the phenomenon of image creation, as the represented object is not present in reality. Additionally, this new representation of images impacts the taste experience, an outcome that artificial intelligence does not plan for, as it cannot control all the parameters influencing each taste experience.

Regarding the *storytelling* circulating in the media and within companies developing such devices, the idea emerges that artificial intelligence can promote healthier eating by suggesting recipes without carcinogenic ingredients. However, as discussed throughout this thesis, humans make decisions based on their taste memory, an element that artificial intelligence does not yet take into consideration. Humans have the ability to choose to consume foods knowing they are unhealthy because these foods belong to a "*foodsphere*" and "*gastrosphere*" (Stano 2021; 2015), which allows them to accept or choose such ingredients. Scrinis's (2008) notion of nutrition is essential, as it shows that artificial intelligence can indeed generate more nutritious ingredient combinations. However, this approach relegates the taste experience to a secondary concern.

Another relevant point is that artificial intelligence can currently replicate a taste or create a new one, but not a new taste experience. This means that while a new taste will subsequently generate a new taste experience, artificial intelligence cannot control and translate all the parameters involved in a taste experience. The discourse of replicating a taste is linked to the idea that vegans and/or vegetarians would be more open to trying tastes created by artificial intelligence, especially those simulating the taste of meat. These cases occur if vegans and/or vegetarians want to replicate the taste memory (Boutaud 2011) of traditional elements they previously enjoyed without breaking their *ethical-ideological* filter. Artificial intelligence may be effective when it comes to nutrition or meat substitutes, but it overlooks many factors that influence the taste experience: in its current state, artificial intelligence cannot fully create such experiences.

This underscores a central element: humans' quest to maintain and replicate the taste memory of the past. This discourse is strongly present in the Italian media regarding *gastrobots*, which are described in the Italian social imaginary as capable of replicating recipes from a

deceased grandmother. Therefore, they are associated with the pursuit of recovering traditional recipes from the past that generate a pleasant taste experience by transporting us to the dining table (Boutaud 2011) in the most idealized manner possible. Thus, while artificial intelligence is an artificial element, its creation objective in these cases involves a constant struggle with the basic human needs of time and memory, considering that artificial intelligence also has a great memory capacity. This also points to a broader, timeless human pursuit: trying to control time and memory. This desire is evident in food technologies as far back as the invention of preservation methods, where humans sought to prevent natural decay. While technology has changed, the fundamental human goal remains the same: to control memory and the longevity of certain elements.

Furthermore, in the interviews conducted for this thesis, the need to maintain the human factor within the realm of taste becomes apparent. Therefore, a hybrid approach between human and artificial intelligence elements would emerge to improve the quality of creating a new taste. Another element arising from these interviews is the classic dichotomy that emerges when a new technology enters a field. Although artificial intelligence is not a very new technology, its use in the culinary field is. Hence, the distinction between haute cuisine and industrial cuisine arises, with artificial intelligence being more likely and easier to maintain in the latter type of cuisine. According to the interviewees, industrial cuisine implies a more standardized taste, found in fast food establishments, leading to the social separation of taste. Taste becomes a separator of social status, requiring palate training that individuals accustomed to industrial cuisine may not achieve. These insights also suggest a potential market where haute cuisine is hybridized with artificial intelligence. However, according to the interviewees, this is less likely to happen frequently, as artificial intelligence could assist chefs with creativity. The question of creativity is fundamental, with the distinction between human creativity and artificial intelligence being unclear. Both Expert 1 and Expert 2 indicate that while artificial intelligence serves to unlock creativity, the creations themselves are authored by each expert. Therefore, future research should focus on issues of authorship in gastronomic creations.

The interviews with experts in artificial intelligence highlight the significance of certain senses, such as olfaction, in activating memories in the human brain. Currently, these sensory activations are impossible for artificial intelligence to replicate. While it is possible to create sensory perception with artificial intelligence, the activation of memories cannot be achieved, hindering the creation of a fully planned taste experience by artificial intelligence. One solution proposed by the interviewees is to include not only recipes, but also gastronomic reviews

produced for each recipe in the database. This addition could enhance the relationship between the taste experience and artificial intelligence.

The same issues raised by the interviewees also appear in media discourses on the topic, demonstrating the construction of the social imaginary (Castoriadis 1975). Media highlight elements such as the potential for improving health through the use of artificial intelligence, emphasizing the need to consider the individual's taste memory (Boutaud 2011). Another aspect frequently mentioned in the media is the potential for economic and environmental benefits, as artificial intelligence could help maintain a balance between the environment and our health. These considerations represent the main ethical characteristics of artificial intelligence.

Simultaneously, there is concern about preserving the human aspect in a realm traditionally created, generated, and consumed by humans, raising issues about maintaining traditional cuisine and gastronomy. However, as discussed throughout this thesis, there are several elements demonstrating compatibility, as many technological aspects can be used to preserve traditional cuisine. Examples include *gastrobots*, which, as mentioned in the Italian media, could recover recipes and replicate the way Grandma used to cook.

It is worth noting that media discourses also emphasize the idea of collaboration between artificial intelligence and humans. Additionally, there is mention of specific diets, such as vegetarian and vegan diets, whose adherents may be more open to trying food made with this technology, in pursuit of enhancing their taste quality and experience.

This point opens avenues for future research, necessitating an analysis of artificial intelligence's use in gastronomy and its impact on diets. For instance, exploring its application in cultured meat, as indicated by the experts interviewed and the media discourses analyzed, demonstrates the growing use of artificial intelligence to simulate meat flavors in diets. Therefore, it is pertinent to continue research in this area given the importance of these diets and their potential environmental and economic implications when artificial intelligence is employed for such purposes.

This discourse aligns closely with the perspectives of artificial intelligence experts, suggesting a way to improve socio-economic impacts, environmental sustainability, and the economies of countries that adopt these tools to simulate meat flavors. Currently, such diets hold significant relevance in contemporary societies. Hence, it is crucial to pursue research that bridges these gastronomic, vegetarian, and vegan domains with artificial intelligence to gain a deeper understanding of its potential future impacts on our societies.

To conclude, it is important to highlight that while artificial intelligence can create a new taste, it cannot yet create a complete taste experience. This limitation arises from the lack of comprehensive knowledge linking all elements involved in a taste experience, preventing artificial intelligence from fully considering them when suggesting a new taste. Although a new taste can generate a new taste experience, it is not fully calculated by artificial intelligence. Parameters such as linking the sense of smell to memory elements are still beyond its current capabilities. This aspect underscores the need for continued research in this field, potentially incorporating information from gastronomic critics to provide artificial intelligence with more data, thereby advancing the creation of new taste experiences. In conclusion, this thesis contributes to a novel and critical research field, especially in light of the recent advancements in artificial intelligence and gastronomy.

Bibliography

Abdala, Karina. 2023. “Livelli di materialità del gusto e dell’intelligenza artificiale”. *E|C*, XVII, 38: 286-295.

Abdulali, Arsen et al. 2023. “Theoretical Framework for Human-Like Robotic Taste with Reference to Nutritional Needs”. *Conf. Ser.: Mater. Sci. Eng* : 1-16.

Allard, Laurence, David, Gaby. 2022. #Foodporn les mobiles du désir. Communication & langages 2022/3 (N° 213), Éditions Presses Universitaires de France.

Appadurai, Arjun. 1988. “How to make a national cuisine: Cookbooks in Contemporary Indian”. Comparative studies in society and history, v. 30: 3-24.

Appiano, Ave. 2012. Bello da mangiare: Il cibo dall’arte al food design. Torino: Cartman.

Ariyachandra, Thilini, et al. 2017. “Does your beer like Big Data?” Proceedings of the Conference on Information Systems Applied Research, v. 10:1-10.

Baheti, Pragati. 2022. “The Essential Guide to Neural Network Architectures. What are neural networks and how do they work? Learn about different artificial neural networks architectures, their characteristics, and limitations”. Deep Learning, 1-10. https://www.v7labs.com/blog/neural-network-architectures-guide Last Access 30/07/2024.

Baietto, Manuela, D. Wilson, Alphus. 2009. “Applications and Advances in Electronic-Nose Technologies”. Sensors, v. 9: 5099-5148.

Barthes Roland. 1957. Mythologies. France : Les lettres nouvelles.

Barthes, Roland. 1964. L’obvie et l’obtus. Essais critiques III (tra. spa. 1986. Lo obvio y lo obtuso: Imágenes, gestos, voces. Barcelona: Paidós).

Barthes, Roland. 1980. La Chambre Claire : Note sur la Photographie. Cahiers du cinéma Gallimard Seuil (tra. spa. 1990. La cámara lúcida. Barcelona: Paidós).

Bianciardi, Lorenzo. 2011. Il sapore di un film: Cinema, sensi e gusto. Siena: Protagon.

Bordron, Jean- François. 2002. « Perception et énonciation dans l’expérience gustative ». Questions de sémiotique : 1-24. Paris: PUF.

Bourdieu, Piere.1979. Le sens pratique. Le éditions de minuit (tra. spa. 2010. El sentido social del gusto: Elementos para una sociología de la cultura. Madrid: Siglo veintiuno).

Boutaud, Jean-Jacques. 2011. Il senso goloso: La commensalità, il gusto, gli alimenti. ETS.

Boutaud, Jean-Jacques. 2019. « De l’expérience à l’existence. Le goût, le social, le modal ». E|C XIII, n. 26: 37-54.

Bronstein, Michael. 2020. “AI-designed “hyperfoods” can possibly help prevent cancer”. Towards Data Science, 1-10. https://towardsdatascience.com/hyperfoods-9582e5d9a8e4 Last Access 30/07/2024.

Castoriadis, Cornerius. 1975. L’institution imaginaire de la société. Essais (tra. engl. 1987. The imaginary Institution of Society. Cambridge: Polity Press).

Cavalieri, Rosalia. 2005. “Educazione al gusto e gastromanie perverse”. E|C, n2 : 147-152.

Combessie, Jean-Claude. 2007. La méthode en sociologie. France: La Découverte.

Compagno, Dario, Treleani, Matteo. 2019. “Introduction to Meaningful data/Données signifiantes”. Semiotica, v. 230: 1-17.

Cristianini, Nello. 2023. La scorciatoia: come le macchine sono diventate intelligenti senza pensare in modo umano. Bologna: Il mulino.

Davidsson, Mikael. 2021. “Using machine learning to generate recipes that actually work. Cooking with data science”. Towards Data Science, 1-10. https://towardsdatascience.com/using-machine-learning-to-generate-recipes-that-actually-works-b2331c85ab72 Last Access 30/07/2024.

De Angelis, Rosanna. 2020. « L'énonciation éditoriale. Une analyse des articles journalistiques numériques ». E|C, XIV, n. 30: 208-217.
De Iulio, Simona, Kovacs, Susan. 2022. Food Information, Communication and Education: Eating Knowledge. London: Bloomsbury Academic.
Do Kim, Sung, Young Lee, Jin. 2023. "The emergence of post-narrativity in the era of artificial intelligence: a non-anthropocentric perspective on the new ecology of narrative agency". De Gruyter Mouton, Semiotica, v. 253: 117-154.
Dondero, Maria Giulia. 2004. "A tavola con la natura morta quando non resta che consumare il sacro". E|C, n.2: 1-21.
Dondero, Maria Giulia. 2020. I linguaggi dell'immagine. Dalla pittura ai big visual data. Milano: Meltemi.
Eco, Umberto. 1992. Interpretazione e sovrainterpretazione. Milano: Bompiani (tra. engl. 1995. Interpretation and overinterpretation. Cambridge: University Press).
Fernández, Berlanga, Reyes, Everardo. 2024. "The digital approach to semiotics a systematic review". Text & Talk; v. 44(1): 119–140.
Ferraris, Maurizio. 2021. Documanità. Filosofia del mondo nuovo. Bari: Gius. Laterza & Figli.
Fiorin, José Luis, Landowski, Eric. 2000. Gusti e disgusti. Sociosemiotica del quotidiano. Torino: Controsegni.
Fischler, Claude. 2001. L'Homnivore. Le goût, la cuisine et le corps. Paris: Odile Jacob.
Floridi, Luciano. 2022. Etica dell'intelligenza artificiale. Sviluppi, opportunità, sfide. Milano: Raffaello Cortina editore.
Frischmann, Brett, Selinger, Evan. 2018. Re-Engineering Humanity. Cambridge: University Press.
Fry, Hannah. 2018. Hello World. How algorithms will decide our future. London: W. W. Norton & Company.
Fuentes, Sigfredo, et al. 2019. "Development of Artificial Neural Network Models to Asses Beer Acceptability Based on Sensory Properties Using a Robotic Pourer. A comparative Model Approach to Achieve an Artificial Intelligence System". Beverages, v. 5: 1-10.
Fumo, Jose. 2017. "A gentle introduction to Neural Networks Series- Part 1". Towards Data Science, 1-10. https://towardsdatascience.com/a-gentle-introduction-to-neural-networks-series-part-1-2b90b87795bc Last Access 30/07/2024.
Greimas, Algirdas Julien, Courtés, Joseph. 1982. Semiotique dictionnaire raisonne de la theorie du langage. Paris : Classiques Hachette.
Greimas, Algirdas Julien. 1984. « Sémiotique figurative et sémiotique plastique ». Documents de recherche du groupe de recherches sémio-linguistiques de l'École des Hautes Études en Sciences Sociales, Paris, VI, 60 : 1-24.
Greimas, Algirdas Julien, Courtés, Joseph. 1986. Semiotique dictionnaire raisonne de la theorie du langage 2. Paris : Classiques Hachette.
Greimas, Algirdas Julien. 1987. De l'imperfection. France: Pierre Fanlac (tra. ita. 2004. Dell'imperfezione. Palermo: Sellerio).
Grignaffini, Giorgio. 2004. "La cucina concettuale". E|C: 226-239.
Grignaffini, Giorgio. 2005. "Il cibo tra senso e materia". E|C:1-12.
Hjelmslev, Louis. 1943. Omkring sprogteoriens grundlæggelse. Kobenhavns Universitet (tra. ita., 1968. I fondamenti della teoria del linguaggio, Torino: Einaudi).
Krauss, Rosalind. 1990. Le Photographique. Paris: Macula (tra. ita. 1996. Teoria e storia della fotografia. Milano: Mondadori).
Kristeva, Julia 1977. "Word, Dialogue, and Novel". Desire in Language: A Semiotic Approach to Literature and Art: 64- 91.

Lakoff, George. 1980. Metaphors we Live. US: University of Chicago Press (tra. ita. 1998. Metafora e Vita Quotidiana. Milano: Bompiani).
Lakshmanan, Valliappa, Robinson, Sara, Munn, Michael. 2021. Machine Learning Design Patterns: Solutions to common Challenges in Data Preparation, Model Building, and MLOps. United States of America: O'Reilly Media, Inc.
Landowski, Eric. 1992. A sociedade Refletida. São Paulo: EDUC Pontes.
Landowski, Eric. 2021. « Plaidoyer pour l'esprit de création ». Semiotika (Vilnius), v. 16: 253-267.
Leone, Massimo. 2016. "Microanalisi del velo: Verso una semiotica del drappeggio". Il sistema del velo / Système du voile, 131–151.
Leone, Massimo. 2018. "Food, Meaning, and the Law: Confessions of a Vegan Semiotician". International Journal for the semiotics of law, n 31: 637-658.
Leone, Massimo. 2020a. Scevà: Parasemiotiche. Roma: Aracne editrice.
Leone, Massimo. 2020b. Volti virali. Edition: FACTES Digital Press, Open Access.
Lotman, Jurij Michajlovič. 1979. Semiótica de la cultura. Madrid: Cátedra.
Malafouris, Lambros. 2013. How Things Shape the Mind. A Theory of Material Engagement. Cambridge: MIT Press.
Mangiapane, Francesco. 2021. "Semiotics, blogs and gastromania". In: Digital age in semiotics and communication, v. III- IV: 83-100.
Markowitz, Dale, Robinson, Sara. 2020. "Baking recipes made by AI. Developers & Practitioners" 1-10. https://cloud.google.com/blog/topics/developers-practitioners/baking-recipes-made-ai Last Access 30/07/2024.
Marrone, Gianfranco. 2013. "Livelli di senso: Dal gustoso al saporito". E|C V. VII, n. 17: 118-126.
Marrone, Gianfranco. 2014. Gastromania. Milano: Bompiani.
Marrone, Gianfranco. 2015. "Senso e forma del cibo: Sulla semiotica dell'alimentazione". E|C V. 4-19III: 3-10.
Marrone, Gianfranco. 2016. Semiotica del gusto: Linguaggi della cucina, del cibo, della tavola. Milano: Mimesis.
Marrone, Gianfranco. 2022. Gustoso e saporito: Introduzione al discorso gastronomico. Milano: Bompiani.
Mazzocut-Mis, Maddalena. 2015. Dal gustoso al disgusto: L'estetica del pasto. Milano: Raffaello Cortina Editore.
Merleau-Ponty, Maurice. 1945. Phénoménologie de la perception. Paris: Gallimard (tra. ita. 2014. Fenomenologia della percezione. Milano: Studi Bompiani.
Niola, Marino. 2019. "L'esorcibo". E|C, XIII, n 26: 69-79.
Panofsky, Erwin. 1955. Meaning in the Visual Arts. New York: Garden City N.Y. Doubleday (tra. ita. 1962. Il significato nelle arti visive. Torino: Einaudi).
Paolucci, Claudio. 2021. Cognitive Semiotics: Integrating Signs, Minds, Meaning and Cognition. Switzerland: Springer Nature.
Papagiannis, Helen. 2017. Augmented human: How technology is shaping the new reality. Boston: O'Reilly.
Parasecoli, Fabio. 2011. "Savoring Semiotics: Food in intercultural communication". Social Semiotics, v. 21: 645-663.
Parisi, Francesco. 2019. La tecnologia che siamo. Torino: Codice.
Parret, Herman. 2004. "Vino e voce verso una inter-estetica delle qualità sensoriali". Aut, aut, v. 324: 90-102.
Pasquale, Frank. 2020. New Laws of Robotics. Defending Human Expertise in the Age of AI. England: The Belknap Press of Harvard University Press.

Peirce, Charles Sanders. 1931-1958. The Collected Papers of C. S. Peirce. C. Hartshorne, P. Weiss, & A. Burk. (Eds.). Cambridge, Ma: Harvard University Press.
Perullo, Nicola. 2010. Filosofia della gastronomia laica. Il gusto come esperienza. Milano: Meltemi.
Perullo, Nicola. 2011. "Esperienza, estetica, cucina, gastronomia". Estetica studi e ricerche, v. 1: 73-92.
Perullo, Nicola. 2016. Taste as experience: The philosophy and aesthetics of food. Columbia: university press.
Pfirsch, Jean Vincent. 1997. La saveur des sociétés : Sociologie des goûts alimentaires en France et en Allemagne. France: Presses universitaires de Rennes.
Pivetta, Andrea. 2012. "Naso elettronico: Funzionamento, applicazioni, problemi aperti". Università degli Studi di Padova del dipartimento di Ingegneria dell'informazione.
Quintarelli, Stefano. 2020. Intelligenza artificiale. Cos'è davvero, come funziona, che effetti avrà. Italia: Bollati Boringhieri.
Reyes, Everardo, Sonesson, Göran. 2019. "New approches to plastic language: Prolegomena to a computer-aided approach to pictorial semiotics". Semiotica, v. 230: 71-95.
Reyes, Everardo. 2022. "Interfaces culturales: sobre la materialidad de la cultura digital". Revista márgenes Espacio arte y sociedad, v. 15 n 22: 15-21.
Sadin, Eric. 2018. L'intelligence artificielle ou l'enjeu du siècle: Anatomie d'un antihumanisme radical. Paris : L'échappée (tra. ita. 2018. Critica della ragione artificiale. Una difesa dell'umanità. Roma: Luiss University Press- Pola).
Schaeffer, Jean- Marie. 1987. L'image précaire : Du dispositif photographique. France : Du seuil (tra. spa. 1990. La imagen precaria : Del dispositivo fotográfico. Madrid: Catedra Signo e imagen).
Schafer, R. Murray 1993. The Tunig of the World. A pioneering exploration into the past history and present state of the most neglected aspect of our environment: The Soundscape. Vermont: Destiny Books.
Scribano, Adrián. 2021. "¡¡¡Sabor a bit!!!: Algunas conclusiones (adelantadas) sobre el impacto sociológico de la Food Tech". Aposta revista de ciencias sociales, n, 90: 12- 31.
Scrinis, Gyorgy. 2008. "Functional foods or functionally marketed foods? A critique of, and alternatives to, the category of 'functional foods'". Public Health Nutrition, v 11(5): 541–545.
Scrinis, Gyorgy. 2013. Nutritionism: The science and politics of dietary advice. England: Routledge.
Scrinis, Gyorgy. 2020. "Ultra-processed food and the corporate capture of nutrition- an essay by Gyorgy Scrinis". Feature, v. 371: 1-3.
Silverstein, Michael. 2003. "Indexical order and the dialectics of sociolinguistic life". Language & Communication, v. 23: 193–229.
Spinelli, Sara. 2011. "Percorsi semiotici sul gusto. Tra practiche e percezione". Istituto Italiano di Scienze Umane Scuola Superiore di Studi Umanistici, Università degli Studi di Bologna, Dottorato di ricerca in Semiotica XXII Ciclo.
Stano, Simona. 2005. "Mauvais à regarder, bon à penser : il food porn tra gusti e disgusti". E|C, v. 23: 1-7.
Stano, Simona. 2012. "Siamo noi questo piatto di grano... L'immaginario gastronomico italiano tra seduzione e incontro amoroso". E|C, v. 11-12: 70-76.
Stano, Simona. 2015. Cibo e identità culturale: food and cultural identity. Roma: Aracne.
Stano Simona. 2017. Gli aspetti del cibo: meditazioni semiotiche su gusto e disgusto. Roma: Aracne.

Stano, Simona. 2018a. I sensi del cibo: Elementi di una semiotica dell'alimentazione. Roma: Aracne.
Stano, Simona. 2018b. "Mauvais a regarder, bon a manger". E|C, XII 23: 170- 176.
Stano, Simona (a cura di M. Leone). 2019. *La soglia del senso: Il corpo come istanza semiotica. Lexia*, *Il programma scientifico della semiotica. Scritti in onore di Ugo Volli.* v. 33: 147-160. Roma: Aracne.
Stano, Simona. 2020. « La Culture Culinaire Marocaine Sémiotique, histoire et communication ». Edition Capital, Actes du Congrès V de l'Association marocaine de sémiotique textes réunis et établis par Mohamed Bernoussi : 58-81.
Stano, Simona. 2021. "Nostalgia, prefigurazione, riscoperta: percorsi semiotici tra pre- e post-gastromania". E|C V. XV, n 32: 117- 124.
Stano, Simona. 2022. "Il corpo negato: privazione, catarsi, culto". Il sacro e il corpo, Milano: Mimesis: 199-215.
Stano, Simona. 2023a. "Food, ideology and critical semiotics". Lexia. Rivista di semiotica, v 41-42: 307-322.
Stano, Simona (a cura di M. Leone and A. Santangelo). 2023b. *I corpi (im)possibili dell'intelligenza artificiale*. *Lexia*, *Semiotica e intelligenza artificiale*.: 219-237. Roma: Aracne.
Tegmark, Max. 2017. Life 3.0 Being Human in the Age of Artificial Intelligence. New York: Alfred A. Knopf.
Urueña, Raúl. 2004. "Sistema artificial de reconocimiento de olores y sabores". Universidad tecnologica de Bolivar, Centro de Educacion permanente, Cartagena de Indias.
Vigo, Chiara. 2004. "Il linguaggio della cucina". E|C, n.2: 1-6.
Volli, Ugo. 2015. « Du goût alimentaire au goût esthétique. . . et retour, ». Lexia, v. 19–20: 37–47.

Appendix

Interview with Chef Working with Artificial Intelligence Expert 1

Karina Abdala [00:00:00] Bueno, inicio con la registración de la entrevista y bueno, antes de iniciar quería agradecer por haber aceptado esta entrevista, ya que esta entrevista es fundamental. Como te había comentado en los encuentros que tuvimos previamente. Es interesante para mi investigación doctoral. Yo actualmente me encuentro en el segundo año. Entonces ya el primer año lo que hice fue recopilar todo un montón de información sobre la temática y quería tener la opinión de un experto dentro de lo que implica la gastronomía y en particular la relación entre la inteligencia artificial y la gastronomía. A modo de información, más o menos esta entrevista durará más o menos 45 minutos y bueno, la grabación. Esta grabación se va, se va a mantener solamente en el momento hasta que termine mi doctorado, que es algo que ya estaba firmado en el consentimiento. Y te agradezco tanto por aceptarla como para por haber firmado ahora el consentimiento. Bueno para iniciar. Gracias por todo. Para iniciar, quería saber, ¿cómo fue tus inicios en la carrera, tanto en la gastronomía, dónde estudiaste? ¿Y cómo después fuiste llevándote, informándote sobre el aspecto de la inteligencia artificial?

Expert 1 [00:01:28] Ahora ya tengo casi 12 años que soy cocinero. Estudié aquí en Milano en la escuela Carlos Porta. No sé si la conozcan. Bueno es una escuela de gastronomía. Aquí en Europa se comienza desde el colegio a estudiar gastronomía, entonces desde muy pequeño ya entras en el en el tema de gastronomía. Trabajé en diferentes restaurantes con estrellas Michelin sin estrellas Michelin, mmm, con alimentación controlada, etcétera etcétera. Eh, La inteligencia artificial entró dentro de mi carrera, digamos, entró. Es como decir, como te había ya comunicado hace unos cuatro meses, más o menos cinco meses, cuando no sé por qué, comencé a preguntar si podía crear recetas. En ese mismo momento me di cuenta que era un súper mmm. Cómo se podría decir una súper ayuda para nosotros cocineros tener una un un instrumento de ese, de ese de esa largueza, ¿no? De ese de esa grandeza. ¿Porque? Porque muchas personas, como te había contado la vez pasada, no tienen la las los instrumentos necesarios para poder aprender más. ¿Qué quiere decir? Que, si yo necesito saber, eh, una receta uruguaya, entonces yo voy a escribir escribiendo una receta uruguaya. Y me sale todo sin tener que estar buscando mucho en internet, ¿no? Entonces para mí, para mí fue demasiado fuerte esto, ¿no?

Inicialmente, como te había dicho. Lo pensé de modo muy positivo y con una pizca de negatividad, como decir bueno, ¿entonces qué va a pasar en 100 años o en 50 cuando ya la inteligencia artificial ya sea super mega programada y que lo haga tranquilamente ella sola? Obviamente entre la inteligencia artificial de un cocinero creo que haya. La parte humana que es la fundamental, o sea, al gusto del no solo probar o experimentar, sino también el saber que un gusto puede estar bien o puede estar mal, ¿sabes? Entonces de ahí, de tener esa pizca de negatividad, evolucionó en tenerla como como modo de experimentar con un con una inteligencia artificial. ¿Quiere decir comencé a preguntarle cosas como Cómo puedo fermentar una flor? Okay. Que es algo que Internet no existe y solo si vas a trabajar en algunos restaurantes puedes encontrar este tipo de información. Y me. Y me salieron indicaciones. Sabes, hasta que no lo bloquearon aquí en Italia y ahora ya no se puede usar, pero sustancialmente yo lo vi siempre como un como un instrumento muy positivo para los cocineros en general, porque te puede ayudar. También en la parte creativa. O sea, no sé, tengo un bloqueo de cómo hacer este tipo de plato. Se lo pregunto a ella, que puede tener mucha información gracias al Data boys que le han puesto las demás personas. ¿Y me puede ser que me desbloquee la parte creativa, la parte mental no? Y pues por eso en realidad estoy esperando que la desbloqueen de nuevo aquí en Italia para poder comenzar a trabajar de nuevo con ella, porque es muy es importante en realidad. ¿Es como decir pues se puede hacer la nueva Biblia?

Karina Abdala [00:05:02] Claro, y actualmente ¿dónde es que estás trabajando, en Italia, en que restaurante?

Expert 1 [00:05:10] Ahora mismo estoy trabajando en un restaurante de pescado. Regresé a Milano. Eh. Si regresamos, ya no estoy en un restaurante de pescado donde se hace pescado se utiliza más que todo producto fresco, todo tipo de pescado, todo tipo de plato. Pasta. Los primeros segundos en tres. Entonces es un restaurante clásico normal de pescado donde se podría comer tranquilamente. Cualquier persona podría entrar. No tiene estrella Michelin, pero se come muy bien.

Karina Abdala [00:05:41] Y para volver al tema de la inteligencia artificial, nombraste algo en la Database que se utiliza para realizar es esta herramienta, ¿podrías nombrarme primero cuál es la herramienta con la cual lo utilizas? Y si tienes alguna noción sobre cómo es que se está incrementando esta data de base, ¿qué es lo que se está usando, si se está tomando en

cuenta, por ejemplo, preferencias de los usuarios de los comensales, o qué es lo que se está utilizando para formar parte de lo que es esa data base?

Expert 1 [00:06:21] Sí. Ahora lo que yo uso es OpenAI, OpenAI, API, eh, grande no es la que yo conocí tramite en Instagram como te decía unos meses atrás y es la que era la que te daba la parte gratis para poder experimentar. Inicialmente tenías que. Pagar el acceso, digamos, para tenerla en mente. Ahora, lo del Database. Como te había contado, yo creo que es algo muy bacilar, no como para un cocinero, Yo creo que ahora, en este momento temporal, el Database de lo que yo estoy usando es muy básico. Quiere decir que tal vez te pueda ofrecer mucho a ti que no eres cocinera, pero a mí, que he tenido mis experiencias, me puede ayudar simplemente con una cuestión creativa. Okay. Mmm. No se podría decir que una persona puede, eh, aprender de una de una inteligencia artificial en este momento, porque creo que hay demasiadas, eh, nociones muy genéricas. ¿Qué quiere decir que faltan? Que podrían faltar, faltan pasajes, Faltan pasos en las recetas, en la en los que uno puede simplemente se podrían agregar tipos de conservación. Tipos de cocción. Un poquito más eh particulares no está a un momento. Está muy básico, muy muy básico. Por eso te decía que lo que yo lo uso es simplemente para ver la cuestión vacilar tradicional de lo que hay. Pero si estamos hablando de una cocina mmm creativa de autor, estamos muy, muy lejos de eso, porque aún el database está como muy, muy básico en este momento.

Karina Abdala [00:08:15] Claro. Y, por ejemplo, cuando hablaste vos mencionaste más o menos las ventajas y desventajas de trabajar con la inteligencia artificial. ¿La ventaja sería el ayudar a desbloquear la creatividad del chef o en qué otras cosas podés ver como ventajas de la utilización de estos dispositivos y qué es lo que vos decís? Bueno, además de profundizar la data de base, ¿qué es lo que decís que le falta a todo esto de dentro de la inteligencia artificial? Por un lado, lo positivo y por el otro lado las desventajas del trabajo con la inteligencia artificial.

Expert 1 [00:08:56] Mmm, Ahora, como te decía, creo que las partes positivas de usar la. La inteligencia artificial es el desbloqueo creativo. Seguramente el desbloqueo mental que puede haber. Tradicional. Los choques tradicionales que hay son muchísimos e. La parte creativa creo que es la mejor, porque uno puede simplemente hacer una pregunta, aunque muy fútil que sea lo que sea, muy estúpida, pásame la palabra e igualmente salen, salen resultados que en realidad te podrías quedar con la boca abierta. Un cocinero. Como por ejemplo el hecho de yo puse eh

había puesto cómo fermentar. Bueno, en este momento estoy muy enganchado con las fermentaciones. Mmm. Y son cosas que en realidad en internet se encuentran muy pocas. ¿No? Ya había. Yo he puesto cómo fermentar, pues no me acuerdo qué ingredientes, pero era un ingrediente muy difícil y me salió todo. Entonces digo ok, perfecto. Vi dónde estaban las partes equivocadas y yo tranquilamente, con mi experiencia y con lo que me dio la inteligencia artificial, yo puedo completar eso es como un complemento para un cocinero. Más que un desbloqueo creativo, es un complemento que podría ayudar, eh. Ahora mismo, por ejemplo, si me pongo a escribir en donde yo busco. ¿Cuál? ¿Cómo fermentar hojas de higo? Creo que igualmente me salga una respuesta. ¿Sabes? Eso es lo positivo. Que no. No se bloquea la persona que no. No se puede hacer. Solo que te igualmente te saca un resultado. Y eso es muy importante. Al menos a mí me gusta mucho la parte negativa, digamos. Podría ser que faltan detalles, faltan, faltan pasos, pero creo que con el pasar del tiempo y con profesionistas que quieran ayudar con el database, con, con ayudar a que se complete esto, se podría llegar a un buen resultado. Ahora mismo, como te mandé la otra vez un link en Instagram, hubo allá un chef que es muy conocido en Rusia, que él ya comenzó a hacer un menú a base de inteligencia artificial. ¿No es que da comida, inteligencia artificial, sino que creas un menú con inteligencia artificial él mismo metiendo sus recetas, sus técnicas y él le pidió Haz un menú de con de recetas de Vladimir porque se llama Vladimir para el restaurante no? Y el del tema del del menú que es degustación es eh, menú inteligente algo así. Ok, pero todas las recetas que ha sacado en ese menú son hechas por la inteligencia artificial. O sea, yo le doy las nociones a la inteligencia artificial. La inteligencia artificial saca lo que ella quiere, Listo, tramite el algoritmo, pero igualmente las recetas son del chef. Las fotos, las imágenes, cómo implantarlo. Esto más o menos en base a todo lo que él le ha puesto dentro de esta, de esta data para que le pueda sacar un producto decente.

Karina Abdala [00:11:54] Y, por ejemplo, ¿hasta dónde va la parte humana? porque digamos yo no sé mucho de lo que es la experiencia en la gastronomía, pero ¿hasta qué punto cuando vos estás creando un plato cuenta, la percepción de los sentidos en la forma de crear un plato, dentro de la parte del ser humano y después ir un poco más allá y pensar si eso se puede trasladar y qué puede hacer una inteligencia artificial? si eso es posible o no. Primero, porque pensaba en esa parte de ¿hasta qué punto, es fundamental la percepción de los sentidos sensorial humana al momento de crear un plato, si es necesario o no. Y ¿esto se puede trasladar a inteligencia artificial?

Expert 1 [00:12:59] Mmm. Ahora yo creo que es la necesidad de tener un sentido humano. Va a estar siempre, O sea, de verdad, a menos que no se estandarice también el modo de comer del de los seres humanos. La necesidad de que la inteligencia artificial y el cocinero se complementen va a haber. Va a haber siempre, siempre una persona va a tener que probar el resultado y de ahí lo puede testar vendiéndolo, haciendo lo que quiera, pero siempre va a necesitar de una persona humana que pruebe el producto, ¿no? Eh Mmm, te hago un ejemplo. Ahora yo que no tiene nada que ver con antes de que existieran las estampan las estrellas. Okay, para poder estampar 3D. Eh, se hacían con estampado, con moldes y lo tenía que sacar una persona y hasta ahí mismo se tenía que sacar una persona, no una persona tenía que sacarlo del molde para que se complete el proceso. Lo mismo es ahora, no, ahora están la estampa ante 3D, lo hacen 3D por papá, pero igualmente una persona tiene que sacarlo de ahí y romper los filos para que ese producto esté finalizado, ¿verdad? Entonces creo que, aunque tu mecánica es todo, todo el proceso que va a tener, que van a tener esos platos, vas a necesitar igualmente una mano humana lo va a necesitar siempre. O sea, a menos que una persona no se complete con no, no, no se contente, como podría decirlo, de lo de lo que le puede dar una máquina. Pero quiere decir que todos vamos a comer productos tipo Coca-Cola y no va a ser nunca así, porque tenemos 1.000.000.000 de tradiciones en el mundo y 1.000.000.000 de sabores y gustos diferentes. ¿Entiendes? Y puede ser simplemente una experiencia. Yo no creo que en realidad la. O al menos ahora, en este momento y contando de aquí, tal vez a cinco años, no muy lejos. No creo que vaya a ser posible que una máquina complete al 100%. Este producto siempre va a necesitar de una persona que tenga un poquito más de experiencia, al menos de gusto, y que diga está perfecto, listo, que la ha balanceado bien en acidez, en dulzura, en SAPI, en sapiens, etcétera. En Texturas AM siempre va a haber una persona que le va, que va a probar lo que ha hecho la máquina y le va a dar el OK. De ahí el momento en y en el momento en el que. Eh, ya haya un database tan vasto, tan vasto. Pero estamos hablando de un proceso que cuanto puede, cuanto se puede demorar, cuanto puede demorar para para llenar un data vez al completo de toda la tradición humana, de todas las clases de comidas que hay en este mundo y hacer probar a todos los chefs el producto de una de una máquina puede durar años. Siglos, creo. ¿No? O sea, es una algo demasiado, muy difícil. Ya hay máquinas que hacen la, las, la las bolitas para hacer las pizzas. Pero, por ejemplo, es un producto muy, muy comercial, ¿Entiendes? Hay muchos restaurantes donde ya usan maquinarias que le meten solo la harina, el agua y la sal, la levadura y salen ya las bolitas hechas de. En ese momento, cuando una persona va a probar una pizza de

ese tipo hecha por ingenieros de Harvard. Etcétera, etcétera Igualmente nota que el producto tiene dos, tiene son dos, dos cosas totalmente diferentes del estar hecho por una mano. Entiendes el pH de una persona, la personalidad, el tiempo, el humor de esa persona es algo fundamental. No sé si te has dado cuenta que cuando estás molesta y te preparas algo de comer te sale mal. Listo, Es normal, dale una. Una máquina nunca va a tener sentimientos, entonces eso también puede ser que haga algo super mega plano, ¿sabes? Como cuando vas al McDonald's Es un sabor plano. No tiene. No tiene formato. No, no tiene en realidad el sentido que dices Wow, no es algo tan plano en la boca que dices. Ah, es muy bueno, pero es plano. A menos que no comencemos a comer así por el resto de nuestra vida. Yo creo que en realidad la máquina nunca va a tener la nunca va a completar eso. ¿Qué hacemos nosotros los cocineros? ¿No? ¿O una persona alrededor de una persona? No un cocinero en general, una persona.

Karina Abdala [00:17:28] Y, por ejemplo, eso que hablamos de la inteligencia artificial hace un gusto y está la persona. El ser humano que testea si esto es bueno o no, ¿qué puede llegar a decirse en anos, lo que puede replicar la máquina? diciendo aprendiendo, digamos, desde lo que es inteligencia artificial. En el caso de si le dan el OK a este sabor, a este gusto, continuar a replicarlo, pero vos lo que decís es que igual siempre tiene que haber el ser humano que te esté eso o va a llegar un punto en el cual se puede comercializar para todos cuando ya se de esa database que se le dé el OK. Digamos que el OK lo da la autonomía, la da el ser humano, pero se va a llegar a esa autonomía en la cual la máquina puede generarlo después de tantos feedback positivos o ¿pensas que es algo muy hipotético?

Expert 1 [00:18:28] Que sí. No, no, no se podría llegar. Yo creo que sí se podría llegar, en realidad. Cuando la inteligencia artificial ya llegué a tener el sabor en mano de lo de los mejores cocineros del mundo. Eso ya está. O sea, en realidad es Siempre depende de quién vaya a probar ese producto, ¿sabes? Porque si lo pruebo yo, que soy un cocinero de un cierto tipo, puede decir que mi gusto es bueno. Pero después llega Massimo y dice que no le gusta o que le gusta, etcétera, etcétera, etcétera Depende siempre de lo que, de lo que funcione y lo que no. Lo bueno de la cocina es que es tan versátil y que cambia siempre. O sea, el tren desde la cocina es siempre movimiento. Un cocinero continuará siempre. Aprender nunca será una cosa que se termina y basta. Entonces cambian técnicas, cambian modos, cambian gustos, cambian productos. Los productos a veces ya con el cambio climático ya no están. Se tiene que se tiene que coger otro tipo de producto. Ahora tengo un ejemplo no hay un chef que quiso hacer una mantequilla a

base de hojas de tomate, listo para que cuando se comía con este pan de tomate la mantequilla sabía de tomate. ¿Lamentablemente cuando tú entras en una huerta llena de tomates, sientes eso? Olor de tomate. Listo. Y en realidad nos. No. Cuando tú lo vas a cocinar, ese sabor, ese olor ya no lo tienes. Entonces el que tuvo que hacer tuvo que modificarlo y usar otra hoja. Como te decía, una hoja de higo para poder hacer una mantequilla que se puede. Tomate Ya está, Estamos absolutamente locos. O sea, eso una máquina nunca lo va a poder hacer porque tiene que testearlo. Entiendes dónde quiero llegar? O sea, puede tener toda la información del mundo y decir Ok, perfecto. Coges la hoja de tomate, hacemos este burro, esta mantequilla y vamos a, digamos. Y se hace así. Sí, listo. Pero en realidad el producto final, como te digo, lo testea una persona que no tenga el paladar fino, llamémosle así y dice no, sí, está bien, pero después llega otro que dice no, que esto no sabe a tomate. Entonces vamos a encontrar siempre algo que no nos va a dar el producto final perfecto, como usar esencias, no como usar esencias de industrializar todo. Entonces ya no sé, ya no estaríamos hablando de cocina clásica tradicional o alta cocina, sino cocina industrial y la cocina industrial. Lo sabemos ya que ya son 100 años que se produce, que es fácil trámite, conservantes, aditivos, esencias, saborizantes, etcétera, etcétera, etcétera, etcétera Entonces estamos hablando igualmente estaríamos hablando de dos productos diferentes para poder estandarizar un tipo de cocina clásica tradicional que tú dices la hace igual a mi abuelita. Yo creo que será demasiado difícil, demasiado difícil.

Karina Abdala [00:21:22] Y cómo logras por ejemplo, porque pensaba cuando vos decís si puede ser el gusto en cierta parte tiene o tiene una parte que es muy subjetiva, lo cual es, como decías, para mí esto tiene un buen gusto, pero si llega otro chef más, no sé, por ejemplo lo pongo. En mi caso, si llega un chef y me dice no, esto no tiene un buen gusto, obviamente mi opinión va a quedar opacada en base a lo que a lo que él diga. ¿Eso cómo se puede traducir en la parte de lo que sería el resultado de la inteligencia artificial o va a quedar en un estándar de gusto mediada por los chefs más importantes? Y si, por ejemplo, el usuario por eso yo pensaba, sí, también se te iba a considerar no solamente, la voz de los expertos cocineros de los chefs, sino también, la voz de de los usuarios. Porque muchas veces eso que vos decís lo el tema del paladar fino no? Digamos esto realmente va a democratizarse. O sea, se puede llegar a una democracia gustativa, por así decirlo, si es que existe ese concepto, mediante estas este lo utilizo estas aplicaciones. O podría quedar muy, como destacando cierto tipo de valor de un gusto estándar en el cual es considerado el correcto y los demás no. O sea, no sé si se puede ampliar

a darle esa autonomía en la cual puede haber variantes de gusto o solamente se va a sesgar al gusto que alguien diga esto está bien.

Expert 1 [00:23:07] Yo creo que ahora enredan. Mmm. Yo te hablo siempre personalmente, ¿no? Cuando iba a trabajar en cocina, tenía un gusto. Después de 12 años de haber trabajado en diferentes restaurantes, con o sin estrella Michelin, ¿obviamente la estrella Michelin te ayuda a que tu paladar se afine porque vas comiendo cosas súper o muy delicadas o muy fuertes, etcétera, etcétera no? Ehh mmm. El paladar, el gusto es igual, igual que ir a un gimnasio es igual, Es lo mismo si tú comes comida pésima por toda una vida, por toda una vida, tú dirás hasta buena, pero cuando después vayas a comer un cierto tipo de comida diferente, con materia, con una materia prima diferente, te vas a dar cuenta que en realidad todo lo que has comido hasta ahora ha sido pésimo, ¿sabes? Ehh Mmm. Tienes mucha razón en realidad. Lamentablemente, depende siempre de quien vaya a creer esto otra vez. Ok, porque no todos somos capaces de aceptar el gusto de otra persona. O sea, yo soy muy orgulloso y tengo un ego muy grande, como todos los cocineros. Y cuando voy a un restaurante la primera cosa que hago es criticar. O sea, porque no está a mi gusto. Sabes? Una persona normal yo creo que no lo hace tan frecuente como lo hacemos nosotros. ¿Cocineros no? Que esto está mal hecho y le falta esto. Que le falta Esto yo lo veo. Esto. Entonces. Mmm. No se va a poder llegar, creo yo, a tener un estándar muy alto, o sea donde todos puedan tener ese gusto, porque cada uno, como te dije, tenemos un gusto propio por las experiencias que hemos comido. Digo comida porque literal es una experiencia más. Comes más. Entrenas, tu lengua, tu paladar, tu gusto, tus sentidos. Ah, que Ah, no, esto está bien. No, esto está mal. O sea, eh, Cuando yo era pequeño mmm estaba otro ejemplo. No sé si tú has visto, ¿Los sommeliers que cogen el vino y dicen aquí huele a cereza, tabaco y este el otro yo cuando va a tomar vino? Digo no siento nada, absolutamente nada. Ok, eso es puro entrenamiento, ¿sabes? Eh, si yo creo que me pongo a entrenar todos los días a leer. Vino a decir Bueno, voy a tratar, voy a tratar, voy a tratar de aquí a diez años, voy a también hacer un sommelier yo también a acatar todo lo que lo que está dentro de ese ingrediente. Para mí la cocina es más o menos lo mismo. Cuando yo veo un algo como algo mmm basta, que lo huelo y ya percibo más o menos todos los aromas que están adentro. Si me puede gustar, si me puede gustar, se está haciendo, se está haciendo, si lo quiero mejor hasta que si falta sal, okay, lo puedes, lo puedes ver del gusto, porque la sal lamentablemente ayuda a que cambie el sabor y cambia automáticamente también el olor lo exalta cuando no tiene sal, el olor está plano, como te decía, ¿no? El y la sal hace que sé que se exalte ese ese gusto.

¿Entonces qué va a pasar? ¿Cómo podría ser? O sea, el ser humano. Mmm. Un ser humano normal que no cocine, que no haga esto de profesión. ¡Va a decir Ah, wow! Quiero probar a hacer esta receta del chef AS. Listo, y yo voy a poner adentro de él otra vez. Coger el pescado, ponerlo bajo sal, lavarlo después de 50 minutos, etcétera, etcétera Él lo va a hacer en el mismo modo estandarizado en el que yo le digo, en el que yo lo puse va a salir el mismo producto, pero lamentablemente se va a alterar porque él no compró el mismo tomate que compré. Yo no compro el mismo pescado que compré yo. Sus manos tienen un pH diverso, diferente del mío. Tal vez la humedad que tiene en su casa hace que ese ese que el producto cambie, ¿eh? Y el pH de los productos también cambia gracias a la humedad o a la o al sol o al tiempo. Listo entonces en automático que está estandarizado por mí por máxima postura, que esto es todo por Karina. Abdalá Eso va a cambiar siempre. ¿Entonces dónde va a estar nuestra parte positiva de esta, de esta inteligencia artificial? Que nos tenemos que adaptar al gusto de otra persona y nosotros. El usuario es el que va a decir está bueno, no está bueno, sabes que va a ser, va a ser muy difícil, va a ser muy difícil, a que, a que alguien diga no, este está muy bueno o no, no está bueno, no porque lo puso él o lo puso él. Van a tener que haber referentes por fuerza para que claro, eh, condicionen la mente porque condiciona la mente de una persona. Ah, no, él es un chef reconocido. Tiene que ser por fuerza bueno, que después te da un caldo hecho mal. ¿Puede ser que hasta que te condiciona el gusto, sabes? Lamentablemente el efecto placebo también existe en la comida y literal existe. Personas que trabajan.

Karina Abdala [00:28:03] El efecto placebo, ¿sería?

Expert 1 [00:28:07] Este. Si yo te hago un ejemplo te digo, te la cuento muy bonito, te sientas, te, yo te digo mira este pescado fue pescado a mano por niños, ¿uruguaya no? De ahí las madres lo pusieron a secar en el sol y en realidad tal vez es una mentira porque en el 90% de restaurantes todos mienten. Listo. Por el producto, por las historias. Es un. Es un contorno, ¿no? Entonces eso hace. Esa experiencia se completa con la parte de la materia prima. Sí, la técnica que se aplica al plato. Si. Y la historia que viene contada por el camarero o el cocinero en el en la mesa antes de que tú lo comas. Eso hace que cambie, que se modifique la percepción de tus sentidos. Obviamente estamos hablando. Si, vamos a ser totalmente sinceros, si ya usas una buena técnica en un producto medio bueno para una persona que no tiene experiencia, ese va a ser el plato más rico de tu vida. Ok, pero si no le pones técnica y usas solo la parte de la del storytelling, te lo puedo asegurar que hasta una persona que no sabe se da cuenta que es un plato que no

funciona. Sabes? Entonces entre técnica, storytelling, producto. Y Inteligencia e inteligencia artificial. Tienen que haber muchas conexiones, muchas entre data vez no solo de uno, de un cocinero, sino de varios cocineros para que tenga un data de diferentes gustos, diferentes sabores, diferentes tradiciones. Mmm. Yo mismo, por ejemplo, si tú me pides que te haga un risotto, yo te lo hago en 18.000 modos. O sea, porque he trabajado en tantos puestos que me han modificado mi gusto y ya no puedo ni siquiera sacar un plato que iba a. ¿Es totalmente tradicional ecuatoriano, porque yo soy de Ecuador o totalmente italiano, porque en realidad ya se ha modificado, ya está en mi ADN, ponerle algo de japonés, algo de francés, algo de español, algo de danés, algo de latinos y así mismo son todos los demás chefs, entiendes? Si estamos hablando igualmente de alta cocina o de cocina medio alta o de cocina tradicional, que son igualmente. Bases muy fuertes que se tienen que igualmente recoger por diferentes personas. Una técnica en realidad ha pasado más pasa por más manos más. ¿Esa técnica mejora o empeora? Depende de quién la coja. ¿Esa técnica, sabes? Mmm. Es complejo.

Karina Abdala [00:30:29] No? Es que justamente eso que decías, la historia que te cuentan antes de comerte el plato, ¿cambia tu percepción sensorial? Se puede decir una historia ¿Esto fue recomendado por inteligencia artificial o es una creación conjunta entre un chef real? Por lo que me explicabas de que siempre tiene que estar el ser humano. Y quizá que la parte creativa o el desbloqueo ese creativo fue gracias a la inteligencia artificial. ¿Qué tipo de experiencia gustativa? O sea ¿qué tipo de experiencia pensás que se puede formar en el público en general con esta nueva historia? ¿Qué pensás, cómo podría cambiar esa percepción de en el momento de degustar el plato?

Expert 1 [00:31:45] Es una buena pregunta. En realidad, no te las responderé de manera concreta, digamos, pero te puedo hacer. Te puedo dar un ejemplo que pueda ayudarte a entender más o menos. A mí también, ¿no? Mmm. Por ejemplo, en un restaurante normal. Mmm. Que no sea de alta cocina o de gourmet, etcétera, etcétera. Por lo tanto, popular. Estamos hablando de una cocina popular. Cuando un cocinero de alta cocina va a cocinar en ese restaurante popular. Mucha gente le da miedo de probar cosas nuevas. Ok. Y me ha pasado muchísimas veces. Ahora mismo me está pasando. Yo le pongo, no sé, un aceite diferente. Y la gente se queda como. No sé si probarlo menos después lo pruebe. ¿Le gusta? Listo. Pero inicialmente están como asustados. Entonces yo te repito como cocinero, sabiendo que ha habido una colaboración entre inteligencia artificial y cocina. Y un cocinero. ¿Eh? Creo que me ayudaría

estar más tranquilo por una cuestión de. De que una máquina igualmente es perfecta. Casi no, no tan perfecta como el cómo el hecho. Yo creo que la perfección está en las dosis. ¿Qué quiere decir? Que si un máximo de rotura no es un dato de inteligencia artificial poniendo dosis. ¿Yo estoy tranquilo que ese plato que lo haya hecho la inteligencia artificial va a salir perfecto como lo hizo más o. Entiendes? Es como decir estamos en una era donde la máquina le damos más confianza a una máquina que a un ser humano. No, no, la máquina no se puede equivocar. La calculadora no se puede equivocar. No, lo mismo es una inteligencia artificial. Entonces depende siempre a quién le vayas a vender ese producto. O sea, si se lo vendes a personas que van siempre un restaurante Michelin, hacer degustaciones o restaurantes gourmet, creo que esta persona, estas personas, la puedan coger con una posibilidad muy fuerte, pero si se lo das a una persona popular, a una persona clásica que no frecuenta ese tipo de restaurantes, o sea que frecuenta solo hostería Trattoria, restaurantes normales, eh, te dirían de no sería no, no gracias. Queremos el menú normal por el simple hecho que no se atreven a probar. Pero este es de. Es que esto es normal. Es normal en los restaurantes, Como te decía, están hablando de personas sin estar. Diciendo en un restaurante normal dice no, pero no, yo quiero algo clásico. Normal no, pero señora, pruebe este polvo. De hecho, con la ostra cogida. No, no, yo quiero. Normal. Listo. Entonces hay dos. Hay dos fases. No la fase de la gente que come en ciertos lugares que podría aceptarlo tranquilamente. Y lo aceptan y lo aceptarían. Yo estoy seguro que lo aceptarían al 90%. Y hay ese otro, otro rango de personas que no frecuentan ese tipo de de de gastronomía que creo que no lo aceptarían muy fácilmente. Ahí estamos hablando de yo creo que un 20%, un 30% estaría aceptándolo y el 70 diciendo que no creo, pero por experiencia mía.

Karina Abdala [00:34:54] Y esto va unido a lo que sería, la cocina, típica, no se puede ver actualmente un avance, el unir cocina tradicional típica con estos aspectos de la inteligencia artificial. ¿Va por ese lugar?

Expert 1 [00:35:25] Sí, Ya lo dijiste. Bien, tengo otro ejemplo para que, Para que más o menos se entienda. Si tú vas a un restaurante donde está la abuelita que está haciendo la pasta a mano, tiene un resultado visible y mental y y de gustativo que es diferente, donde está una máquina que te hace la pasta fresca. O sea, son dos los mismos productos, solo que una. Una abuelita te está haciendo la pasta fresca y tal vez eso sea solo show y atrás haya máquinas que te hacen kilos y kilos de pasta fresca. Sabes cómo hay muchos restaurantes aquí en Milano que venden pastas y tú ves el chico que está haciendo la pasta a mano, pero en realidad todas tienen

máquinas que hacen pastas. Pero como te digo, el efecto placebo, el efecto mental de la gente implica muchísimo. Entonces, en el momento en en el que excúsame, en el momento en el que tú le das eh. AM Inteligencia artificial a un eh, cometido, a un tipo de cliente que está acostumbrado a ir donde él come la donde cocina la abuelita y no acepta ni siquiera la máquina que te hace la pasta. Me parece muy difícil, o al menos en este momento, con este tipo de personas que viven en el mundo que lo acepten. ¿Puede ser que mi hermano, ahora que tiene 14 años, cuando ya tenga la edad para salir y hacer él, lo acepte mucho mejor porque es más joven, sabes? Es otro, otra era otro tipo de mentalidad. Pero las personas que ahora tienen de. 30 a 70 años van a tener mucha, mucha, mucha menos ganas de probarla. En realidad, tal vez mis hermanos que tienen ahora tienen diez, 12, 14, 18 años. De ahora en adelante la gente está muy, mucho más porque la tecnología está en las manos de ellos. Sabes? El teléfono, el azar, la PlayStation, etcétera, etcétera, etcétera. Fui a un restaurante la otra vez y salió un robot que me traía que me llevaba los platos. O sea, es una cosa que a mí me dice okay, que está todavía vacilar también ese tipo de implantes, digamos. Pero. Que no se podrían poner en un restaurante pequeño un robot de ese tipo porque tienen que te detecten, te tantea la sala y tiene los movimientos. Un poquito sí, pero cuando en realidad los robots ya puedan volar como en Futurama y eso ya será, aunque sean uno pequeñito, antes será mejor. Ya no van a haber camareros, van a ver robots, de acuerdo y será mucho más aceptado. Pero por la gente que ya está viviendo la era de la tecnología, no de la gente que ahora tiene 35, 70 años. O sea, siempre, siempre tenemos que hablar de esto. ¿Pero en qué era Estamos hablando en el 2023 o en el 2050 o en el 2020 del 2030? Disculpa si umm, es un poquito extraño. Karina Lamentablemente no, yo te digo, yo soy una persona muy abierta y me encanta modernizar mi estar siempre actualizando en todo, pero la gente nacida antes del en los 80, 70, 60, 50 son muy cerrados. O sea, no te digo retrógrados porque, ¿pero casi sabes? No, yo como solo este tipo de pasta. No, yo no me atrevo a comer alas. No, yo no me atrevo a comer vegano. No, yo no me atrevo. Porque no se atreven, porque están en su zona de confort. Las nuevas generaciones están ya sin zona de confort, Ya no, no les, no les interesa. Tienen tecnología, tienen viajes, tienen todo, cuando en realidad era todo. Es mucho más fácil. Entonces un viaje a diez, 10 €, ¿ida y vuelta a quién le va a interesar que te lo hace una máquina o menos? Ahí va. Ahí lo que va a estar es el gusto. O sea, si me lo hacen a máquina, yo lo acepto. Pero si en el gusto no está bueno, voy a preferir un cocinero real.

Karina Abdala [00:39:11] Y esto es o sea limitante. ¿Vos decís se relacionan a un aspecto cultural de depende del país en el que estés, o es algo que ves generacional? Y otra cosa ¿vos decís que la parte cultural de la persona afectaría también al aceptar o no estas cosas?

Expert 1 [00:39:52] Creo que no, no es claro, no es el producto, pero sea la tradición, o sea yo, estamos hablando de Italia, ¿en Italia de la pasta no? Si vamos a Latinoamérica vamos Ecuador. Yo soy de Ecuador, de Ecuador y de la parte del sur de de de Ecuador, o sea Machala. Mi abuelo, por ejemplo, no come nada, nada que venga de una lata, nada que venga de una lata. O sea, te está hablando de frijoles en lata precocida, ¿no? Nunca en su vida él no come el arroz hecho en la en la noche. O sea, si te las hicieron en la tarde y quedó, él no te lo come. ¿Quiero un arroz nuevo, sabes? Entonces, eh. Es normal. La pasta, El arroz, ¿eh? Si tú vas donde unos chinos y le das la pasta hecha por por las máquinas, puede ser que te lo acepten, porque ellos ya están en ese, en ese mundo, ¿sabes? Tradicionalmente. Pero yo creo que, si vas dando en China, le dices mira, te hice, te hice este ramen, el chino te va a decir no, espérate, ¿sabes? Porque es toda una cuestión de cultura. Hay productos que tal vez sean aceptados y hay productos que tal vez no sean aceptados muy fácilmente. Y, por ejemplo, mi abuelo no te come ni pasta ni nada hecho por una inteligencia artificial. Creo que se se moriría. Él no va a MacDonalds, no va a KFC, no te come ni siquiera en la calle, por ejemplo. Es es muy. Tiene 73 años, mi abuela 76 y mi padre tiene 52. Y él nunca en su vida, en su vida tampoco ha comido. Por ejemplo, a él no le gusta la pasta. Él nunca comerá pasta, pero si tú le dices sano, este arroz te lo está haciendo una máquina con la inteligencia artificial, ¿eh? Puede ser que te lo acepte, Diga No, está bien y puede ser que no, que estás loco. O sea, depende siempre de la cultura, de dónde estás, del producto que has decidido hacerlo y sobre todo quien decidió por ti hacer ese producto, o sea, quien decidió por ti. O sea, en Perú está Gastón Acurio, no los mejores cocineros de Latinoamérica, no? Entonces Gastón Acurio hizo una colaboración para hacer el mejor ceviche con inteligencia artificial. Perfecto. Entonces la gente puede ser que diga probémosla, pero de la misma manera. Como te decía, lamentablemente solo para un cocinero que aprecia las técnicas, aprecia la materia prima. Gastón Acurio. Para mí es un buen chef. ¿No? Pero si tú vas a hablar con un peruano, dice. Gastón Acurio fue la persona que nos trajo visibilidad a Perú. Pero un ceviche te lo comes mejor en una hueca en medio del mercado, donde está el pescado por tierra y entiendes que es siempre varias de tipos de personas que deciden. ¿No? Yo voy donde Gastón Acurio, voy ehh Don Massimo, venderán tu casa, etcétera, etcétera y prefieren comer ese tipo de comida. Cuando una persona popular, o sea la mitad del mundo, es popular, la mitad de este mundo somos unos

siete millares. Mi, mi millar de personas eh, que comemos normal. Los ricos son los que en realidad los ricos, los que se pueden permitir y los que quieren probar nuevas experiencias son los que aceptan ese tipo de gastronomía. Todo el resto. No sé, últimamente vi hasta una peli donde este chef te decía. Yo quería. Yo quise ser cocinero por comer como los ricos, ¿no? Cuando yo fui cocinero y comencé a ver lo que lo que ellos comían no tenía nada que ver con lo que yo comía. O sea, yo tuve problemas por un vasito de caviar. Me tuve que estar cuatro meses. ¿Mi mamá tuvo que trabajar cuatro meses para pagar un vaso de caviar que yo rompí porque me descubrieron que lo estaba probando y cuando lo probé, sabes lo que dice? Sabes lo que es peor cuando lo probé? Que sabe a mierda. Disculpa la palabra así lo dice en la peli. Dice. Lo peor es que sabe a mierda. ¿Y por qué hay gente que paga mucho por un sabor así? Por qué a mí me encanta el caviar. Creo que me he acostumbrado. Me han entrenado mi paladar. ¿A que ese sabor es bueno? ¿Porque condicionado por la alta cocina dices ah, pero por qué lo comen todos? Tiene que ser buenazo, No como el sushi. El sushi. La primera vez que yo lo comí dije no es un asco. Y ahora si no lo voy a comer una vez a la semana estoy mal. Es adictivo. Lo mismo es eso. Entonces hay gente que decide de probarlo y acostumbrar el paladar y hay gente que decide no probarlo simplemente. Y eso también podría ser un buen tema. O sea, la gente se acostumbrará a algo que estará. La inteligencia artificial se acostumbraría a que lo hace. Y porque todos dicen ah, la inteligencia artificial lo hace, el metaverso lo hace. ¿Esto podría estar funcionando? Yo creo que sí, porque el ser humano es tan. Es tan mediocre. Karina, que en realidad sí podríamos llegar a que cuando. Sí. En realidad, sí. Cuando ya todos estemos en el metaverso y todos comamos inteligencia artificial, comer comida normal va a ser la revolución. En realidad, lo que yo digo es que se necesitará mucho tiempo. O sea, yo Sí. Estoy muy, muy, mucho pegado en los en los Social Network y todo. Pero en realidad, si tú vas a ver. Mmm. Hay muchas personas que todavía no están mucho en Instagram. Mi novio, por ejemplo, ya no usa muchísimo Instagram, yo lo uso muchísimo más que ella y. Muchas personas no aceptarán ese tipo de vida que se va, que se va a ver, pero igualmente en siete yo millar de personas creo que serán dos que no van a no van a tener metaverso, todo el resto sí. Entonces estamos hablando de un de un grupo muy grande que va a comer de inteligencia artificial y le va a importar un culo de lo de lo que es al gusto o. Mmm. O personas que en realidad se vayan a acostumbrar a ese gusto. No depende siempre de lo que vayan, de lo que vaya y quién lo haga. Porque te digo, si lo hace más una futura, puede ser que hasta yo me la coma. Y te lo digo con sinceridad más dura la cagas polvo q quien quieras. ¿Los mejores chefs del mundo, si hacen eso es por fuerza que te lo voy a comer yo al menos entiendes? No sé. Las demás personas, las personas, las

populares. En este momento todavía no, pero cuando ya haya esa revolución tecnológica donde de verdad vamos a estar, como en Black Mirror. No sé si has visto Black Mirror de Netflix. Sí, metidos enganchados en ese tipo de que vamos a comer píldoras, que cuando te las comes te van a. No sé, no sé, sinceramente. Puede ser que lleguemos a un extremo tanto de tecnología que la inteligencia artificial va a ser una receta en una pastilla y que tú te comas esta pastilla. Vas a sentir los sabores mejores del mundo. Espero. Lo espero porque sería súper bonito verlo de haber visto que se comía desde cero. ¿A que no estamos ya comiendo experiencia?

Karina Abdala [00:46:40] Una de las cosas que más me decías del tema para crear la database, el tema de la cultura del chef de diferentes gustos y diferentes tradiciones. Pero como me decías, en tu caso en el cual ya no tenés, una receta típica ecuatoriana porque ya está contaminado. Ahora ¿es necesario llamar a diferentes chefs de diferentes países, por diferentes tradiciones o no?

Expert 1 [00:47:57] Yo creo que para obtener un dato preciso y que se acerque mucho más al paladar humano. Necesitarías coger diferentes tipos de chefs, si no no nacionales, sino un tipo de propio del mejor que hace arroces, el mejor que hace pastas, el mejor que hace, que hace pescados mejor, que hace pasteles, el mejor que hace bebidas, el mejor que hace fermentos, etcétera etcétera, etcétera Para poder tener estándares muy altos de cada persona. De las recetas son aparte, no? O sea, cómo se hace la pasta fresca por montura? Tiene una receta, yo tengo otra y etcétera, etcétera, etcétera Y va a haber muchas personas que tienen diferentes recetas. Mmm. A quién va a estar? Quién va a ser el que elegirá? Cuál es la mejor receta entre varios? Por qué? Porque quedarnos en uno. Sabes? No es que es muy, muy es es muy, muy complejo. O sea, es normal que si yo cojo una receta tradicional ecuatoriana y quiero que sea completamente ecuatoriana, trato de no contaminarla, no? Pero mi gusto se ha modificado tanto que yo la modifico por gusto, por una cuestión de gusto mío. Pero si se lo tengo que hacer a mi abuelo, por ejemplo, una sopa de pescado al ecuatoriana trato de no modificarla porque yo sé que mi abuelo me mata si le pongo algo que no le va a gustar.

Karina Abdala [00:49:16] ¿Una de las soluciones podría ser el pensar para quién tengo que armar ese database?

Expert 1 [00:49:28] ¿Quién va a ser? Va a ser el usuario final de la data que va a usar la inteligencia artificial, quien va a ser, va a ser un cocinero. Entonces el data tiene que ser hecho por cocineros profesionales, va a ser un usuario normal que no sabe mucho de cocina. Entonces puede. ¿Puede ser que basten recetas clásicas de los cocineros mejores del mundo para que una persona que no es cocinera esté bien, sabes? Porque al final un cocinero bueno, uno de los mejores del mundo, son los que parten de la tradición y la modifican. ¿Se contaminan, sabes? Entonces yo estoy seguro que el cocinero mejor del mundo te sabría hacer una lasaña perfecta. Así se las hace. Se la hace perfecta. Entiendes? Aunque no sea un plato que él vende en su en su. Entonces, en su restaurante. Entonces estamos hablando que igualmente vas a necesitar de dos tipos de usuarios. ¿Ya tienes que dividir los usuarios no? El usuario que puede ser un profesionista y que necesita un tipo de información y el usuario ve que va a ser una persona simplemente curiosa que quiera ver algo bueno, algo hecho bien, pero sin muchos, sin muchas, muchas técnicas, muchos pasajes. Algo muy simple, ¿no? Para que pueda también entenderlo. Mmm yo creo que, si yo leo la Biblia y la leo un cura, un párroco, hay dos. Hay dos. Dos diferentes procesos, ¿no? O sea, yo lo. Lo interpreto de un modo y el cura lo interpreta en otro. Lo mismo en la cocina. Si un cocinero lee una receta, la lee en un modo y la interpreta en un modo. Y uno que no es cocinero la interpreta en otro. O sea, es ahí donde se va a conectar lo que yo te dije. Si quieres de verdad llegar a que una persona que quiera hacer una receta de alta cocina o tradicional, lo mejor es que haya. ¿Y los pasajes perfectos no? Que te digan coge la cebolla y déjala en agua por 30 minutos. Después de esto, en 30 minutos seca la se haciendo de verdad. Muy detallista, detallado al, aunque sí parezca inútil como información, pero más información hay más. Una receta se va a acercar a lo que en realidad la persona que propuso en ella tal vez quiso hacerlo. Sabes? No es como las recetas de los recetarios normales que te dicen en 30 minutos, pero no te dicen que tienes que ponerla a secar, que tienes que poner un tipo de aceite, etcétera La hace muy general, o sea, no, si tienes cuanto basta, no, lo que sirva en realidad no, porque tienes un resultado totalmente diferente.

Karina Abdala [00:52:01] Y la inteligencia artificial ¿podría utilizarse como herramienta para eliminar, estos dos tipo de interpretaciones o serviría más como para unir el mundo de las personas que no somos chef ? Esa interpretación doble ¿va a existir siempre? la cual, si leo la receta dada por la inteligencia artificial, ¿eso no es que me va a limpiar mis errores de principiante?

Expert 1 [00:52:44] No, yo creo que van a saber siempre dos, dos mundos diferentes entre cocineros profesionistas del sector. Y personas normales que no cocinan. Es que es algo tan. Es. Es que. No, no va a ser nunca Va a ser posible que una inteligencia artificial pueda quitar lo mejor de una técnica de un cocinero y ponerla en una técnica de casa. Es imposible. Sabes? Para llegar a un producto, a un resultado de un producto perfecto, necesitas por fuerzas de diferentes pasos, porque si no, las personas que tienen estrella Michelin o que son cocineros renombrados no lo tendrían porque si hicieran lo mismo que hacen las demás personas. ¿Ahora te hago un ejemplo para hacer una carne muy buena, Ok? Que te salga super bien. Necesitas marinar la. No la pones a marinar, le pones el adobo. Si tú sabes de cocina sabes que si es un corte barato tienes que poner la A. Si se llama oxida en la. No, eso no me acuerdo la técnica como se llama, pero bueno si tú ves que es un corte que no, que no funciona, que no cuesta mucho, que no es carne Kobe o Baggio es una carne que compraste en el mercado. Lo. La técnica perfecta es meterla y ponerla en agua con gas. Ok. 40 minutos en la refrigeradora. Entonces quiere decir que yo ya 40 minutos me estoy perdiendo para hacer esa hidro. Bueno, no sé, carbonatación algo así. Hidrocarburos, carbonatación que hace que las moléculas de la del agua quiten toda la las impurezas de esa de esa carne mala, no digamos de bajo costo. De bajo costo. ¿Entonces de ahí que tienes que hacer? Secarla bien, hacerla que se repose, poner la marinar 48 horas, cocinarla la cocinas a la plancha, la cocinas como quieras, asada no la pasas. Y tú sabes que un cocinero sabe que el tiempo de cocción es el mismo tiempo de reposo antes de comerla. Entonces tú mira, imagínate qué proceso que te he dado ahorita para hacer una carne asada. Claro, entiendes que hago una tostada, entonces no compro una tostada, no me costó mucho. Entonces cogemos agua. Agua con, con, con gas. La dejamos 40 minutos, 50 minutos. Depende del grosor. Se seca, se hace marinar en lo que tú quieras por 48 horas para que la carne esté más suave. Y le podemos ayudar. Le ponemos miel, le ponemos sal, pimienta, lo que tú quieras. La vamos a cocinar. Entonces se cocina en 45 minutos porque es muy alta, no 45 minutos, 45 minutos. Tiene que reposar esa carne y después no lo va a comer. Estamos hablando de tres días de producción de carne a costa de carne, pero esa carne va a ser muy buena porque has aplicado técnica, has aplicado el tiempo, has aplicado al amor tu pH de tu humor, le has puesto todo el empeño, ¿no? ¿Eh? ¿Entonces cómo vas a poder? Quitar simple y simplificar. Esto ¿para qué? Para tener un buen resultado, la final será un resultado igual a un libro. De comprarlo, entonces va a ser muy difícil igualmente que una persona lo entienda, ¿no? Si tú no le das explicaciones del por qué tiene que ponerla en el agua con gas, si no es una carne que cueste poco, que cueste mucho, etcétera, etcétera, etcétera, etcétera entonces mmm, no va

a ser posible. Yo creo que no vaya a ser posible que una inteligencia artificial eh desmiembra una técnica para poder ayudar a la persona que no, no se entiende de cocina, digamos no, pero ¿yo quién soy para decirlo? Es mi modo de pensarlo. No.

Karina Abdala [00:56:24] Y digamos ¿si vos tuvieras que hacer, como un identikit de la persona que aceptaría probar este nuevo tipo de cocina, sería por lo que me has dicho una persona de joven, y qué más?

Expert 1 [00:56:50] Tiene que ser seguramente una persona de mente abierta. Listo. Una persona de mente abierta tiene que ser joven, no por fuerza tiene que ser joven, tiene que ser la. La primera persona es de mente abierta, o sea, dejarse llevar, porque si no te dejas llevar, cualquier tipo de tecnología te bloquea que sea hasta un celular. O sea, no, no, ¿simplemente una inteligencia artificial no? Porque si tú no quieres modernizarse, te compras el celular con los con los. Con los pulsantes. No siempre así. ¿Si quieres modernizar te compras un iPhone donde tu haciendo así eh? Tienes la ¿cómo se llama? de la de la huella digital, la de la cara, etcétera, etcétera. Exactamente. Entonces estamos hablando de una persona que quiera tenga hambre de tecnología, tenga hambre de modernización, una persona de mente abierta. De ahí que tenga un buen gusto o que no lo tenga. Es, es. Lamentablemente es diferente para cada uno, porque cada uno tiene un gusto, cada uno tiene recuerdos. Yo te podría decir que he probado los mejores platos del mundo, pero cuando yo voy a comerme un logro que hace mi vieja, tal vez sea el mejor plato del mundo. ¿Y si lo pruebo? Un chef dice está bueno, pero en realidad recuerdo la memoria del recuerdo, el recuerdo, eso. Eso te hace que te condicione tu paladar y diga Me acuerdo de cuando era pequeño, Que bonito estaba, ¿no? Y dices Ah, pero en realidad es un plato super simple hecho con dos verduras, un poquito de leche y un choclo, ¿no? Mmm. Es muy, muy complejo.

Karina Abdala [00:58:21] Y ¿pensás, por ejemplo, que las personas vegetarianos o veganos, estarían más abiertos a probar? ¿No se asociaría por ahora, a la inteligencia artificial, a un tipo de dieta? ya sea tanto por ideología o celíacos, pensando también en problemas de alergias.

Expert 1 [00:58:48] Las personas serían más. Ahí yo creo que las personas serían más abiertas en comerlo, porque mmm, como cocinero te puedo decir que cuando llega una comanda al restaurante, a un celíaco, un vegano, un vegetariano, un rescataría no es uf, no, pero en el

momento en que en el que en un momento en el que una persona que tenga problemas de encontrar cómo comer en el ambiente en el que estamos ahora, yo creo que sería mucho más propenso a probarlo. Ahí sí, celíacos. Estamos hablando de celíacos, vegetarianos, veganos, eh, Pastafari No es lo que sea, ¿no? Que puedan encontrar una solución al problema. Es algo. ¿Es una solución, sabes? Es una solución que le das. Pero igualmente es un margen de personas muy, muy pequeño. No para como para que funcione. Es una. Sería. No creo que de ahí naciera una aplicación solo para ellos. O sea, tenía que ser un poquito para todos, pero creo que ellos lo podrían usar mucho mejor. De nosotros. O sea, un vegetariano.

Karina Abdala [00:59:56] Casi. ¿Quizá ahí también entra un poco lo de la confianza? de decir bueno, la máquina no se va a confundir y ponerme un ingrediente que mi cuerpo...

Expert 1 [01:00:06] Bravísimo. Exacto. Es lo mismo. Perfecto. Sabes porque en los restaurantes hay mucha contaminación cruzada. Sabes? O sea, por, por, por pasta, por ser, por harinas, etcétera. Ser crustáceos. Entonces cuando tú. Ahí, ahí, ahí, se conecta, como como decíamos antes, lo de la confianza. Una máquina no se puede equivocar, no me va a pasar nada, Entonces voy a estar mucho más tranquilo. Yo que necesito de alguien que me haga eso y va a ser mucho más fácil, claro, mucho más fácil, demasiado. Hasta entonces será una cosa.

Karina Abdala [01:00:39] También entra un poco lo de la narrativa, porque por lo que hemos hablado no es imposible que la máquina por sí sola sin pasar por el ser humano realice el plato. ¿También entra en ese tipo de narrativa, pensando ese perfil de personas sería como más adapta a esto, a creerse esa narración de la perfección y la impureza en el plato por no pasar por el ser humano? Lo que estábamos hablando como una fantasía, igual que la señora que hace la pasta y atrás están las máquinas en ese sentido.

Expert 1 [01:01:18] Exactamente. Mmm. Igualmente va a tener siempre que haber un data de una persona que en realidad tenga un buen gusto vegano, un buen gusto que no coma gluten exactamente. Así que siempre va a tener que haber alguien atrás que le dé una impronta, una identidad de esa que haya inteligencia artificial, porque si no va a ser simplemente algo comercial, no? Es que si no regresaríamos lo mismo. Lo que estamos diciendo que es algo industrial. Che, los veganos, los vegetarianos comen muchas cosas industriales porque no hay la la capacidad de producción en los restaurantes para poder presentar un plato decente, que sea

vegano, que sea sin gluten, que sea vegetariano, ¿no? Entonces están por fuerzas obligadas a comerse esos esas hamburguesas vegetarianas donde hay muchas cosas de proteínas, del del del pídelo y etcétera, etcétera. Mmm. La solución sería que en realidad preparen platos. O. Buenos, no de simples frescos. Llegar a una solución de que te venga un plato sin gluten fresco, un plato, eh, Vegano fresco. ¿Qué dices? Ah, lo puedo hacer yo también. En casa no me ayuda la inteligencia artificial. Coge esta. Esta berenjena hasta la portada minutos, quítale la piel, ponla con la salsa de soja, etcétera, etcétera, etcétera, etcétera Entonces no sería mal, pero siempre tiene que haber atrás un profesional, un cocinero o alguien al menos que tenga la capacidad de poder producir estas recetas y que sean de verdad buenas, ¿no? Que no sean simplemente. Por ejemplo, ahorita tengo abierto Open, yo escribo escribir una receta vegana. Veamos lo que me sale, ¿eh? Ahora me sale hamburguesa vegana de lentejas y espinacas. Lentejas cocidas se van a aplicar espinaca. Ofrezca ofrezcan diente de ajo, cucharada de comino, cúrcuma, blablá, recalentar el horno. Entonces no me digas. Se me bloquea porque no me da más colocar las hamburguesas. Pero sustancialmente es lo mismo que hacen las demás personas. O sea, este no, ya no es muy nuevo esto de coger lentejas o coger, ¿eh? Estos los o los frijoles y cocinarlos y hacer una hamburguesa no es nuevo para nada. ¿Distancia la ahora mismo Tyson un ejemplo en vivo con la con Open mind Pero si ya viene otra persona y te dice voy a hacerte probar una berenjena asada pero que en realidad está rellena de crema de demandarla con esto y con el otro, con un aceite de ajonjolí que llega y con y te voy a hacer el aceite a ti mismo, etcétera ya sería una experiencia mejor. El storytelling está ahí mismo, sin necesidad, pero tiene que haber siempre una persona atrás que te lo haga, ¿Sabes que pueda ser un profesionista o un profesionista?

Karina Abdala [01:04:22] No, eso estaba pensando hasta ahora. Lo que hemos hablado es que la inteligencia artificial te replique lo que se le dio en la database, pero ¿existe la posibilidad de aplicaciones en las cuales la inteligencia artificial crea una mezcla de este ingrediente con este otro que salga algo nuevo? Y después que el ser humano lo teste en este caso, por ejemplo, la aplicación Flavor Graph, y que la inteligencia artificial logre su propia receta envasado. O sea, ¿eso lo ves posible?.

Expert 1 [01:05:31] Yo lo veo posible. Mmm, ni mucho. O sea, había un libro. Hay un libro que casi todos los cocineros lo hemos leído y se llama en español. Se llamaría Arcoíris de sabores o algo así. Y tú vas a ver, eh, todos los tipos de sabores que mezcla este libro tramite

un profesionista, creo, no sé, no me acuerdo. Ahora a mí no me gustaron. Yo creo que el 70% de esos, de esos de esas mezclas no estaban en mi en mi gusto. Por ejemplo, puede ser que un gusto italiano esté, etcétera. Mmm Puede ser que después de años de testing y de experimentos con la inteligencia artificial de un profesionista, llegue a crearse este algoritmo de que la máquina mismo trámite matemática quiere decir que. Ah, okay, perfecto. Estos 100 gustos han gustado mucho, estos otros 100 han gustado mucho. Entonces vamos a ver si es que nosotros podemos, claro, matemáticamente yo creo que sí se puede hacer, okay, pero siempre va a tener que haber una persona que pruebe y que diga si no. Una es muy poco, yo diría tendrían que haber 100 personas que prueben para poder decir sí o no y sacar igualmente una media matemática, no para decir que es lo mismo que sucede en un restaurante Yo pongo un menú. Un menú lo testeo quiere decir que sí. Que si yo en 100 personas que vienen a comer en mi restaurante a 99 les ha gustado y a uno no, ese uno no vale a 99 está bien, son 100. Entonces lo mismo puede ser que a uno le guste, a 99 no le guste. Entonces ese ese gusto no va y se elimina. Entonces creo que sea lo mismo con una, con una inteligencia artificial, tratar de hacer una. El testing en la experimentación en si es muy importante sea para la inteligencia artificial que para un cocinero real, entonces es algo que no es, no es algo que va muy allá de nosotros. Se queda aquí siempre con nosotros, los reales y la inteligencia artificial, que es una tecnología nueva.

Karina Abdala [01:07:35] Y se le está dando, ¿una forma de experiencia a la inteligencia artificial en base a los errores? por ejemplo, cuando vos decís se larga un resultado de una receta, yo la pruebo, la testeo si le va bien, se puede hablar de que ella misma va creando experiencia para aprender cuál es el gusto ideal para el ser humano.

Expert 1 [01:08:05] Sí, sí. Se podría hacer tranquilamente. Obviamente, depende de qué número de personas, qué tradición, de qué parte del mundo vienen. Porque, eh, los gustos italianos, por ejemplo, son muy apreciados, pero son gustos que en realidad sí. Yo me acuerdo la primera vez que comí el gran Ah pagano, el performa el queso grana no me gustó para nada. Era un gusto que era un umami Xesco que a mí me encanta ahora, pero cuando yo lo probé, que tenía 12 años, dije no, que esto, esto es un asco. Lo mismo del caviar, ¿no? Entonces cuando yo comienzo lame en la primera vez y yo te hablo de ecuatoriano que probé salame, que mi mamá me lo llevó de Italia, yo cogí, lo corté y lo freí en aceite. Imagínate que sí, si lo hago ahora me mato yo solo. ¿Entonces siempre es siempre en base de gustos, no de qué tipo de tradición, De dónde viene este gusto? No va a poder ser una. Yo creo que tendría que ser algo como como

dividido por tradiciones, porque igualmente cada país pase años que pasen siempre va a tener la tradición y siempre van a tener sus gustos. Y es por eso que este mundo es tan lindo, porque cada uno tiene sus gustos, sus recetas, sus tradiciones, sus recuerdos y una inteligencia artificial no va a poder nunca llegar a dar un gusto unánime para todos.

Karina Abdala [01:09:26] ¿Existe una estandarización de gustos?.

Expert 1 [01:09:29] No, no absolutamente. O sea, es muy difícil, muy, muy difícil. Solo la alta cocina. Mmm y ni siquiera eso, porque la alta cocina se basa por regiones, porque por localidad sabes. De nuestra localidad. Y yo uso estos ingredientes con técnicas avanzadas y la gente dice guau, o yo como esa esa verdura todos los días, pero él me la ha hecho en un modo no simplemente una técnica aplicada más el storytelling y bla, bla. En el momento en el que yo me separo y yo en el mismo plato que hice en Italia, lo voy a hacer en Colombia no les va a gustar a los colombianos, voy a Uruguay. Ese gusto no les va a gustar porque cada uno tiene su propio gusto, cada uno tiene su propia identidad, su propia cultura, ¿no? Y es difícil.

Karina Abdala [01:10:20] A mí lo que me hace cuestionar es qué tipo de database se necesita. Porque si partimos de la base de que no existe la estandarización del gusto, pero si un chef importante dice este gusto vale, a la inteligencia artificial le da el Ok. Pero este gusto, esta para cierta cultura, para cierto chef, para cierto país. ¿La solución sería abrir estas aplicaciones en todas partes del mundo?

Expert 1 [01:11:05] Es exactamente exacto. ¿Es que es que cómo te explico? En Italia. Hay unas muchas regiones y en cada región hay una, hay una cultura, hay un acento, hay un tipo de pasta, hay un tipo de comida. Entonces, si yo llevo el risotto, la mina y dice en Puglia ya los, ya los de en Puglia me dicen no, cómetelo tú, Yo me como una pasta con el tomate. Estamos hablando de mil kilómetros, mil. Por mil kilómetros.

Karina Abdala [01:11:33] Por eso ¿cómo se estandariza?

Expert 1 [01:11:40] Yo creo que se podría crear un filtro. Yo creo que se podría crear un filtro para ayudar. ¿No? O sea, eh, Quiero hacer una receta. No. Escríbeme una receta de milano o de puya o de Ecuador de esta región, porque igualmente en la parte de Ecuador la parte de la costa

tiene un tipo de comida. A la parte de la sierra tiene otra, la de las Andes tiene otra de la del Amazonas tiene otra. Entonces es quiero comer, escribirlo ahora mismo.

Karina Abdala [01:12:07] Más la ubicación tuya me imagino que incide, porque si vos lo estás buscando de Italia te va a poner capaz que ingredientes de Ecuador que consigas en Italia por decir.

Expert 1 [01:12:17] Exactamente, exactamente. O bueno, sería un poquito más difícil. Pero sí, sí, sí, sí. Ahora estoy en una receta amazónica ecuatoriana.

Karina Abdala [01:12:29] Lo otro que pensaba, por ejemplo, en el tema de los casos de salud, si no es necesario también tener dentro de la database nutricionistas. ¿No sé hasta qué punto?

Expert 1 [01:12:48] Siempre de que depende siempre de qué tipo de usuario vas a tener, porque también hay esos tipos de personas que te digan bueno, esta receta tiene kilocalorías porque me interesa saberlo, pero a mí, sinceramente no me interesa. No sé si a ti te interesa ver las kilocalorías de los alimentos, ¿no?

Karina Abdala [01:13:05] Pero en la alergia. O sea, pensando por ejemplo en un vegano o vegetariano, ¿es necesario tener un nutricionista o un chef ya eso lo puede contemplar completo?

Expert 1 [01:13:20] No, no en teoría. Si tú me dices hacerte un plato vegano sin gluten yo te lo sé hacer. Pero no creo el nutricionista te podría estar complementando. La receta es ya como para complementar. No, no sirve para hacer la y que el chef te lo mete en práctica. O sea, al final la cocina es química, ¿no? Si tú sabes cocinar las cosas normales, en teoría tendrías que saber cocinar también platos veganos o libres de gluten, libres de pescado, etcétera. No creo que sea una mmm, no creo que sea algo mmm extremadamente necesario tener un nutricionista en esto. Vamos en, por ejemplo, si yo le escribo a la máquina, a la inteligencia artificial, escribo Escríbeme una receta para deportistas. ¿Ahí es donde en realidad yo creo que se necesitaría un nutricionista, porque un cocinero ya no podría entrar en esa parte de nutrición, sabes? Ahí o no sé, escríbeme una receta para un enfermo de diabetes. Claro que vamos a hablar, vamos a hablar de una persona que sufre de diabetes. Entonces tienes que tener en cuenta todo el tipo de

azúcares que hay en el mundo vegetal. Un tomate tiene determinada cantidad de azúcar, una fruta, una fresa, tiene determinada cantidad de azúcar, el arroz tiene determinada cantidad de azúcar. Entonces, ¿cómo vamos a poder balancear una receta? Ahí es donde entran nutricionistas con el cocinero y hacen la receta perfecta diciendo tú vas a poder usar solo determinado tipo de tomate en determinado modo, cocinando en este modo. Entonces ahí se une profesión más ciencia y se saca una receta decente y perfecta. No creo.

Karina Abdala [01:15:12] Sí, ¿quizá la inteligencia artificial puede servir de conexión entre los dos mundos, o sea, si se utiliza para la gente toma en cuenta la Database, también un nutricionista en los casos específicos de problemas de salud?

Expert 1[01:15:34] Hay personas que no sé no comen por, simplemente porque el cuerpo no las, no las acepta, porque los hace inflarse. Hay intolerancias, alergias, eh ya enfermedades tipo diabetes, eh, deportistas que tienen que tener un cierto tipo de dieta. Mmm ahora no sé, una dieta para un astronauta te hablo, no digo que ahí ya, ya entra lo que es la industrialización y las exigencias, porque no creo que sea mucho así, pero no creo que haya un límite. Karina Para para una colaboración no creo yo. Van a haber 10.000 tipos de. O sea, ¿quién te dice que alguien no va a poder preguntar cómo hago de comer la escribidme una receta para perros te lo escribimos ahora mismo se escribe Yo no, yo no quiero ya de comprar comida para para los perros porque quiero hacérmela yo y tú vas en YouTube y la encuentras, ¿no? ¿Y por qué? ¿Por qué no? No lo puedo hacer. Una. Una de tres fases. Arroz, huevos, taza de caldo de pollo. Cuchara de oliva. No, no, no. Escribe Sal en una mezcla de arroz. ¿Los huevos se entiendes? ¿Ahí? No necesitamos ya un cocinar. Estamos Un doctor de animales. ¿Como se llama? Un veterinario. Que si estamos hablando de un. No sé, Comida para caballos. Natural comida. Es que es muy vario. La cuestión comida es ¿quién? ¿cuál es el usuario final? No. ¿De qué? ¿De qué región quieres probar? O sea, yo entro en la en la inteligencia artificial y cuando yo creo que se podría hacer un filtro donde quiero que me cocines algo. Yo estoy en Italia y quiero comer algo ecuatoriano, quiero comer algo chino, ¿no? Entonces trámite Maps, trámite Google Maps y todo te va a poder hasta decir compra esto en este, en este mercado, en ese lugar, gracias a los feedback de las diferentes personas, ¿no? Este aquí encuentro el caso, pues aquí encuentro el nopal, aquí encuentro el choclo de la mazorca, etcétera, etcétera, etcétera. Tendrían que. Tendría que ser algo tan. Tan conectado con muchas más cosas, ¿no? Para que sea completa la experiencia y para que en realidad sirva algo. Porque a mí que yo te escriba una receta de alta

cocina, pero tú como Bueno, ahora ya Amazon no compro todo en Amazon, que es siempre algo, siempre que no se podría hacer. Simplemente que ya tienes todos los links de Amazon. Es que es un trabajo. Yo solo al pensar la data de tiene que ser algo enorme, de poner tanta información, esa.

Karina Abdala [01:18:33] De una parte veo como que ¿es posible en el caso de que ya está Maps, donde están los supermercados más cercanos, una zona donde tiene cada ingrediente que puedes encontrar, o sea, te da una parte si nos ponemos a pensar toda la información que hay de internet?

Expert 1 [01:19:11] Sí, se podría hacer tranquilamente. Pero sabes, no sé cómo funciona la cuestión burocrática. Maps me daría la posibilidad de hacer conexiones con Open Mind? ¿Eh? Me daría la posibilidad de usar Maps o Google o yo qué sé, Instagram, Facebook, poder coger informaciones. Es que me vuelvo loco solo a pensarlas a veces, porque es algo tan absurdo, tan futurístico que digo no estamos mal, Sí. O sea, ya que te digan directamente que te vengan todos los links donde puedes comprar cada ingrediente, los feedback de las personas, el eh, hasta que se te abra un video. No sé, es que me vuelvo loco de verdad, solo pensarlo me vuelvo loco, se me se me abre la cabeza y me vienen 200.200 mil ideas y me quedo loco yo mismo con lo que me viene en la cabeza. Pero yo creo que sí, que sí se podría hacer para completarlo todo. Tendría que ser algo muy conectado con, con otras, otras, otras cosas, no como puede ser, como decía Google Maps, nutricionistas, veterinarios, eh, chefs veganos, chefs sin gluten, chef de alta cocina, chef de cocina tradicional, eh, etcétera, etcétera abuelitas, etcétera, etcétera, etcétera. No es que de verdad no para que sea completo al 100, para tener un resultado que, en realidad, aunque si nosotros le pongamos todo esto, eso llegaría a ser, creo, un resultado de 1 a 101 60. Mmm. ¿Cuánto se podría acercar a lo que hace un humano? Sabes que va él mismo va a comprar la comida. Él mismo sabe dónde ir. Es. Es muy diferente. Y poniéndole todo lo que hemos dicho ahora en esta hora y media, en realidad. Mmm. Yo creo que llegaríamos igualmente A1A1 60% y de ahí de que llegues al 60%. Es de ahí de cuando se tendría que comenzar a trabajar en ello, no a modificar, a perfeccionar. A ver dónde están las fallas, cuáles son las fallas. El cocinero no funciona, entonces se tienen que poner otro tipo de detalles, ¿eh? El usuario es diferente, cambia entre zonas. En Ecuador este tipo de de de información no sirve en en en Cuba este tipo de información sirve mucho más. Etcétera, etcétera. Te decía yo creo que desde el 50 o 60 años. Va a estar perfecto. Espero poder estar ahí. ¿Verlo? Me encantaría.

Karina Abdala [01:21:36] Si decís que el trabajo del chef cambiaría muchísimo en base a la utilización de la inteligencia artificial, ¿cómo lo ves?

Expert 1 [01:21:50] Yo sí lo veo. Si lo veo en el momento en el que todos, pero a colaboran con él con el proyecto, porque hay muchas personas que obviamente se hacen pagar para abrir un restaurante. Hay muchas personas que se hacen pagar por hacerte un menú, hay muchas personas que se hacen pagar, entonces estamos hablando igualmente de dinero, ¿no? Cuando se habla de dinero es mucho más, más, mucho más difícil que un chef diga no, por qué yo te tengo que dar toda la información que me que me he tomado en 50 años de trabajo y dártela a ti para ponerla dentro del data boys, de tu de tu inteligencia artificial, yo que gano, etcétera, etcétera, etcétera. Hay mucho pro y muchos contra que al que hay que pensarlo, obviamente no todos. Creo que colaboraría, ¿no? Desde una persona que te viera el marketing, desde una persona que tiene las recetas de una persona que te diga como abrir un restaurante. Pero si tú tienes todas las personas que te colaboran, creo que se podría llegar a un buen a un buen resultado, ¡no de decir wow! Una inteligencia artificial me puede dar un resultado del 60% que a veces está mucho mejor de una persona normal y de un 100. Estoy hablando de un súper profesionista súper profesional, no de un cualquier profesional super ultra, no de una persona normal. Una persona normal puede ser que llegue hasta un 30 o un 40% de probabilidad de que supere la inteligencia artificial. ¿Eh? No sé. Hay que verlo. Hay que vivirlo para verlo.

Karina Abdala [01:23:22] Bueno, muchas gracias por todo tu tiempo.

Expert 1 [01:23:26] Se pasó volando. Y también es muy. Es interesante el tema.

Karina Abdala [01:23:34] Si hay algo más que quedó por fuera, que sentí que sea necesario agregar a todo lo que hemos hablado podes hacerlo.

Expert 1 [01:24:08] No, yo creo que hemos estado muy completos. En realidad, la conversación ha sido muy intensa, muy bonita, gracias a ti también, porque son pocas las veces que uno se puede poner permitir de hablar de un argumento tan delicado como puede ser, la inteligencia artificial que va a tocar nuestra cultura, nuestra vida, nuestros procesos diarios. Y

como siempre, si veo algo que me interesa o se me viene en mente algo, yo te escribo un e-mail, te escribo en Instagram, no te preocupes.

Karina Abdala [01:24:41] Gracias, gracias.

Interview with Chef Working with Artificial Intelligence Expert 2

Karina Abdala [00:00:10] Cet entretien s'inscrit dans le cadre de ma recherche doctorale. Sur la base de l'information que j'ai pu recueillir au cours de la première année de ma recherche et jamais avoir l'avis d'un expert en particulier en ce qui concerne la relation entre l'intelligence artificielle et la gastronomie. Et l'entretien dura 45 minutes et je vous remercie pour avoir accepté l'entretien en ligne et avoir signé le formulaire. Pour commencer Je voudrais savoir de la profession. Et Comment voyez-vous la relation entre l'artiste, l'expert en nutrition et l'intelligence artificielle ? Et depuis combien de temps travaillez-vous sur l'intelligence artificielle et la gastronomie ?

Expert 2 [00:01:17] Ça fait beaucoup de questions. Alors. C'est quoi la première question pour commencer ?

Karina Abdala [00:01:25] Comment avez-vous commencé à travailler avec l'intelligence artificielle et la gastronomie ?

Expert 2 [00:01:32] Ah oui? Ben. En fait, moi, l'intelligence artificielle, quand j'ai commencé à l'utiliser de manière consciente parce que je l'utilisais de manière inconsciente comme tout le monde avant avec les Google ou les guidages de GPS de voiture. Et tout ça, c'était pour fabriquer des images. Parce qu'en fait, moi je suis artiste contemporain et je travaille sur la nourriture. Et du coup. Je fabrique des produits aussi comme des hommes. Je fais du marketing, donc il faut des images, il faut des choses. Parce que ce qui m'intéresse, c'est la relation qu'on a à la nourriture mise en parallèle, la relation qu'on peut avoir avec l'art, mise en parallèle avec la relation qu'on peut avoir avec les gens. Parce que manger c'est faire rentrer quelque chose d'étranger à l'intérieur de soi. Et ça, c'est très largement la métaphore de beaucoup de choses. Qu'est ce qu'on fait des étrangers? Qu'est ce qu'on fait de soi et comment on protège? Et comment on accepte et comment. Il y a des règles à tout ça. Et ce que j'aime dans la nourriture? C'est que c'est des règles qu'on ne dit pas. On les transmet par des gestes ou par d'autres mots, mais c'est rarement direct. C'est la famille en premier qui dit après c'est la société. Quand on va à l'école ou qu'on mange dans des cantines, c'est là. Moi, j'ai vu mon fils. À partir du

moment où il a été mangé à la cantine, il a commencé à vraiment dire j'aime pas ça, j'aime pas ça, alors qu'avant c'était pas ça. Et bien j'ai trouvé que c'était quand même bien parce que ça veut dire socialiser. Et du coup il y a une influence sociale très forte. Mais on va jamais en profondeur sur pourquoi on n'aime pas quelque chose ou pourquoi. On trouve que c'est dégoutant parce qu'au fond, c'est les histoires de goût, le bon goût, le mauvais goût. Et c'est moi ça qui m'intéresse. Parce que le bon goût et le mauvais goût, c'est des marqueurs de classe sociale et toute la problématique. Pour moi, la problématique, une des problématiques mondiales, c'est c'est cette histoire de lutte des classes et comment elle est. Comment elle est utilisée par des gens qui réfléchissent à ça. Et l'accès à la nourriture et la culture de la nourriture tend à conserver les classes tout en créant des illusions de changement de classe. Alors qu'est ce qu'on peut dire de ça? Qu'est ce que c'est? Qu'est ce que l'IA nous dit là dedans? Euh je vais revenir au tout début. Quand j'ai commencé à utiliser l'IA, c'était pour faire des images et j'ai tout de suite voulu faire des images de nourriture. C'était là, c'était ce qui m'intéressait. Alors c'était les premières versions de C'était des GaNS, je ne sais plus le nom. C'était il y a deux ans, trois ans, et c'était très primitif, les images de basse qualité. Mais ce que je voulais, c'était. Je partais du principe qu'il y a eu un database du Dataset. Elle est entraînée sur des images et que c'est vague. C'est banque d'images. C'est un petit peu l'expression de la culture globale d'Internet, mais surtout de la culture occidentale, parce que c'est les dataset de Google ou des database occidentales. Du coup, il y a quelque chose de l'ordre de la psychanalyse. Ce qui va sortir des demandes des promptes, ce sera certainement quand ça sera basé sur ces images qui sont de la culture occidentale. Et alors? Le but pour moi, c'était d'aller chercher. Alors de travailler avec cette basse définition d'image et le côté liquide dû à la technique en fait de l'IA, de la manière de mélanger les choses, c'est une fusion. Enfin, c'était une fusion puisque maintenant c'est très, ça a beaucoup beaucoup évolué et du coup je pensais aussi à la nourriture fusion et à la nourriture mondialisée. Et qu'elle est quel est l'ingrédient le le plus mondialisé en terme d'image et qui pose plein de questions intéressantes? Pour moi, ce qui m'intéresse c'est le fromage fondu. C'est ce fromage jaune qu'on peut voir qui est le typique. Le fromage américain veulent le faux cheddar industriel qu'on voit sur toutes les images de foodporn. Ce fromage, par exemple, il arrive en Inde depuis depuis deux ou trois ans, en Inde indien et depuis plusieurs années. En Inde, on ne sait pas exactement ce que c'est des fromages affinés comme ça, puisque la culture du fromage, c'est plutôt le fromage frais, pas salé. Aucun rapport. Et du coup, ils fabriquent des sauces jaunes grâce qui coule, qui ont la mouture, la. Pour les yeux, c'est comme le fromage qu'ils ont vu sur internet ou dans les publicités. Et sur les pizzas, il y a

des fromages, mais c'est pas du fromage, c'est autre chose. C'est juste la matière. Et c'est le plaisir des yeux d'abord, avant, avant le plaisir du voilà, c'est. Et du coup, c'est ça que j'ai commencé à travailler avec l'IA. C'est ce fromage fondu synthétique. Bref, c'est très bizarre. Mais comment? Comment l'IA peut. Dans les années 80, il y a eu cette période où il y a eu toutes ces publicités aux États-Unis pour les pizzas et le fromage fondu. Et alors il y avait cette suggestion de soulever la part de pizza avec le fromage qui s'appelle Cheese Point et Cheese. Pour toutes les agences de pub, de photo, de nourriture, devez savoir faire autre chose. Et c'est pas facile, il faut rajouter de la colle, il faut rajouter plein de choses et pour que ça fasse le cheese pour le parfait. Après le bol, il est arrivé dans la première pub Publicité Pizza Hut en Union Soviétique après la chute du mur et ils ont eu leur si vous voulez, ils sont entrés dans le désir du fromage fondu. Eh bien, c'est une civilisation du fromage fondu. C'est obsédant. Et maintenant, avec les burgers partout, les gens me regardent. Partout. Il y a de ce fromage fondu, Il y a vraiment partout. Voilà. Et du coup, voilà, je travaille dessus en image. Et puis aussi plus récemment à ChatGPT. Donc moi je l'utilise pour la gastronomie finalement peu, mais je lui ai demandé de travailler sur des œuvres d'art autour de la gastronomie. Donc je lui ai expliqué que j'avais ce collectif qui s'appelle Atelier du ventre. C'est la marque. Je faisais avec ma avec ma compagne qui est aussi une artiste. On a fait Atelier du monde et j'ai dit à ChatGPT Voilà, on est ce duo d'artistes qui travaillent autour de la nourriture et on vient d'être contactés par le projet en Arabie Saoudite. Line Ça, c'est une fiction, c'est une fiction. Ils veulent faire une exposition. Il y a une curator qui veut nous inviter pour faire une œuvre, une œuvre gigantesque, hein? C'est le projet Europa. Et j'ai donné beaucoup d'indices sur nous, sur Atelier du ventre avec sur les choses sur lesquelles on travaille, l'anthropocène. Quelque chose de très critique en fait. En fait, j'avais parlé de Zola, hein, et en fait j'avais parlé de tout ça et c'est ChatGPT qui a inventé cette histoire, c'est pas moi qui l'ai inventé, c'est ChatGPT qui a dit voilà la curator de l'exposition je ne sais pas quoi à The Line vous invite. Et donc je lui ai demandé d'écrire la lettre. Donc la curator a écrit une lettre. Voilà, ChatGPT a tout inventé et il a inventé l'œuvre, les œuvres qu'on pouvait présenter. Je lui ai demandé et donc des œuvres autour de la nourriture qui devrait avoir du sens. Et alors il invente des œuvres très stéréotypées, avec des plats qui seraient qui symboliserait des pays du monde. Est ce que j'ai parlé de la tectonique des plaques et du volcanisme? Et du coup ils associent les nourritures avec des pays et c'est très réducteur et ce n'est pas du tout bienvenu dans un contexte où on fait attention à ce qu'on dit, dans un contexte où on fait attention à ce qu'on dit, ça marche pas du tout. En fait, ces réductions sont très. C'est ça? C'est très simplifié et en même temps, ça ressemble vraiment à des choses

qu'on pourrait voir dans des grandes foires d'art contemporain. Ça marcherait vraiment, ça pourrait vraiment être là bas de ligne. Et après, j'ai continué en demandant des recettes, en cherchant des recettes. Alors, j'utilise la version Chat GPT de Bing de Microsoft, Donc c'est à peu près Chat GPT quatre fois, je crois, et. Et plus on l'utilise et plus il fait attention en fait. En fait, les premières semaines, on pouvait lui faire créer des choses et les maladroits. Elle est maladroite et il y a de la maladresse et elle a essayé d'inventer des recettes et c'est très maladroit. Et plus ça va et plus elle fait attention aux maladresses et elle fait, plus elle sur eux. Elle se replie dans la citation d'autre de source et c'est très difficile de lui faire dépasser. Et au bout d'un moment elle dit d'ailleurs je ne peux pas inventer. Ça dépend des fois, mais des fois elle dit je ne peux pas inventer, je suis une intelligence artificielle, je ne peux pas inventer une une une recette. Et c'est très curieux parce qu'elle a conscience que beaucoup de gens essaient de lui faire faire des choses bizarres. Alors il y a et puis il y a cette tendance. De YouTube. Toutes ces vidéos cuisinaient des choses proposées par Chat GPT. On voit clairement que ce n'est pas au point ce côté là puisqu'elle fait que citer des choses et faire un mélange. Moi je trouve que pas. C'est pas l'endroit où c'est intéressant. Là où c'est intéressant, c'est bien la prédiction des goûts futurs, là je crois. Parce que l'intelligence artificielle appliquée à l'industrie de la nourriture, c'est. Très basiquement, savoir. Il y a plusieurs utilisations des caméras et des robots, des capteurs. Savoir trier la nourriture très rapidement, c'est une chose, mais savoir recomposer des menus possibles avec de la nourriture qui est disponible, ça c'est très intéressant. Je pense que. Je pense que Samsung avec leur frigos intelligents, ils ont déjà et sont déjà là dessus. Mais ça crée des recettes comme Chat GPT et des recettes un peu bancale.

Karina Abdala [00:12:33] Et comment savoir s'il s'agit d'une recette créer par une l'intelligence artificielle ou d'une citation de qualche chose de déjà creé.

Expert 2 [00:12:54] C'est là que je crois des boîtes comme Flavor Graph. Alors je crois que j'ai installé ça sur mon téléphone. Mais oui, mais je sais plus si je l'ai installé. Oui j'ai installé ce truc de Sony et mes comptes, mais moi je suis pas. Je l'ai installé comme un user, un utilisateur normal et en fait je crois que je n'ai pas compris l'utilisation. Je. Je dois faire des dégustations et rentrer des choses. En fait, ils attendent de moi que je nourrisse la database, que je mette des choses dans la database. Mais pour avoir accès à la database, j'imagine qu'il faut payer plus cher, fait qu'il faut payer et payer cher. Là où je voulais en venir. Ce que je trouve inquiétant, c'est. L'IA qui prédit les goûts futurs parce que elle se base sur les sur les inputs

comme moi. On va faire une dégustation et mettre les choses. Mais enfin, en recherche, en science, en recherche, on sait bien que les biais il y a des il y a des biais partout. Mais là c'est évident que l'industrie agroalimentaire, elle fait si elle peut prédire que des choses qu'elle a déjà inventé elle même en plus les tendances. Alors maintenant l'image fait partie des tendances avec avec Tictoc, avec les réseaux sociaux, on mange beaucoup avec l'image et donc la tendance, c'est qu'on va finir par manger des images. Enfin je veux dire, quand on voit par exemple les hamburgers qui font peut être 70 % de la carte du volume des choses vendues dans certains restaurants, même des fois plus que 70 %, C'est. Ça veut dire quoi cette tendance là? Ça veut dire déjà que si le et les cuisines, ça veut dire qu'on peut embaucher des cuisiniers qui sont des gens qui vont assembler des choses, moins de qualifications, ça veut dire que si on a un vrai cuisinier, vrai cuisinier, il va s'ennuyer. Parce que faire des hamburgers toute la journée, c'est ennuyeux, mais ça veut dire qu'ils savent qu'ils peuvent vendre quelque chose et qu'ils peuvent acheter et que c'est économique.

Karina Abdala [00:15:06] La database de Flavor Graph est créée pour les suggestions des utilisateurs uniquement en fonction de leurs préférences ou existe-t-il un classement d'experts pour créer de nouveaux goûts ?

Expert 2 [00:15:43] La question c'est est ce que c'est mieux d'avoir des experts ou est ce que c'est mieux d'avoir des gens. Donc là le truc c'est que les opinions populaires sur la nourriture, il y a quelques études marrantes. Quand on demande à un panel de personnes aux Américains, vous préférez un café noir profond avec des notes aromatiques fortes ou un café qui a pas beaucoup de goût? Tout le monde préfère que c'est dark. Et sur les mêmes gens qui vont déguster plusieurs cafés en vrai, ils préfèrent celui qui n'a pas beaucoup de goût. Mais dans les mots, ils préfèrent et souvent c'est ça. Il y a Malcolm Gladwell qui a fait un super Ted Conference qui s'appelle What the Winner About Spaghetti Sauce et qui est vachement intéressant sur qu'est ce qu'on veut réellement et qu'est ce qu'on dit qu'on veut. Et c'est pas la même chose en fait. Et alors en plus maintenant, avec le facteur mental des des recettes tendance le grand public, c'est compliqué. Alors moi je travaille beaucoup avec les fermentations et les microbes, les micro-organismes et tout ça. Et ça, ça fait, ça fait vraiment peur. Et alors, qu'est ce que ça fait partie des tendances food actuelles? Le truc, c'est qu'on a l'impression qu'il faut que la nourriture soit passée par des biais de reconnaissance, c'est à dire peut être des grands chefs, puis popularisées dans des émissions de télévision pour qu'on puisse que le grand public

puisse accéder à quelque chose. C'est comme si il y avait besoin d'une digestion médiatique pour qu'on accepte les nouvelles choses. En ce moment, je travaille beaucoup avec la simili et les simili carnés. D'ailleurs, je me demande à Chat GPT comment on fait. Et il est pas très grand, il répète, il sait pas trop. Et les simili carnés, c'est pareil. Alors c'est intéressant parce que j'ai fait des ateliers où on fabrique des carnets fabriqués en simili carnés. C'est fabriquer un muscle. C'est ça que je leur dis. Et donc l'intérêt d'un bon simili carné, c'est qu'il faut qu'il y ait de la peau, du gras, des tendons, des cartilages. Et donc il faut fabriquer toutes les textures, parce que c'est ça qu'on aime. C'est ça la viande. Et c'est la seule. Et aussi parce que je suis un artiste et que c'est de la sculpture qu'on fait et qu'on sculpte comme comme sculpter des athlètes dans le marbre. Sauf qu'on fait, on veut retrouver des choses. Et tout ça pour dire quoi? Que quand on dit ça, les véganes trouvent ça écœurant. Mais les gens qui mangent de la viande aussi trouvent que c'est écœurant parce que personne veut savoir que de la viande, c'est des tendons et de l'anatomie quoi. Alors c'est pour ça qu'il y a que les experts qui savent ça et qui savent que les tendons, ça fait du collagène et ça fait de la sauce. Ça, ça donne de. La texture à la sauce, la longueur, tout ça. Les experts, ils savent, mais le grand public ne peut pas dire on va recréer un corps et tout ça. Et le problème des experts, c'est qu'on est jamais. C'est quoi? Est ce que ça existe un expert indépendant? On est expert dans un laboratoire, on est expert d'une formation et on sait que c'est compliqué. Est ce que est ce que le goût mondial ça existe et est ce qu'on peut être responsable d'orienter le goût mondial? Les gens qui travaillent chez Proctor et Gamble, les gens qui travaillent dans les grosses, grosses, grosses, par exemple en ce moment en Inde, c'est magique je crois. Bon, c'est en Afrique magie, mais en Inde aussi. En Inde, il y a. Il y a une autre grosse entreprise de nourriture lyophilisée qui est en train de changer complètement le goût des Indiens de refaire la cuisine. C'est vraiment un endroit où en dix ans, tout change et ils mangent bio et à l'obésité qui arrive très très vite et tout. Et donc en fait, c'est très c'est quelque laboratoires qui ont changé 1 milliard de personnes et c'est complètement fou. Alors l'IA là dedans, elle est de toute façon toujours biaisée par les gens qui l'utilisent. Sauf si peut être si si on donne une conscience nutritionnelle ou globale à l'IA. Mais. Mais d'où elle sortirait cette conscience de l'homme? L'homme n'a même pas cette conscience.

Karina Abdala [00:19:59] Donc le rôle de la perception pour faire le goût avec l'intelligence artificielle, comme l'intelligence artificielle pour avoir la perception ? Parce que pour toi je ne sais pas, pour toi la perception sensorielle est importante dans le moment du creé le goût ?

Expert 2 [00:20:26] Hein? Il y a un truc quand je dis que je travaille sur les fermentations, c'est que c'est quand même très précis. Quand on fabrique du fromage, on fabrique des choses. Il faut l'accompagner avec l'essence, c'est on doit goûter. Comment? Les fermentations, quand elles sont faites industriellement, elles sont théoriques. C'est des chiffres, c'est une pause et on sait que le output, il est régulier. C'est toujours la même chose parce qu'on part de choses qui sont pas vivantes et que tout est très très mesuré. Et alors que toute la nourriture vivante, on a mettre plein de capteurs et de saveurs et de. Et encore parce que le problème de travailler avec des choses vivantes, les fromages, les vins, tout ça, les charcuteries. C'est que les accidents peuvent être bien. Et d'ailleurs c'est pour ça que d'une année sur l'autre, c'est jamais pareil. Parce que voilà, c'est les typicité et c'est ce qu'on sait, ce qu'on veut presque et l'IA comment on l'entraîne, à reconnaître qu'un accident est heureux ou pas heureux, c'est que c'est compliqué parce que c'est pas que le goût et c'est pas que des comme pense, c'est aussi l'actualité, la société, les fromages qui sont faits pendant le confinement du vide. Ils ont, ils ont une valeur particulière. Tout ça c'est en fait les inputs seuls sont tellement plus larges que juste les flavor compounds. Et pareil, une tomate c'est pas une tomate si il y a une tomate pas mûre qui vient des serres. En Espagne, il y a une tomate de machin, c'est. Et dans les recettes on dit une tomate, un machin mais il n'y a pas deux tomates qui sont pareilles, c'est des acidité et tout ça des sucres. Et il y a quoi en goûtant qu'on peut le savoir. Et l'IA à moins de qu'on lui mette, qu'on mette et qu'on fasse goûter à l'IA avant. Elle est sur une tomate mentale qui est moyenne, qui est pas excellente, qui est un machin et parce qu'elle fait de la planification. Et ça, ça me fait trop penser. Justement, je reviens à l'U.R.S.S. Qui a planifié sa cuisine à un moment donné pour nourrir tout le monde et la salade, la salade russe qui mélange tout, tout est en boîte et tout, tout. Ce sont les mêmes variétés qui ont été reproduites, les mêmes petits pois pour tout le monde, les mêmes carottes, la même sauce au soja découpé au soja. C'est planifié et tout a toujours le même goût. La mayonnaise qui est partout pareil. Et donc c'est pas un très bon goût, mais au moins c'est pas horrible. Et parce que ça a été planifié et l'IA comment c'est compliqué parce que lui dire voilà. Alors après, en plus dans la nourriture, il existe une version premium de tout et existe une version. Accessible de tout, du caviar, de tout où tout ça existe. En version accessible, c'est moins bon.

Karina Abdala [00:23:22] C'est la industrie culturelle. Oui, oui.

Expert 2[00:23:25] Oui, la. Et c'est une illusion. Et je crois qu'il y a un peu Ah, qu'est ce que c'est compliqué! Qu'est ce qu'elle peut faire dans cette île? Est ce qu'elle peut lutter contre cette illusion? Alors elle peut anticiper les goûts, mais elle pourrait aider à faire des remplacements. Là, je fais des sauces au fromage en ce moment. Végane. Et donc comment on remplace les saveurs du fromage avec d'autres fermentations et avec la couleur, avec la texture et tout ça. Je pense que là dessus elle peut faire du travail. Mais toute façon c'est avec des inputs de gens qui travaillent déjà dans des laboratoires, qui élèvent des levures et des bactéries pour faire des gros synthétiques de fromage. Tout ça c'est très bien. Mais moi, pour moi, l'intérêt c'est comment on fait ça à la maison, Comment on fait du fromage à la maison, sans fromage, sans vache, sans les avec des choses qui ne sont pas de laboratoire et qu'on peut faire soi même. Et ça, l'IA qui va lui apprendre à faire des des fermentations traditionnelle chinoise qu'on fait à la maison, qui va lui apprendre ça? Parce que par exemple, les normes à CCP, ça veut dire ça fait qu'on peut pas faire toutes les fermentations à la maison, on peut pas faire pousser le Koji, on ne peut pas, c'est interdit. Et encore, il faut. La législation est en train d'essayer d'être défini, mais c'est très c'est. Pour l'instant c'est pas possible et je pense que l'IA elle doit respecter. C'est comme les règles, les règles de robot, la popote, l'IA doit respecter CCP parce que sinon elle empoisonne.

Karina Abdala [00:25:04] Vous rencontrez un problème d'IA culturelle et idéologique pour la sélection des bases de données ?

Expert 2 [00:25:15] Alors j'ai vu, j'ai vu des gens, je ne sais plus le nom de deux database. Il y avait, il y a même une version je t'avais envoyé les trucs. Il y a une version pour la culture occidentale avec des associations de goût par ressemblance, par notes, par similarité de saveurs comme Pense. Et il y a l'autre qui est, qui vaut pour le Japon, la Corée, une partie de la Chine. C'est par umami et par démultiplication associées aux mamies et que ça fait que ça c'est exponentiel. Et ça c'est culturellement déjà. C'est que deux parties du monde. Mais la cuisine sud américaine, c'est encore autre chose. Et puis peut être la cuisine italienne, c'est aussi où mamies et associations, ça peut être les deux. Et après les cuisines des pays de l'Est, c'est encore des esthétiques de la cuisine méditerranéenne, d'autres esthétiques et live avec eux deux. Alors c'est une équipe japonaise qui a développé ces choses là, donc c'est pour ça qu'il y avait le MAMI, mais on pourrait travailler ça partout. Le problème, c'est qu'il y a il y a des cultures sur représentées et des cultures qui sont jamais représentées. C'est ça le problème. Alors que. Oui,

effectivement, on pourrait se dire que ces associations de goût, elles pourraient servir à tout le monde. Mais ça pourrait revenir à dire qu'il y a qu'on peut avoir un groupe, un global Global Taste, et il n'y en a pas un global taste, mais ça peut être bien comme c'est compliqué. Le monde des fermentations. Je trouve ça intéressant d'arriver dans des dégustations avec des choses fermentées, parce qu'avec rencontrer des gens qui viennent d'autre d'Afrique, parce qu'ils ont en tête des fermentations de leur pays et il y a des similarités. Alors on peut dire aussi avec le fromage et tout ça, mais les fromages, oui, certains fromages peuvent faire penser à d'autres produits, mais avec des légumes, des légumineuses, des haricots fermentés. Il y a des choses qui sont dans plein de pays du monde. En fait, c'est des saveurs de plein de pays du monde. C'est intéressant et c'est toujours un petit peu gênant au début parce que c'est des choses qui ont une odeur et qui rappellent l'animalité, qui rappelle l'humanité, qui sont des odeurs, qui rappellent qu'on peut mourir pour la putréfaction et tout le monde. On a tendance à être gêné des choses fermentées. Et en fait, il suffit de commencer à mettre sur la table un premier truc qui sent un peu fort Ah ouais, nous chez nous on fait ça et c'est pire et ah c'est nous, on fait ça et c'est encore pire en fait. Et ça fait du bien de partager cette chose là. Le soft power coréen depuis dix quinze ans, ils se sont dit le kimchi va nous servir pour le soft power parce que avant le kimchi, c'était peut être fun. C'est pas moi qui l'invente, c'est des sources coréennes, un problème? Ah, ça pouvait même faire honte parce que ça sent fort, parce que c'est un produit un peu rustique et ils ont décidé de dire non, on va mettre en valeur ce kimchi alors. En plus, il y a le Japon qui fait du kimchi, qui est une salade pas fermenté, qui a un peu le goût du kimchi mais qui pue pas, qui n'est pas fermenté. Et le kimchi japonais était plus connu internationalement que le kimchi coréen. Il fallait récupérer le symbole national quand même du kimchi. Et du coup, ça fait partie maintenant du softpower coréen et ça a beaucoup aidé à ça Quoi montrer? On a un truc qui est typique, piquant et qui pue. Et quand on ouvre une boîte de kimchi, quand on ouvre un pot de kimchi, quelque part, ça sent et c'est tout le monde sait qu'on a ouvert. Mais voilà, moi en Pologne, on a ça aussi, on a les cornichons. Qu'est ce que l'IA fait des ces questions, de ça, de le soft power culturel. Voilà, moi je suis parti du soft power, du fromage fondu américain et maintenant voilà. Il y a cette dimension vivante et qui est qui est l'animalité? Est ce que l'IA peut comprendre l'animalité?

Karina Abdala [00:29:47] Pensez-vous que l'IA permette d'atteindre un nouveau goût ou quelque chose de plus standardisé ?

Expert 2 [00:29:53] Le truc c'est qu'une IA, ça peut, ça pourrait fonctionner comme un syndicat, comme une chambre du tourisme local avec des impôts locaux. Elles pourraient inventer, ils peuvent. Alors ce qui est marrant, c'est qu'ils inventent, elles inventent des trucs qui ne sont pas super mais qui sont d'un niveau normal comme on pourrait vraiment rencontrer. Donc un peu cliché, mais donc. Mais il faut garder les humains qui existent, il faut laisser. Même si les idées des humains sont pas super, il vaut mieux que ce soit quand même des humains qui les aident. Parce que. Parce qu'on sait jamais ça on peut. Il peut y avoir un dérapage, une erreur qui fait que ça devient bien, que ça devient autre chose. Et les accidents? Après, je crois que l'IA allait plus, elle serait plus forte pour défier effectivement les grandes tendances mondiales. C'est ça? C'est, je crois que c'est ça que l'effort, et là où elle est très dangereuse, c'est qu'on va aplanir, on va voler, on mange tous. On vient de quitter les avocats de Toast, mais bordel, ça, quelle mauvaise idée! Ils ne savaient pas, Ça ne va pas du tout et c'est des tendances avec des images et tout. C'est compliqué ça. Donc elle peut faire semblant de faire des choses locales. Hum hum. Les IA, ça s'entraîne, ça s'élève. On pourrait presque se dire ça s'élève comme on élève des vaches et des poulets et des bactéries dans des caves, les caves de certains fromages, Les bactéries, elles sont là. C'est que dans ce fromage, on pourrait dire qu'une IA. D'ailleurs, il y a une. Il y a une artiste à. Comment elle s'appelle? Allemande? Japonaise. Ito Steward qui a fait une super installation à Kassel cette année. Sur Sur les bactéries, les caves, les fromages, les bergers, tout ça. Peut être qu'on pourrait faire grandir des l'IA . Comme dans un ville, Comme des bergers dans un village. Pas d'input du reste du monde, mais voir ce qu'est ce que ça donne. Comme si, comme avant les moyens de communication, une IA qui ne connaitrait que que quelque chose d'hyper local. C'est une fiction. C'est bizarre, mais ça, qu'est ce que ça donnerait? Une IA qui vit avec des bergers, qui connait juste les allers retours en haut en bas la vallée, c'est tout. Et donc le fromage? La viande, des moutons, je ne sais pas. Une esthétique très ramassée.

Karina Abdala [00:33:00] Auriez-vous un profil de personnes qui seraient prêtes à essayer de nouveaux goûts créés par l'IA ? Les personnes qui mangent végétalien ou biologique sont-elles plus ouvertes d'esprit ?

Expert 2 [00:33:26] Oui oui oui. Oh je comprends. Mais carrément. Alors ça c'est aussi un des thèmes qui m'intéressent, c'est la bizarre, les choses bizarres, les choses étranges. Eh bien moi je pense qu'il faut plus de choses étranges, parce que le monde se définit avec plus d'étrangeté,

que ce soit à travers les genres, à travers les modes de vie, et que plus l'étrange prend de la place et plus c'est de la liberté qui prend de la place par rapport à des normes. Je pense que des gens qui sont dans des minorités comme végane ou des consommations spéciales ou sont plus ouvertes sur des nouvelles expériences, parce qu'aussi il y a une notion de. Il y a tellement peu de possibilités que il faut tout essayer. C'est presque le désespoir et puis d'essayer. Après c'est vrai qu'il y a toute une cuisine industrielle végane qui adore les simili carnés, les simili fromages qui sont pas faits par des enfants qui sont industriels. On va être très clair, c'est que c'est industriel et même très mauvais pour la santé. Les fromages véganes, c'est quasiment que du gras de noix de coco, c'est vraiment pas cool et ça éloigne en fait de la nature, de la nature et du vivant. Mais c'est un équilibre qu'on fait avec soi même parce qu'on est dit quand on dit végane, on pense au vegan de la pureté qui est née végane et alors que en fait, on peut essayer d'être vegan et essayer, c'est déjà de, c'est déjà c'est déjà bien, c'est déjà hyper bien. Et le végane pur depuis 20 ans, c'est une petite partie, Mais les gens qui viennent juste de passer à un régime vegan, c'est ça. Et ils sont prêts à tout. Moi je suis quasiment. Je suis pas végane, mais je réduis vraiment beaucoup et j'essaye de fabriquer beaucoup les fromages et les viandes. 6100 sont vivants et ouais, c'est compliqué, mais en tout cas c'est des gens curieux. Et moi là je présente du mammouth mammouth vegan. Hier, hier j'ai servi un ramen pour 50 personnes avec de la viande simili carnés de mammouth. Le mammouth, ça n'existe pas, ça existe plus, on ne peut pas le manger. Donc il y a un paradoxe qui fait que c'est tout de suite vegan. Mais je dis quand même que c'est légal. Et curieusement, c'est deux ou trois derniers mois, il y a eu ces histoires de boulettes de mammouth, de viande de mammouth en laboratoire. Et en fait il y a un il y a un gros projet qui s'appelle des extensions qui qui a beaucoup, beaucoup d'argent, qui vient des plus grandes entreprises du monde, qui veut, qui est en train de remettre, de fabriquer du mammouth comme Jurassic Park en gros, parce que c'est symbolique, parce que c'est un gros symbole, c'est peut être, c'est peut être le symbole du premier animal que l'homme a fait disparaître. Peut être que si on le fait réapparaître, ce qui est même pas vrai en fait. Mais si on le fait apparaître, la nature va nous pardonner. On va solutionner la faim dans le monde. Je ne sais pas. C'est de la viande, c'est compliqué, mais en tout cas les vegans sont très excités quand je leur dis on va manger du mammouth et les gens qui mangent de la viande des. Si ce n'est pas de la viande.

Karina Abdala [00:36:39] Vous pensez que trés importante et la narration de comme faire la viande du mammouth pour inciter les gens à essayer le plateau ? Et si la narration de la façon dont la viande a été préparée influençait la perception de la viande ?

Expert 2 [00:37:09] Oui, bien sûr, bien sûr, c'est quand on dit la viande de mouton plus les gens imaginent quelque chose de réaliste. Mais moi, moi, comme je présente tout ce projet, c'est que je dis le mammouth, c'est à moi ce qu'on a dans la tête, un mot du mental. Il peut avoir le goût de fleur, on peut avoir le goût de chocolat, on peut avoir le goût de viande aussi. Alors voyez avec quel goût ça a le mammouth? Qu'est ce que ça mange un mammouth? À quoi? A quel animal ça ressemble? Ça ressemble à un sanglier avec du gibier. Ça peut manger des plantes, des graminées, des proto céréales, les herbes. Alors il y a des herbes dedans. C'est. Ça doit être une viande très forte. Alors il y a même du café, du cacao, mais des tas de choses très très noires dedans. Voilà. Bon, on projette en fait des choses de force et de violence et de et de fumée, de feu et tout ça. Et de poivre, des épices chaudes, Quelque chose de très chaud. La sauge, la sauge, ça a une odeur musquée. Donc j'ai mis beaucoup de sauge et j'explique tout ça. Et à la fin on sent que c'est un peu des notes un peu animales. Mais après j'ai fait une autre version. Hier, j'ai fait une version japonaise et c'était pas du tout comme ça, ça ressemble, c'était comme du porc japonais, mais la même recette de base. Alors ouais, l'histoire ça fait beaucoup et effectivement ça fait beaucoup. Est ce que le mammouth c'est à la fois une peluche pour faire des câlins et à la fois c'est un animal qui écrase les gens? Et ça dépend. On est tellement loin des lois du mammouth que ça peut être tout ce qu'on veut. Il y a une prise en charge de Disney High Edge, le dessin animé Mammouth sympa, mignon. Il y a la prise en charge des extensions mammouth, symbole de Dieu. On est Dieu, on remet le mammouth, on est le qu'Ovide des humains mammouths. On a gagné, On est plus fort que la nature. Voilà. Qu'est ce que l'IA elle peut faire là dedans? Je ne sais pas, Je ne sais pas. En tout cas, les gens qui bossent, qui travaillent dans les laboratoires, je pense que c'est eux qui mettent le plus d'input dans tout ça. Des gens qui ont une connaissance très profonde et analytique du coup, et, et du coup voilà l'analyse, c'est froid, c'est une science froide et. La psych, la psychanalyse et le côté psychanalyse, c'est plutôt une science chaude et du coup le goût c'est plutôt chaud. Je veux dire, c'est très influençable, très biaisé. Alors c'est compliqué de confier ça. Compliqué.

Karina Abdala [00:40:21] Voulez-vous ajouter une autre réflexion sur l'avenir du goût avec l'IA ?

Expert 2 [00:40:22] Par exemple, sur le train, je suis en train d'imaginer en Italie du vinaigre balsamique, une cuve avec plein de capteurs et ça goûte tout le temps en temps réel et. Et qu'après plus personne veut acheter. Je veux dire que c'est parce que c'est des robots qui l'ont fait et que même après du coup on en veut plus des choses, des robots. Je ne veux pas acheter de voiture qu'un robot fabriqué, ni un ordinateur qu'un robot a fabriqué. Moi je pense. Moi j'imagine des histoires, des fictions, des spéculations. Voilà. Comment ça, comment? Parce que. Parce qu'en fait, comment ça fait la fin du monde? Parce que l'IA c'est toujours la fin du monde. Le machin de Rocco. Tu vois, c'est toujours la fin du monde. Alors il faut faire la fin du monde avant l'IA, c'est nous qui devons la faire avant ou la fin de l'IA avant le monde, je sais pas mais. C'est compliqué cette histoire. En tout cas, l'artisanat et tout ce qui se fait avec les mains et avec la sensation et avec avec beaucoup du storytelling. Parce que le vinaigre, les AOP et tout ça, c'est du storytelling aussi, avec des vrais gens, une vraie région, un terroir, un terroir. Comment on analyse un terroir? Parce qu'il y a une dimension culturelle dans un terroir. C'est pas des qu'on pense pas du fait c'est pas la terre, c'est pas le sol, c'est pas c'est pas chimique. C'est ça qui fait. Mais comme on voit la valeur authenticité, par exemple, si on bouffe depuis dix ans quinze ans du authentique dans la musique, dans la culture, des faux trucs authentiques, les bars, les pubs, les faux pubs avec du bois partout, authentique, les étagères avec les bocaux comme là, comme la nonna, mais il y a rien dedans. C'est alors que maintenant il faut remplir avec des choses vivantes. Mais le problème c'est l'apparence de l'authenticité. C'est compliqué. Alors. Un. L'IA peut être qu'on va adopter des IA comme on a un petit chien, peut être on leur donnera un corps limité qui limite leur pouvoir. Je sais pas. Comme Fidel Castro qui voulait qu'il. Et Fidel Castro aimait beaucoup le lait et la glace et voulait que chaque Cubain famille cubaine et une petite vache d'appartement, une mini vache. Et donc il a fait des demander au ministère de l'agriculture de faire des croisements de vaches indiennes et de vaches brésiliennes pour faire des mini vaches qui pouvaient tenir dans les appartements. Ça n'a pas marché, mais il voulait que ça soit ce que. Mais c'est comme une idée. C'est une idée, comme une idée. Dire ça, c'est complètement fou. Avoir une vache dans son appartement, c'est quand même fou. Vrai.

Karina Abdala [00:43:33] Donc pour toi est très importante la authenticité ?

Expert 2 [00:43:39] Ben je crois que plus il y aura des l'IA et plus on va vérifier que tout est vrai. Est ce que déjà il y a des tas de théories qui disent qu'on est peut être pas dans la réalité,

mais à la limite les enfants qui vont grandir avec ça, tout ça, c'est vraiment ténu. C'est du faubourg déjà. C'est pas du bois, c'est l'image du bois.

Karina Abdala [00:44:07] Merci pour votre temps.

Interview with Expert in Artificial Intelligence and Gastronomy Expert 3

Karina Abdala [00:00:02] C'est cet entretien s'inscrit dans le cadre de ma recherche doctorale sur la base de l'information que j'ai pour recueillir au cours de la première année de ma recherchela. Et j'ai amené comme connecteur les aspects dans les domaines de l'intelligence artificielle et la relation entre l'intelligence artificielle et la gastronomiecombination. Et l'entretien durera 45 minutes et je vous remercie d'avoir accepté cet entretien en ligne et d'avoir signé le formulaire de consentement. Pour commencer, pourriez-vous vous présenter et quels sont les taux que vous allez faire.

Expert 3 [00:00:58] Les études. J'ai fait des études, donc j'ai fait. Un baccalauréat scientifique avec une option en biologie et après j'ai fait l'université, donc j'ai fait une licence à l'université Paris-Sud Paris-Saclay. Donc. Oui, c'est ça. Paris-Saclay en biologie, sciences de la terre et de l'environnement, je crois. J'étais aussi en partenariat avec le NS. Cachons donc l'Ecole Normale Supérieure de Cachan. Voilà. Et après j'ai fait un master en neurosciences, toujours à l'Université Paris-Saclay et en partenariat toujours avec. Avec le NS. Et puis j'ai fait mon premier stage de fin mai à mon stage de Master deux à l'Université Lyon un, au Centre de recherche en neurosciences de Lyon sur la mémoire olfactive et la mémoire des odeurs chez chez l'humain. Voilà. Et après je suis passé et après j'ai fait ma thèse. Enfin j'ai fait un master et après j'ai fait une thèse sur la capacité des odeurs à ré évoquer des souvenirs chez les gens, l'émotion associée aux odeurs, aux saveurs, etc. Et ça, j'ai fait ça en neurosciences, donc je m'intéressais principalement au cerveau en IRM fonctionnelle et puis en électroencéphalogramme fille pour essayer de voir quelles régions du cerveau étaient particulièrement activées. Quand les gens se remémorer des souvenirs qui étaient indiqués par par des odeurs.

Karina Abdala [00:02:55] Et comment arriver à travailler avec l'intelligence artificielle.

Expert 3 [00:03:00] Et après ma thèse, j'ai fait ça pendant ma thèse. J'ai fait pas mal de choses en programmation et en science des données et de manière très sur le tard et après, pendant après ma thèse, je suis parti au Canada pendant cinq ans et là j'ai fait beaucoup de choses en

intelligence artificielle. J'ai rejoint un centre qui s'appelle Unique, qui est l'Union des neurosciences et de l'intelligence artificielle au Québec. J'étais dans un laboratoire qui faisait aussi qui utilisait l'intelligence artificielle pour analyser le cerveau, donc pour essayer de décoder les processus qui se passent dans le cerveau et aussi pour essayer de mieux comprendre, de modéliser comment l'information a été encodée par le cerveau. Donc c'est à la fois tout ce qu'on appelle encoding et numéro deux pour les neurosciences et du coup j'ai beaucoup travaillé là dessus. Et là, ça fait deux ans que je suis. Un an et demi que je suis revenu en France et que je travaille au centre de recherche de l'Institut Paul Bocuse. Et là je travaille justement sur toujours il y a j'utilise pas que l'intelligence artificielle, j'utilise toujours des outils d'intelligence artificielle, mais dans le cadre des recherches qui sont plus en lien avec. Toujours un peu l'olfaction, les saveurs, le langage aussi, beaucoup associé aux odeurs chez les experts.

Karina Abdala [00:04:35] Et donc comment? Comment définir l'intelligence artificielle? Parce que. Et possibile est la perception. De l'humain Et une compensation comme la perception sensorielle de l'intelligence artificielle. Mais comment? Et cetera, Et comment travailler? Et avec l'aide aux dispositifs dans la question de l'enseignement et la transmission pour la machine ou l'intelligence artificielle?

Expert 3 [00:05:09] Bien, L'intelligence artificielle, c'est un domaine de recherche qui est ancien mais qui a explosé il n'y a pas longtemps. Et le but, c'est vraiment de développer des systèmes informatiques qui arrivent à réaliser des tâches qui qui normalement sont faites par des humains. Donc ça peut être. Apprendre à détecter des éléments particuliers dans des images, apprendre à répondre suite à des questions avec tout ce qui est en analyse automatique du langage. Traduire du texte planifié, par exemple robotisé, planifier des mouvements et les intégrer à des robots. Tout ça, c'est peut être basé sur et sur l'intelligence artificielle. Et donc il y a de plus en plus de développement qui a été fait là dedans et donc de domaine d'application, que ce soit en industrie, en recherche ou ailleurs. C'est un peu la définition de base de l'intelligence artificielle. Après le lien entre intelligence artificielle et intelligence humaine, je pense qu'il est fait parce que l'intelligence artificielle, c'est ce qu'on connaît à l'heure d'aujourd'hui qui ressemble le plus à l'humain. Mais c'est pas c'est pas la même chose. On peut les comparer, mais il y a aussi beaucoup de différences qui existent. La principale, c'est que l'intelligence humaine, elle est très. Comment dire, Elle est complexe. Elle intègre plein de processus cognitifs différents. Elle va inclure aussi les émotions, la conscience. Ces notions là

qu'on retrouve pas dans l'intelligence artificielle et l'intelligence artificielle. La première caractéristique, c'est quand même qu'elle a été créée par l'humain. Donc c'est pas quelque chose d'autonome, en tout cas pour l'instant. Et ce qui à chaque fois vient d'une création, d'une volonté humaine pour pour. Pour être mis en pratique. Et son but c'est d'imiter l'humain ou de reproduire certaines capacités de l'humain. Mais une des limitations pour l'instant de l'intelligence artificielle, c'est justement sa capacité à généraliser. Donc souvent en fait une intelligence artificielle. Elle va être entraînée pour une tâche bien spécifique. Donc par exemple, un algorithme qui va permettre de traduire du texte va pouvoir traduire du texte, mais ne va pas pouvoir ensuite détecter si la personne a les yeux bleus ou pas dans une image par exemple, parce que ça va être des processus très différents. Donc il y a cette notion de généralisation, de flexibilité entre les tâches, de transfert de connaissance d'une tâche à l'autre et donc souvent une intelligence artificielle. C'est très. C'est pas polyvalent, pas comme une intelligence humaine où là, nous, on peut switcher d'une tâche à l'autre. Là je vous parle. Mais après, en même temps, je me vois dans l'image en même temps, je réalise certaines tâches cognitives en même temps, mais il n'y a pas encore de notion d'émotion et de conscience dans l'intelligence artificielle. Actuellement, ce qu'on a aussi dans l'intelligence.

Karina Abdala [00:08:35] Et la question est justement de l'émotion est très différente à les humain. Et il y a un problème avec la conscience de la gastronomie et pour l'émotion en point où il y a en a complémentation. D'où l'approche de in train l'intelligence artificielle est la question gastronomique plus humain

Expert 3 [00:09:05] Bah qu'est ce que tu veux dire? C'est si on va poser cette question là. Elle se traduit dans la gastronomie.

Karina Abdala [00:09:13] Oui, parce que je ne sais pas si c'est correct. Moi naît la gastronomie. Vous savez, la question de la emotion, de la sensorialité, de la mémoire gustative. Et donc comme il a commencer par faire et le passage, douce émotions à l'intelligence artificielle.

Expert 3 [00:09:36] Pour l'instant je pense que les émotions, on n'y est pas encore, mais pour l'instant, les intelligences artificielles, elles peuvent reconnaître, on peut leur apprendre à reconnaître les émotions. Par exemple, on va pouvoir détecter ou quantifier la joie, la tristesse

dans des visages humains par exemple. Donc ça, on va pouvoir le détecter, mais on va pouvoir le digitaliser, cette information et le et oui, et l'extraire en fait de données visuelles. Mais dans le domaine de la gastronomie en fait. Et le problème, je pense que c'est pas spécialement en lien avec l'émotion, c'est aussi ça. Mais c'est surtout en fait le problème de la décence en fait de la sensorialité, puisque dans la perception pendant l'intelligence artificielle, il y a dans la gastronomie la caractérisation de ce qu'on dit, ce qu'il va faire en goût, de ce qui va faire une saveur, de ce qui va faire un plat. Ça va être une association de plein de choses, mais ça va être visuellement, ça, l'intelligence artificielle, elle peut le capter, mais ça peut aussi être des informations de texture, de température, de d'arômes, de parfum, d'acidité, de piquant, etc. Tout ça qui va permettre de créer un goût ou évoquer des souvenirs et de trans et de traduire une émotion. Et c'est là où pour l'instant. Ça pèche puisque en fait, l'intelligence artificielle ne peut pas percevoir comme l'humain. Donc ce qu'elle va pouvoir utiliser, c'est des capteurs. Donc soit. Donc les images, elles sont complètement digitalisées. Donc ça, elle va pouvoir avoir accès à l'information visuelle sans problème. Le son, on arrive aussi à le digitaliser. Donc ça on peut entraîner des modèles sur du sur du son aussi. Par contre, tout ce qui est, tout ce qui va concerner les informations gustatives et olfactives par exemple, donc tout ce qui est l'essence chimique, là, même si c'est un domaine qui a été. Qui est encore en train de beaucoup de chercheurs, essaye justement ce challenge justement pour essayer de réussir à digitaliser ces informations là. Pour l'instant, en fait, il y a des niches, il y a des niches électroniques, il y a des artificielles, des bouches artificielles dans des palais artificiels, mais c'est encore très créé dans les premières étapes de recherche. Et pour l'instant, donc, ça, ça ne fonctionne pas, pas très bien. Et aussi, est ce qu'on ne sait pas, On sait pas. Enfin, d'un point de vue neuroscientifique justement, on ne sait pas exactement. Pour le goût, on sait, mais pour la réflexion, on sait pas exactement comment. La comment la la, Les milliards d'odeurs qu'on est capable de reconnaître sont traitées par le cerveau. Et donc du coup, pour réussir à le digitaliser, il faudrait en connaître la clé ou alors avoir une autre idée pour le représenter. Et pour l'instant c'est pas encore. C'est pas encore un fait. Donc du coup, il y a un problème au niveau de la sensorialité. Enfin c'est surtout l'aspect perception en fait est très peu présent dans dans l'intelligence artificielle pour l'instant. Même si les intelligences artificielles peuvent être entraînées à détecter et à faire des choses, à apprendre justement des associations entre eux, par exemple la couleur, la texture, la forme des aliments, identifier des aliments dans une assiette, etc. Ça, c'est des choses qui peuvent être fait par l'intelligence artificielle et qui peuvent aussi avoir des va permettre une certaine fin, donc de pouvoir apprendre des choses en lien avec la gastronomie à l'intelligence artificielle. Elle

peut aussi être entraînée sur des dizaines et des dizaines de recettes, sur les associations d'ingrédients, donc sur du texte en fait. Et du coup, avoir accès à toute une base de données là dessus, et là, ça peut donner aussi pas mal d'applications pour, justement la génération de nouvelles recettes, des associations plus ou moins innovantes d'ingrédients, des nouvelles, des anciennes méthodes, peut être aussi de cuisine ou d'extraction de parfums, etc qui peuvent être utilisées et retrouvés dans des textes anciens. Donc tout ça, toutes les connaissances, en tout cas en lien avec la gastronomie qui a été quand même beaucoup documentée. Ça aussi, c'est un vrai pan de l'utilité de l'intelligence artificielle en gastronomie.

Karina Abdala [00:14:21] Et donc vous travaillez la question et les texture, les couleurs et il y a la possibilité de capter. Et avec la question des le oui pour les visuels. Et donc il y a la possibilité de faire un nouveau goût l'intelligence artificielle. Donc, et il y a la possibilité de créer un nouvelle recette nouvelle goût.

Expert 3 [00:14:48] Une nouvelle recette. Oui, un nouveau goût, c'est bien. En fait, on va pouvoir le faire, on va pouvoir faire des suggestions. Mais l'intelligence artificielle n'aura jamais, par exemple, une caractéristique. Je sais pas avoir une caractéristique des parfumeurs par exemple, c'est qui arrive à mentalement savoir comment. Si, si. Si je combine cinq ou six odeurs ensemble, à quoi ça va? Ça va ressembler à quoi ça va sentir, etc. Une intelligence artificielle pourra pas vraiment faire ça. Ou alors elle se basera simplement sur les formules chimiques des aliments. Mais on sait très bien que la perception olfactive et gustative est pas liée à cette information chimique uniquement en tout cas. Donc du coup, l'intelligence artificielle pourra faire des propositions pour proposer de nouvelles recettes pour approuver des associations, mais elle aura aucune idée elle même. Il nous faudra un humain pour savoir si ça fait du sens ou si c'est n'importe quoi. Et il faudra tester pour savoir quel goût ça pourrait avoir. Parce que elle même, l'intelligence artificielle ne saura pas prédire ce goût là par contre.

Karina Abdala [00:15:58] Et donc elle s'est trouvée là, situation dans laquelle l'humain dégoutait les pour essayer les nouvelle goût. Et donc il y a l'humain test le nouvelle recette.

Expert 3 [00:16:15] Pour l'instant, on est un peu obligé de confronter les propositions, les suggestions, l'intelligence artificielle avec un humain, une bouche humaine, un cerveau humain pour savoir exactement ce qui est fait, quoi.

Karina Abdala [00:16:33] Et donc pour l'expérience du goût créer pour l'intelligence artificielle, c'est pour développer à un algorithme pour détecter se la suggestion, c'est la suggestion correcte.

Expert 3 [00:16:51] On en a. Moi je travaille par dessus, mais il y a plein de choses qu'on peut faire pour pour. En fait, pour l'intelligence artificielle, elle peut être utilisée dans plein d'étapes différentes pour la gastronomie, puis avoir plein d'applications différentes de l'intelligence artificielle. Donc l'intelligence artificielle, elle peut être, elle peut être entraînée sur. Sur des livres, Sur des recettes, Sur des images, sur des plats, sur des mèmes, des interviews de chefs ou sur de la parole sur soi, du texte, des images en fait. Globalement et principalement pour l'instant. Mais après en fonction, il y a beaucoup de demandes en fait, pour l'instant en intelligence artificielle et en gastronomie. Mais en fonction des gens qui sont en train d'utiliser l'intelligence artificielle, les intérêts sont différents. Donc par exemple, si c'est des informaticiens ou des chercheurs, pour l'instant, le but, ça va plutôt être soit d'essayer d'utiliser l'intelligence artificielle pour essayer de décoder. Comment le cerveau humain, par exemple, peut faire enfin donner du sens à ces informations, comment il va encoder ces informations là dans le cerveau pour essayer d'en apprendre davantage sur le cerveau. Pour un informaticien, ça peut être de par exemple rêver, faire essayer de se challenger en fait, pour essayer de résoudre ces défis technologiques qui va être de digitaliser les odeurs ou le goût pour les intégrer dans une intelligence artificielle. Donc ça peut être, ça peut être ça. Pour les entreprises, ça peut être, ça peut être développer des nouvelles innovations ou des nouvelles associations. Une saveur encore inégalée de remettre au goût du jour. Je sais pas moi, des processus, des techniques oubliés ou ou ou qui pourraient faire plus de sens maintenant avec, je sais pas moi, le changement climatique par exemple, ou des nouvelles contraintes qu'on peut avoir aujourd'hui. Donc ça va être d'essayer d'être plus efficace et plus innovant que ses concurrents grâce à l'intelligence, en s'aidant de l'intelligence artificielle à chaque fois. L'intelligence artificielle, elle vient pour aider un processus qui est déjà là. Elle vient pas pour créer de zéro quelque chose toute seule. Pour la gastronomie, pour les professionnels de la gastronomie, ça peut aussi être la robotisation ou l'automatisation de différentes étapes du processus, donc avoir moins de choses à faire eux mêmes, ce qui leur laisse plus de temps pour pour faire et pour apporter vraiment une grande attention à certaines étapes du processus qui là méritent de l'expertise, mais peut être pas d'autres pour ça, pour optimiser, pour pour les consommateurs, ça peut aussi

être d'avoir des recettes qui vont être plus personnalisées ou à pouvoir proposer des questionnaires aux participants. Et puis du coup, demander à l'intelligence artificielle de dire basée sur toutes ces informations là. Ces préférences, ces contraintes, Un régime alimentaire précis. Je suis végétarien, je ne sais pas. N'importe quoi. Je suis lactose intolérant Et de proposer des recettes plus adaptées. Quelqu'un qui veut faire un régime ou quelqu'un qui a des problèmes de diabète ou quoi, on va pouvoir lui proposer des recettes plus adaptées, planifier plus facilement des repas équilibrés, ce genre de choses. Donc voilà, il y a plein de. Il y a plein de. D'Applications possibles à l'intelligence artificielle en gastronomie.

Karina Abdala [00:20:20] Et vous, vous avez une idée pour la création de la base de données? Et vous avez trois pâtes et la question du les usages et les préférences des usages pour le diabète diabétique X pour les. Et donc les recettes dont le chef. Mais vous savez, on en sélectionne d'où procède du pays du Chef ?

Expert 3 [00:21:02] Ben pour l'instant en tout cas, au centre de recherche, nous on fait pas directement ça. Je parle de manière générale mais. Donc du coup. Mais oui, dans tous les cas, si j'ai bien compris la question, c'est. Dans tous les cas tu peux demander d'adapter au pays, à la culture, à la technique du chef. Soit les recommandations ou même les techniques culinaires qu'on va apprendre à l'intelligence artificielle. C'est aussi envisageable en tout cas.

Karina Abdala [00:21:36] Ok. Et vous, Pensez à la question de les changements dans la gastronomie par example, les pratiques, pour penser l'avenir des restaurants et avec l'incrémentation de l'intelligence artificielle comme vous pensez ce possible ?

Expert 3 [00:22:05] Ben je pense que. Oui, c'est possible. Enfin en fait, l'intelligence artificielle. Mais encore une fois, ça dépend vraiment ce qu'on lui demande. Il y a plein de tâches différentes qui peuvent être faites, mais cesser de produire des nouvelles recettes ou d'avoir des idées un peu originales. Si on a assez de données et si on a des données assez intéressantes. Donc l'idéal. Donc souvent ça c'est les intelligences artificielles sur entraînés sur des grosses bases de données, de recettes, de blogs, de cuisine, de choses comme ça. Mais ce qui serait intéressant pour que ce soit un peu le niveau d'après, ce serait justement d'avoir des grosses bases de données, mais pas forcément de recette textuelle, mais plus de perception consommateur ou de perception client ou de perception humaine en tout cas, qui puissent

décrire les sensations associées à chaque recette, qui puissent donner leur avis. Qu'est ce qu'ils ont pu percevoir en terme de saveurs, même si ça reste textuel? Et c'est sur cette grosse base de données, je veux aussi leur appréciation, à quel point ils ont aimé, a aimé, etc. Et c'est sur cette grosse base de données qu'une intelligence artificielle peut être entraînée pour trouver les régularités statistiques qui vont permettre en fait de dire ben voilà, tous les gens qui ont testé ces produits là qui avaient entre 25 et 35 ans, eh bien en fait, ils aiment plus, je sais pas moi, l'association entre tel truc qui était truc. Donc en fait bah si demain il faut créer une nouvelle recette pour sept pour ces personnes là, et bien on va peut être essayer de d'abord se baser sur ces erreurs, sur ces ingrédients là pour que comme point de départ ce genre de choses. Donc ça peut être sur la régularité statistique. Après pour la. Voilà, pour le pour les professionnels, je pense que oui, c'est ça. C'est un peu la même chose que tout à l'heure, c'est l'optimisation de la voix de leur temps et de leur énergie et du coup de revenir à avoir à soi automatiser, soit robotiser certaines des parties pour que leur temps soit dédié vraiment aux étapes où l'expertise du chef est vraiment indispensable et peut être alléger la lourdeur de certaines tâches dans les cuisines de restaurants gastronomiques et d'autres d'autres restaurants, avec l'aide d'un robot de plus en plus sophistiqué qui font des choses de plus en plus compliquées ou de plus amples, ou alors de plus en plus en autonomie.

Karina Abdala [00:24:34] Et la question par exemple de l'utilisation du Chat GPT pour créer une nouvelle recette. Qu'en pensez-vous ?, parce que il y a un chef cuisinier qui a travaillé avec Chat GPT pour créer nouvelles recettes.

Expert 3 [00:24:57] Voyez, je pense que tous les outils sont les bons. Parce qu'en fait Chat GPT c'est pas. Si on a pas d'idée à la base de Chat GPT ça va donner des choses qui sont assez génériques. Donc ça peut être intéressant comme base, comme point de départ. Mais si derrière le chef il a rien d'autre à ajouter de plus que ça, bien il va très vite se retrouver avec les mêmes recettes que tout le monde, parce que Chat GPT justement, il est pas forcément. Il y a pas forcément toujours si on ne donne pas les bons pront. Il n'y a pas de avoir les bonnes. En tout cas, ces réponses ne vont pas être vraiment adaptées à la cible, au projet, au but du chef. Je pense que ça peut donner des idées qui peut stimuler la créativité du chef lui même. C'est là où ça devient intéressant puisque c'est une énorme base de données, une bonne base de du monde et en même temps, on peut la questionner directement. Donc on gagne énormément de temps. Mais je pense que derrière l'idée, elle vient toujours, sauf si la personne fait exactement ce que

Chat GPT lui propose. Mais bon, il y a des vidéos sur YouTube de gens qui ont fait exactement ce que Chat GPT propose pour visiter une ville, pour découvrir les plats et tout et on se rend compte à quel point c'est pas du tout excitant et très très engageant. Donc je pense que oui, c'est une bonne base de départ et c'est une source d'information super intéressante à exploiter. Mais il faut forcément qu'il y ait encore à l'heure d'aujourd'hui. Il faut forcément qu'il y ait encore une intelligence humaine pour pour en faire quelque chose de vraiment créatif et innovant. Quoi.

Karina Abdala [00:26:42] Oui pas que cet encore, de faire la médiation trans les human parfaire la quiestion de la créativité. Et il y a la possibilité de créer une information au chef cuisinier adaptable pour travailler avec l'intelligence artificielle, il y a la possibilité de faire un séminaire de préparation puor l'assemblée du plateau, pour faire l'esthétique ?

Expert 3 [00:27:19] Ou Je crois pas que ça existe pour l'instant. Mais je suis pas. Je suis pas. Je suis peut être pas au courant, mais en tout cas, moi je ne connais pas de cours spécifiques à l'utilisation de l'intelligence artificielle en gastronomie et les différents outils qui pourraient être utilisés pour la gastronomie, etc. Je pense qu'effectivement ce serait intéressant de développer ça. Mais je crois pas que ça existe pour l'instant.

Karina Abdala [00:28:04] Merci. Souhaitez-vous ajouter d'autres informations que je n'ai pas demandées ?

Expert 3 [00:28:07] Ben non, moi j'ai l'impression que c'est intéressant. Je sais bien Qu'est ce que tu veux faire avec tout ça?

Karina Abdala [00:28:46] J'aimerais rédiger la thèse, et l'inscription ne concerne que la rédation de la thèse avec différents entretiens à rédiger l'anneé prochaine.

Expert 3 [00:28:46] Avec des chefs ?

Karina Abdala [00:28:48] Oui des chefs que je fais. À Trois chef et donc je voudrais explorer la question d'où les personnes, plus que travailler avec l'intelligence artificielle, pour approfondir la question? Et parce que j'ai trouvé beaucoup d'informations de la question de la

philosophie sur l'intelligence artificielle et la comparaison de l'algorithme avec le fonctionnement de le neurone humain et pour moi est très intéressant de le comparaison pour comprendre la question de l'expérience gustative médiateur pour la intelligence artificielle.

Expert 3 [00:29:37] Mais il y a un truc qui est intéressant je trouve récemment, c'est c'est quand on a, on a d'abord beaucoup. On s'est d'abord beaucoup basé sur le fonctionnement du cerveau et principalement du système visuel pour tout pour développer les algorithmes d'intelligence artificielle liés aux images. Donc là, c'était très basé sur la biologie, les neurosciences et le fonctionnement du cerveau. Et en fait, on se rend compte quand même que plus ça va et plus on s'en détache du cerveau. Et en fait, il y a quand même de plus en plus d'algorithmes qui arrivent à des performances très fort, très bonnes, autant aussi comme thread GPD par exemple, et où on n'a pas eu besoin de comprendre comment le cerveau faisait pour arrêt pour réussir à le traduire en algorithmes qui fonctionnent très bien et qui et qui marchent, qui marchent très bien. Donc en fait c'est assez marrant parce qu'en ce moment on est en train de voir une espèce, un espèce de bypass du cerveau, enfin parce qu'il y a certains processus où on arrive en fait à entraîner de manière très efficace des intelligences artificielles, alors qu'en fait le processus physiologiques est neuroscientifique et pas très fin, il y a encore pas établi clairement de manière précise. En fait, autant c'était le cas pour le système, pour le système visuel, autant pour eux même, pour le langage, etc. C'est beaucoup plus détaché en fait de.

Karina Abdala [00:31:09] Comment les dispositifs d'intelligence artificielle sont formés pour faire plus efficacement avec les images ?

Expert 3 [00:31:26] Et il y a plein de possibilités. Les gens, les chercheurs de, les chercheurs, les meilleurs chercheurs du monde, que ce soit dans l'académie ou que ce soit dans les grosses industries comme Facebook, Google et compagnie. Si on travaille tous les jours pour essayer de faire ça. Mais il y a plein de manières différentes et il y en a certaines qui sont basées sur ce qu'on sait dans le cerveau. Il y a des moments où on va ajouter des modules qui sont basés sur des processus cognitifs plus inspirés, en tout cas de processus cognitifs. Et il y en a d'autres, c'est purement des mathématiques et là c'est purement de l'optimisation mathématique.

Karina Abdala [00:32:10] Merci. Si vous voulez ajouter quelque chose.

Expert 3 [00:32:21] Pas de problème. Je pense que tu pourrais trouver peut être des gens dans l'industrie alimentaire. Travaille un peu avec l'intelligence artificielle qui pourrait peut être accepter de parler avec toi, même si c'est des gens qui ne sont pas forcément dans la gastronomie directement. Il y avait des gens en particulier, mais je sais que par exemple Seb est Seb. Ils font beaucoup de choses en robotisation et en création de recettes basées sur sur les dernières technologies et l'intelligence artificielle aussi sûrement. Et je sais qu'il y a des parfumeurs. Il y a un groupe de parfums qui a créé une filiale en Espagne sur justement l'utilisation de l'intelligence artificielle pour créer des nouveaux parfums, des nouvelles saveurs. Je crois que c'est Firminy qui a fait ça. Firminy. Je sais, tu vois ce que c'est? Ouais ben peut être que dans ces gens là en tout cas, tu aurais des gens qui auraient des choses intéressantes à te raconter.

Karina Abdala [00:33:39] Merci. Merci.

Interview with Expert in Artificial Intelligence and Gastronomy Expert 4

Karina Abdala [00:00:02] Okay. This interview is part of my doctoral research, basis on the information that I have in the first years. I would like to get their opinion of on aspects of the field of artificial intelligence especially regarding the relationship between AI and gastronomy. This interview will last about 30 minutes, and the recording will be complete only during the analysis of my doctoral research. And thank you for accepting this online interview and seeing the the concert. For the beginning, I want to introduce yourself and tell about your experience with, AI and what and where did you study, for example?

Expert 4 [00:00:59] So, uh. Yeah. So, um. Uh, so, yeah, my name is FG and I'm currently work at Sony AI in the strategy and partnerships team, and my role is to support, uh, a number of engineering teams in the company, um, with uh, one of our main projects, which is to do gastronomy, and it's specifically looking at how can we use AI and robotics to help and enhance the creativity of some of the world's best chefs, and how can we maybe help them make more delicious bottles in more sustainable and more healthy food? Um, and in this sense, we're using AI to two main places. One is with robotics, um, and we are looking at robots that can sit in the kitchen with a chef and collaborate on different dishes together. So not an automation task. Many much of the industry is looking at automation, but we're looking more, um, collaboration. So really having robots work together with chefs to put together new and more amazing dishes. On the other side, we're then looking at AI for, uh, maybe more in the data space, looking at how we can use AI to capture data from the food industry and then give it to chefs, maybe make connections within it, um, give them new insights so that they can then create, uh, or come up with new ideas that they've never, never thought of before. Um, and increasingly, we're also looking at a third area, which is to say, how can you make predictions about the effect of multimodal stimuli on someone when they're eating? So if the dish sits in front of them, um, maybe, uh, maybe there are many things that have gone into creating it, but also one thing that will impact your experience of the dish is the light and the temperature of the room. And also sounds you hear. So high pitched sounds can make food taste sweeter, low pitch sounds can make it taste more better. And we and we're embarking on a project that looks at, um, using AI

to, uh, to control this, to control this effect. So I've been at sending AI since November 2020, working on this project, uh, doing lots of lots of exploration in this area, lots of exploration of how I can make a difference in gastronomy. Um, before then, I worked at, uh, uh, a Japanese company called rapid ten for 15 months doing corporate strategy. Before then, I was a business school, so I, um, did an MBA based in Barcelona. Um, during this MBA, I focussed a lot on tech, and I am increasingly looking at, um, how can you how can we build interesting project products with, um, the most interesting AI and, um, uh, in the in the process of this, I did an internship with a London tech unicorn who is doing interesting things in the gaming space. Um, before my MBA, I worked for four years in innovation consulting and again, looking at this stage much less developed AI, but looking at how car companies, airlines, etc. can use AI. Um, also looking at how, uh, academic publishers can do more with the data that they have in that, in that, um, as part of all the channels that are submitted. So I did a big project or kind of two year project with a big academic publisher looking into this space. So always my link to our has been on the almost commercial side, trying to understand what direction you can take it and how you can build things into the real world with them.

Karina Abdala [00:04:42] And how do you define the artificial intelligence? I read something like this compartion, with the human intelligence and the AI. How do you define the AI?

Expert 4 [00:05:04] Yeah, I think there are kind of two types of AI. Maybe that we talk about a lot. And the first type is of artificial intelligence is very, um. It's almost very simple. It's anything. It's what a calculator does to some extent. It's what your computer can do. And they're very advanced. They're very advanced versions of this. And a lot of the AI that we see been used today by, uh, I don't know, let's say Google and lots of their different products, um, is a type of AI which is making predictions based off a lot of data based off algorithms that have been trained with a lot of data. And this is one type of AI, and it's, um, useful for many different purposes. It has lots of different superpowers, so to speak. Um, things like accumulation of data, things like pre-processing. Uh, the second type of an AI that is spoken about is the more, um, kind of romantic type that we imagine this idea that, uh, a computer can think for itself. And can start to create on its own accord and based on everything it's been trying to do and the recent leaps forward with generative AI with large language models. Although I wouldn't say that they are the second type yet, I think the reason people are excited by the things like ChatGPT or Dall-E. The reason people are excited is because they're slightly closer to that.

This this is a space that, um, I want to some extent, the models are doing some thinking for themselves.

Karina Abdala [00:06:33] And in your opinion is possible that the AI create a new taste ?.

Expert 4 [00:06:40] Yes, I think it's possible for sure. And I think there are some examples already. And people have been looking at this space for a while, sort of creating a new taste. Maybe, but also creating new recipes. And, um, recipe generation has been an interesting area for AI. Um, and you could now I think ChatGPT will simply give you a new recipe. And people have tried these and some of them work. Um, for some years people have been using AI to understand the molecular makeup of different ingredients, to suggest which ingredients you should pair together. And so this type of molecular gastronomy, which was started by Heston Blumenthal and um, Ferran Adria, people like that, they were doing this in their heads or on pen and paper. I have seen ability to make this a bit easier into more stuff because it's greater understanding the data. The challenge there is that the data doesn't really exist. They're all databases of ingredients. So it's a really tough place to make much difference in. Um, the, the so then. Yeah. So that I would say like another area that this is being done in food is with companies like Beyond Meat or Impossible Burger or Not Company. They are using AI models to try and understand what the taste of meat is of a hamburger. Let's say, uh, to then break it down and then recreate it with different ingredients so it doesn't use meat. And that is a form of kind of new taste being created. But they they sometimes market it like that is not code. The company, they, they sort of market that algorithm to that. And I in order to say how they created it. Um. But it's I wouldn't say it's quite what we're talking about here, which is that you are given a new taste and it's AI that's created. It is still, you know, is a tool that chefs are using. Not it's not replacing the chef. Yeah. I would say.

Karina Abdala [00:08:38] In how is created the database for create a new tastes?

Expert 4 [00:08:44] So for things like, um, molecular databases. So ingredients with lots of different, with all the different molecules that make up and in particular the dominant molecules that affect the flavour, um, these are created, uh, these databases exist from research institutes and they. A created one famous research institute in India. So triple it. Created it by taking data from lots of different journals, lots of different academic publications which have the molecular

data that all of this data was created using something called gas chromatography mass spectrometry, which is a form of understanding water molecules in an ingredient test. And as a result, these databases are very small because gas chromatography mass spectrometry is a very, um, expensive and slow process and you have to do it many times. It is difficult to get right. So far, there's no better way of finding the molecules than doing this or we haven't seen one. And as a result, these databases are pretty small. And and as a result, you know, there's not that much you can do with them. Um. ChatGPT or a generative AI model is, in theory, scraping data from the internet. And the way that some of these databases have been created is by pulling all of the information online from recipes, food channels, food blogs, um, even restaurant websites and the menus they put up that, uh, and so some of the databases can be created like that and you get quite an interesting type of knowledge base, let's say, and you can pull different insights from it if you have the correct model. The correct models are quite algorithms. Um, and yeah. And then I would say also individually these databases around food are being created within some restaurants and within some food companies. Uh, so far I'd say they're not being shared. So there's not being any link really between one restaurant's data and another. Well, one take food companies and another. And what I would also say is that even the biggest and most advanced companies, they are very, very slow. They haven't done this much yet. So if you think of the big famous food companies, the ones that make all of our supermarket products, even they don't really have molecular databases of their food yet. That very kind of it's very early in this stage of using food data. Probably they have really good databases on their customers. They know everything about customers. They have really good, um, figures of kind of financial figures. But in terms of the actual food data, that there isn't that much there. And so when we originally started our project, we thought that our job would only be one of consolidating, of taking, trying to get people to give data into one place. Now we sort of think it's a job of creation as well. A lot of this data needs to be created.

Karina Abdala [00:11:46] In in the beginning, you talk about the perception, the temperature, restaurant, of this kind of sensation and perception, how they it is possible to AI. Concerned this information in the database ? How do you translate these sensations into AI?

Expert 4 [00:12:39] Yeah, it's a good question. So the data collection for this, I think you you basically need to sit with humans and get them to eat and get them to record their reaction or their feelings about eating while playing different sounds or seeing different life. And as they

do that, they may be score. They may be score the food in terms of saltiness or sweetness or, um, other, other parameters. And the AI basically will then start to understand that for this person. So you have maybe that age and gender and you know who they are. And what their eating history is like. So you have that, and then you understand that when you play these certain sounds, you have this input, they have this type of reaction to it. And I think as you start to build a database with lots of different examples of this, you begin to see how these different inputs can affect or can be felt by different people. And the AI in theory should be able to predict spam for you. Karina as an eater, when you're eating something, it might be able to predict how to make it more salty for you, or sweet of you, or how to make it more enjoyable for you. It's not.

Karina Abdala [00:13:53] So, regarding the preference of the users in the database, it's not only the ingredients, it's also the preference of the user for create the database?

Expert 4 [00:14:07] Yeah. Well, we so we on this, um, multimodal project, we're only just beginning, so we've only just started this project, so, you know, we're we're looking into this space, but we don't have a set. This is this is my kind of my, um, Casio. And we haven't tested it, um, with some of the other areas we've explored. Yeah, we tend to look at the moment. We tend to focus mainly on the food data because it's it's a bit easier. It's less, uh, you don't need to worry so much about privacy and things like this. So we tend to look a lot into that space. But yeah, there's the, um, there's the opportunity to build databases that go beyond simply food data and into other realms as well. And then we'll say, if you build the data of molecular databases, it's also interesting to add things like the sustainability value of that ingredient or the health value of that ingredient, maybe the salt content, the calories, uh, allergens, things like this associated with that. Um. With that, uh, ingredient and. Yeah, that then that database can just grow and grow. Um. And love.

Karina Abdala [00:15:18] And do you think that this fact change the gastronomy of the society ? How do you see the future of the gastronomy?

Expert 4 [00:15:31] Yeah, I think so. My. And to me it seems like in the industry everyone thinks that the future of gastronomy is very personalised, i.e. both from a diet and health perspective, but also a taste perspective. Um, you will eat things that you especially will enjoy and the that will be different to the person next to you, even if you're at the same name. You eat

a diet kind of really personalised towards you that suits your body best. And I think that this has been a big revelation in food, that people have begun to understand that everyone is so different. So all of these diets which say you should do this or you should do that, it doesn't really work anymore because people have such different reactions to different foods and over time it changes. So I think this sense of like personalisation is possibly one part of the future. Um, from the like, taste and creativity perspective, I think that there's I think the future could be that we, we begin to break down this tension that exists between delicious food, healthy food and sustainable food. And it's kind of like when you're a child, like everything you want. When you're a kid, your parents say, no, it's bad for you. Or like, there's too much sugar. Um, this is so interesting because we want it, but it's because it's delicious. But it's said to be bad for us. This tension has been going on for a long time, and I think the future is the break away of this tension, so that the things we want are also the things that are healthy. And, um, maybe we just want things because our parents say no. But I think also, uh, for me, like ice cream is more delicious than lettuce, let's say, than a salad. But if I can eat French fries is more satisfying than a salad. But if I can eat a salad. But maybe I have the sound of French fries, or I have to smile or something. Maybe I can enjoy the salad just as much as I would enjoy French fries. Um, and so I think that's this, uh, the future is a kind of greater satisfaction with healthy food and also sustainable food to.

Karina Abdala [00:17:42] And in your opinion, what's happening with the traditional gastronomy and this dispositive?

Expert 4 [00:17:51] I think that traditional gastronomy, it still seems to be incredibly strong. And the, the, the there was a trend from probably the beginning of the 2000, but the end of the last century, beginning of 2000, until really recently, that was moving a bit away from traditional food, looking at really scientific food. And I think that's what you could say, that Ferran Adria, Heston Blumenthal really pioneered a very scientific approach to to eating food. I would say that it's still there's still a place for this. But also people are now using the science to recreate traditional food, to understand traditional food, understand why we like it, understand why it developed in the way it did, and maybe give something, uh, give back some of this traditional sense and. I would also suggest that as we as our lives become more or less by technology, there is a bit of a trend for kind of traditional basic, uh, farm to table type of eating. Um, and definitely that that seems to be quite clear. If you look at the foods that are really popular at the moment,

it's not, uh, new type of food, really. It's still like pizza. Um, burgers. These are still, still making new trends. And there's still like, there's a new revolution happening in pizza. There's a new revolution happening in focus in Spain. These are quite traditional foods. They're not they're not special or different. And in the sustainability world, everything that they're trying to create and as a kind of plant based food is just copying traditional foods. It's like, how do we copy the burger? How do we copy the, um, the milk, for instance, things like this.

Karina Abdala [00:19:36] And do you think that the people with diets like a vegetarian or vegan are more open of this new taste? Uh, or maybe it's not the relationship with the diet.

Expert 4 [00:19:52] Yeah. It's funny. I'm not. I don't know how much of a relationship there is, because I don't think it's true that people who are vegetarian or vegan are more healthy than people who aren't. I think often you there aren't great many good options sometimes. So sometimes you you might be vegetarian and you eat French fries because there's nothing else. But this is not healthier than somebody somewhere else. And so, um, I don't think it's necessarily the same, but it's interesting that, um. So we think a lot about creativity. And I think as popularity of vegan and vegetarianism increases. Um, this is forcing a new type of creativity where new types of food are being brought to the table. And so people are thinking more suddenly about vegetables. How can you make the vegetables interesting and satisfying? How can you how can you recreate things with vegetables that that we sort of hadn't really focussed on before? And that, that I think is quite an interesting space.

Karina Abdala [00:20:58] Okay. Thank you. And if you have to add something you I can do it.

Expert 4 [00:21:13] No, I don't think so I mean. I think that. I think that if it's of interest, some of the other trends in the industry, I think that, like robotic automation is a significant trend that will change the way that we. Uh, get fast food in particular. I think it would be really normal in about two years or three years that you go to, like a McDonald's or you go to a pizza place and there's a robot doing some of the process, some like maybe doing the fries or something like this. The restaurant industry is having a real labour shortage across the world and in Japan and Germany and Spain and France and the UK and US and everywhere in between, I think there's a massive shortage of people who want to work in the industry. And this this will have loads of

effect, loads of impact in different areas, and the robots will probably form a more significant part as a result because chefs really, really want them. Um. I think that's one major trend. And then the other major trend. It says that there is a growth, there's a decreasing gap between what we do at home and what we see in the restaurants. And I think that there is a real desire for chefs. They want to be more part of our home lives, even the very high end chefs. And part of this is that they need to find new revenues. Um, but also for us to no longer to VCR food at home is totally separate from chefs in the in the restaurants. These chefs are now kind of and it's been happening for 30, 40 years. But these chefs are now kind of celebrities that we have in the home. We can eat addition. We say, I know whose dish that is. It's like Ottolenghi or something. Um, and, and there's this kind of merging of the two worlds. And in Covid, how's the merging more because of take away, take away some. It used to be only a few restaurants. It's a takeaway now every restaurant has takeaway. And this this again is making us eat at home and stuff that used to be in the restaurants. So there's this real kind of blurring of the lines. And I think this is an interesting space because in some respects. People are getting cleverer about food. People are understanding it more, getting cleverer about chefs, understanding who the chefs are, how restaurants work. And I think this is important because especially talking about, you know, creating new tastes and serving us new tastes. I think it's really relevant to think that actually people are a bit cleverer now about what they're eating. I think at least in developed countries, people are understanding it more, a slightly more, um, picky, I think, more choosy about what they want to eat.

Karina Abdala [00:24:04] And do you think that this change are produced by the discourse in the media?

Expert 4 [00:24:13] No, I think actually because of that. So chefs, chefs have been keen for a long time to find new revenues for their businesses. And one way to do that is to create strong Instagram followings. And so that now if you want to be a famous chef, you need a social media profile. You probably need a cookbook as well. And then ideally, you would also find a TV show to go on and the kind of Netflix effect bring in. Netflix has done loads of programs and related programs that bring chefs into the home that we can see them. And, uh, this kind of wall that, um, sits between the kitchen and the diner is really breaking down completely. It used to be that you would never see the chef inside the restaurant would be called something different to the chef. The chef would stay behind the walls, and maybe they would come through the

door sometimes and say hello, but usually they would stay behind the till. Now the name of the restaurant is the chef's name. The walls have come down so you can see inside the kitchen, and you can talk with the chef on social media as well. And you watch a TV show with him too. So we really like, I think media has played a really strong part in making us aware and interested in cooking in the chefs and restaurants.

Karina Abdala [00:25:29] Okay. Thank you. Thank you so much for your time.

Interview with Expert in Artificial Intelligence and Gastronomy Expert 5

Karina Abdala [00:00:02] So, this interview is part of my doctoral research. Based on the information that I have in the first years of research. I would like to to get the opinion of an expert in the field of AI and the relationship with the gastronomy. The interview will last about 40 minutes. The recording, will be kept only during the analysis, for my doctoral research. And thank you for accepting this online interview and seeing it the comments. For the beginning, if you if you want if you are a green, I want to introduce yourself and tell me about your experience with AI and when and where did you study something of the your introduction of yourself.

Expert 5 [00:01:00] Okay, so my name is GS. Uh, I'm, a PhD candidate at University of Cambridge and my PhD project is coming to the end in two, three months. Is basically personable robot, robotic chef where we have no AI robot program to cook. Uh, and then it has a feedback from some sensors, which are kind of, similar to our taste and the way it works. Uh, 111 way it works. You would, uh, cook something similar to the robot. You know, work with probit, uh, and then try to cook something or on its own. And after that, uh, you know, want to try to cook something that fit again and therefore you have, um, you know, you you have the, the ground truth pretty much or a goal in, in terms of control up from what, uh, what a human cooked and showed and, and then you have the current state, what robot to measure with its own cooking based on that, it adjusts the various parameters to go closer to what, uh, what human this. Uh, as comes to I. Well, I, I, I, um, I pretty much took, uh, quite a few I courses back in my masters. And then when I started my PhD and then, uh, of course, it was kind of a practical application of those. And if you look at, some of works. Well, uh, a lot of it is like analysis of, information and training models based on the data set we, um, we gathered by measuring food and, of course, uh, this is very specific. Uh, it can be be messy because, of course, you know, the interaction of the sensor with the substrate can be messy and so on. It's also the data sets, uh, tend to be quite small. So what you do? You probably don't, uh, don't train neural networks from scratch. You probably try to find a model. Um, kind of train for similar task and do some transfer learning on it, or just use, you know, out of the box model as a part of the bigger system of rewards. Um, you have some, you know, more old school machine

learning, um, which is, uh, kind of still a go go to thing. If you're that dataset is not huge. Plus, you know, all of current things run on, on the data sets, which are huge. So I think it's, um, a good introduction for it.

Karina Abdala [00:04:01] Thank you. And if you have to thinking about the AI. How do you define the AI? For example, I see the the people that cooperative with the human intelligence. What is the relashion with the human intelligence and artificial intelligence?

Expert 5 [00:04:40] To, I think they are not that different. To be honest. Of course we are not that even level now, but when people kind of advertise their artificial intelligence, uh, is kind of, uh, similar to human, what they do is the use of the use like our, um, assumption that human is, of course, the smartest thing in universe and so on. While I think it's kind of different. Like we are not that smart, to be honest. Uh, so, you know, the artificial intelligence can, uh, actually reach our level sooner or later. Because if you think about, like, our intelligence, it's, uh, it's constantly. Um, well, first of all, it it's usually academics, uh, talking about it. So very, very, very smart people. And that's not an average intelligence and a lot. So they, they, they are saying, oh, it's going to be a, uh, it is going to be hard to make it as smart as an academic. While 2 to 4, I prefer most jobs. You don't need to be like that smart. So that that's one thing. And also if you think about like human intelligence, um, it's very much key keeping track by everything we, uh, kind of emotionally or physically and biologically want. So you may know. Well, I shouldn't smoke cigarettes. Of course. It's a no brainer. What's the use of it? But if you do a robotic system or software system, that's a not a problem there. It will not be, you know, push to smoke cigarettes or eat a cookie or whatever.

Karina Abdala [00:06:39] The other topic is about the question of the sensory perception and the translation of the sensory perception in the AI?

Expert 5 [00:07:29] Mhm. Um, how to do the translation. Well, so uh, I think here again, people are kind of, uh, lost by the idea that, you know, human is this kind of perfect creation, uh, to do, you know. Super advanced perfect creation while it's, you know, an form of evolution with, you know. A stupid design in many, many places. It's like your appendix can get, uh, you can get an infection and need to a surgery, even though it's kind of not needed for anything and so on. Uh, similarly, with your eye, uh, you know, like, all the nerves are going to, like, on this surface,

uh, uh, of protein or other, um, kind. It's so all of this things, I think, also happen in perception a lot, uh, and particularly in perception of taste. So if you think about the function of taste, in the end it's about, uh, sensory input of whatever you put inside your mouth. And it is first. Like a label, uh, or like an and in addition to a label to what you put, uh, in your mouth in decision. If you should eat it, eat it, uh, try to eat it more frequently. You should go go out and put an effort to to get it or not. And that just part of the package of information we get about it. One would be like not smell and colour and so on. If it smelled, it smells bad to you and it's good for whatever you eat. You don't want it. Uh, there is a look. We we just remember that we like that thing when it's like yellow or red in in terms of an apple, but not when it's green. And so on. And this is like just another information to this package. Very important one though, because it it's something that gives you any version of on what's inside and of course to that uh. We have. You know, people talk about about the taste, but there is much more information. Taste is just like the last gate before you, uh, swallow it. Because even after you swallow it, that there is, you know, a a digestion, it can contain, uh, certain things which will then work on you, uh, on brain level, like coughing. Coughing is like, you know, a part which we kind of cannot taste. But, um. That's pretty much like a memorial track. It was pretty much shown that when bees, um, uh, go and pollinate, then the flowers containing coffin, they remember what were they are better than other. And that's what why we like of into um and then this can be associated with a certain taste and so on. So the taste is, you know, just like one input, one information, um, about the food. And then if you want to think about perception of it, all of it should be taken together. And that then we say we have, you know, this, uh, six basic tastes and so on. Um, and we kind of have, um. Uh, but like like, like the overall experience is, um, a little bit more. And those basic states are also, of course, very distinguished. Distinguished because, uh, they are basically those, uh, which give, give us the moment most important information, something like about uh, nutrition and so on. If something is sweet, uh, it means well, and then it will be very easy to get energy out of this thing. Something is salty. We know we will get like a portion of electrolytes from it. And so on. So we pretty much evolved to kind of have this, uh, kind of information available for us and like it or not. But in the end, the brain is, you know, inside the skull. It's completely blind. It's electrical. See, see, uh, electrical signals going, um. So, uh, I don't see any part of the system that we couldn't engineer in the long term.

Karina Abdala [00:12:24] Okay. How to describe the database? How to do this database for giving the decision to cooking?

Expert 5 [00:13:07] What do you say. Mhm. Well so the data set depends on the task. So when you train a model you kind of have an input and um. Up. Yeah. So if you think about, like, uh, like what happens in your mouth, you would kind of have, uh, a regression task. Uh, um, a kind of a multiple multi-dimensional regression task. You would have, like, your, uh, six basic tests. And what you did there. Uh, you, uh, kind of assign a number to to each of them. Let's say from 0 to 100. So it's, uh, um, society like 25 of the hundred and so on. When you, when you eat. So. So in this case, what you, uh, if you wanted to change some system or neural net based on it. You would probably have like some measurements of the sensor. So you probably want to, you know, have a good battery of sensors and then use them to measure samples. And save their measurements as the input to a system. And then you need to produce the ground truth label. So you know, about a few months would need to come, uh, and taste it and then and then just give uh, t scores, uh, for, uh, the label and then you theoretically could do it. Uh, there's a lot of work to do it. So that's, you know, it's probably needs to be a little bit more than just, uh, uh, single page gesture and doing this. But you, you see that, uh, this that data set will work on this task, but for other tasks, uh, it's gonna be completely useless. Yeah. Uh, similarity. Um, so I like to think about it with, uh, with what people do in computer vision. The basic task is to do the, uh, classification of all the pictures. So, you know, the. Uh, the classic task of dog versus cat. You give the images and they say, uh, zero if it's cock one, one. If dogs, you have, uh, two labels assigned by him. Um, and you can do, uh uh uh, you can do classification training on that to the patient. But now if you want, uh, to detect them. So you want to like put a picture and it will show a square around cut and say cut and square and Doug and say Doug, this data set is now useless because your dataset needs to have the labels for the box. Uh, and then if you want to do self-segmentation, which means that every pixel that, that in that is cut is going to be, uh, kind of mask with one colour and uh, and the system will, will assign the cut and similar with a dog. Then you need to a specific that data set to train it again where someone like would uh, you know, uh, draw like a boundary where, where it needs to be and similar with, uh, cooking the data sets will be very different, um, depending on what you do with a taste. Probably the idea of think is, uh. Oh, I told you. But people also, you know, it will do something simpler to not spend years on it. So people would do it like a classification, uh, between, like, uh, types of meat or is a fruit ripe for not ripe, uh, and stuff like this. So, uh, that's it. Um, also, if you want to, you know, do testing the data set is completely different than if you want to do cooking, because if you want to do cooking, you would have, uh, some sort of measures at the

end. Uh, and your input may be, uh, um, your, your. So if you want to kind of do a prediction of uh, of like process of cooking, your input would be like a cooking parameters and the output would be, uh, something like, uh, the taste or a composition of a meal and, and so on. But what you may want to do is start some kind of reinforcement learning if you want to, you know, during cooking, you want to choose what your next action is. Yeah. So you you've cut the carrot. What do I do next? And then the dead dad, the data set is completely different that it has nothing to do with, uh, Ted taste. Also, if you are cooking, well, manipulation will be a part of it. I'm not, uh, especially as an expert of manipulation. But if you think about it, if you want to grasp something now, you work on, uh, uh, uh, trajectories, and it's kind of all you know about or Cynthia Harmon, so on. Usually it's it's done analytically, but it's not great. And people also try to do machine learning on it. So yeah, deep data sets can be crazy different. And in the end, uh, it will not be like a human which will like, you know, choose, um, choose and learn. Yeah, just like that. You need to put a specific task for neural net like inputs. Outputs.

Karina Abdala [00:19:50] What kind of people can taste the creation of gastronomy by artificial intelligence only professionals? And what about the subjectivity of taste?

Expert 5 [00:20:13] Oh, gosh, uh, that's uh, super hard and, um, I don't think feel this yet at this point. Uh, I mean, we are aware and we are looking at it all the time. Um, but it's more about a now, you probably want to talk with someone doing the, uh, set of psychophysical experiments, some psychologists and so on. I read quite a bit about it. Uh, but there is definitely, like a lot of variation between people and so on. And so, you know, it will be a miss, uh, in, uh, the data. So you will definitely need to know you will definitely need to think how to generalise it. So that's true. Um, if you think about, uh, is it a trained person or not? Uh, different studies do different thing. And, um, if you think about it, uh, your choice needs to be, uh, adequate to a task. So if you. I don't know if if you were to feign your robot to, like, assess how tasty pancakes are. You have like some sensors and so on. You would probably do the stuff, uh, I said before where you probe the, uh, pancakes with some sensors. You, you you save the optical sensors and then some human probes and gives it a score. And that's your your why? That's what you want. You go nuts. Uh, you output. Uh, in this case, you probably want to do as many people as possible just to kind of get an average for the society. I mean, similar as, like supermarket will do their, um, their stuff, you know, for, for the tasting and so on. Um, but if you want to. So would that probably like untrained people as wide across the society as possible

because you, you just say is it good or not. Yeah. If you want to do something like, I don't know how to control a process in a wine yard and so on. Then you probably want to train it on an expertise. So as you see it, you learn what is in the data set. So you need to, uh, you need to, uh, choose to take the data set accordingly. And the reason is because we don't have a technique as we have, for example, in natural language processing where people do those foundational model which they train on, like all the text you can get your hands on, and then you fine tune them for a specific task. So we don't have, uh, such a technique yet.

Karina Abdala [00:23:30] Okay. And it is possible that AI create a new taste?

Expert 5 [00:23:43] A new taste? You mean like a salad?

Karina Abdala [00:23:47] Something that is not, created by the human?

Expert 5 [00:24:03] You. You mean on the perception level of the robot that it would have like a seventh, the basic base and so on? Uh, definitely. Yes. You just need to get, um, a label and label, uh, a different thing. So first of all, if you, uh. So now we are setting our model with, like, you know, uh, a multiple regression, um, task. And definitely you can train the model to, uh, detect something. So if you see the model. Mhm. That detects like adulteration over milk. People do it like a lot when, when you can just like get some milk. And I think you adulterate with like sugar and, and flour and something uh to make like more milk out of a cheap ingredients and so on. Uh, they pretty much like have a classification for this specific thing. So you might say the model has like an alcohol, right. Like, uh, our tastes have, like, for sweetness and so on. So you can do everything you train for. Uh, now, the question is how useful it is here. Because if you have done it for sweetness. Well, that that's what people care about with something else. That's what people care about. Uh, if you do it for an education, that's what people care about. But if you think there is probably like infinitely many of things you you can do for you. You probably, like, know the deep taste of mint, and that's like another taste. And you could train the system to like, detect a taste of mint probably that would remember that would probably require a lot of sensors and um, especially sensors with like daisies and so on. But, yeah, uh, I don't think why why it wouldn't work. But I also don't think, uh. I also don't see, like, uh, the good application for it, uh, in cooking. I mean, I see good applications, but remember, you need to build the whole system. And then if the sensing system is itself like a

huge system, then it's like a lot of stuff that can, uh, go down. So usually with Samsung, um, it's considered great if you can sense very little and still cook something good with it.

Karina Abdala [00:26:53] Thinking ahead, how does this project impact society?

Expert 5 [00:27:24] Well, so first, uh, we get to the main cost of cooking nowadays, it's it's probably time. Yeah. It's not like, uh, it's not like the price of gas. Maybe it's price of food, but usually not if you don't eat like someone normally with, like on, like, uh, with you don't eat like someone with caviar all the time. The main cost of cooking, uh, and eating is time. Yeah. And if you think about, like, how, how healthy you eat and so on, that's a lot of depending on how much time you want to spend of cooking or pay others to do it for you. Uh, of course. So if you have such, such robots now, like the probably biggest, um, biggest thing, uh, is that we kind of minimise or reduce this cost. So now people kind of should have more freedom. What, to choose uh, to eat the barbecue because, well, you don't have a cost of, uh, of time in the cooking. And it similarly works for restaurants. Probably. Maybe you don't need to pay as much for a restaurant anymore and so on as compared to what with companies do with it. They will probably get a lot of information about you. So if you think about inflammation, uh, if you have, you know, such, such a thing at your workplace where you get a lunch every day, that's a lot of information about you. I don't know what like people selling insurance and so on, what we'd like to do with it. If you eat, uh, a lot of salads, probably your insurance is lower. If you eat burgers every day, probably your insurance price is going up. So there is definitely like, a lot of, uh, information and so on. What you eat is probably very, very like, also aligns with your political view. Uh, so maybe if you had this information, what people eat, uh, you maybe you could do like, you know. I'm basically doing a study. Who they will, uh, ver vote on and so on. And that's like a powerful, powerful, uh, information to like the study. So I'm like, you know, very, very higher level than, like a country wide level. So who knows? That would be possible. Uh, but more mostly people can switch. Uh, you can get more cheap, especially in, like, you know, uh, high income areas where people in neuroscience are paid a lot. It's probably. I mean, it's still a robot. He capital costs are high. So we probably want to get, um, your money's worth back. So probably places where you can operate it 24/7. So like, fast food restaurants, maybe, like, uh, you know, near the work place where you kind of your demand is very known and maybe you can like precook some stuff and so on. Um, maybe also elderly care where you kind

of are happy to pay more than the food's worth for like giving someone an independence of living colour. So that's, uh, the areas I could get into some years.

Karina Abdala [00:31:08] For example, what's happening with traditional cuisine?

Expert 5 [00:31:33] Well, I think, uh, um, so I think there's two ways to go around it. One way is company comes and optimizes the hell out of it. And to have like the most optimized cooking. So it can be successful. So, so it can be done fast and so on. But all but the problem with it is that people like certain things. And imagine you are starting a robotic restaurant and it does, you know, some obscure stuff from, uh, Middle East with which, like, nobody in, uh, UK eats. That's a problem. Uh, so people. Oh, it's robotic. Look what it cooks. Uh, maybe it's good. Maybe not. I don't want to think, but if it does. Pizza. Oh, pizza. Everyone loves pizza. Let's get pizza. So you probably will have, like, a trend just from from a business call point of view that you are coming in. And you want to eat something. You know, because we don't like new things. People say, oh, we love diversity and so on. But, you know, as it's cost, the food you need to, uh, research says you need to try it 15 times before you like it. No matter if you are children or adult. So if you want to do something strange and specific, uh, you would need to convince your clients to come to the restaurant 15 times before he will start. Start, like liking to come to your restaurant. That stuff, isn't it? So I think people would like, definitely tap into, like, the kind of traditional and popular foods. And then anything else.

Karina Abdala [00:33:26] So, Is it possible to insert in the database traditional recipes from different places that are not known ?

Expert 5 [00:33:56] Uh, so you definitely can do it. Uh, but there is that's kind of more an academic project, to be honest, because with robots and programming where you really, um, and when it, like, really improves lives, it's effect of scale. Yeah. Like this app we are using now, someone wrote it once and millions of people use it. And that's where value is coming in. Similar with training a robot to cook something, you would probably see you first like pizza, uh, scrambled eggs, pancakes, something that can be set first is consumed a lot in, uh, high income, uh, places because you need to fund your growth and earn some money. Uh, and then it needs to be, you know, uh, something also reasonably easy and so on, and then retraining it for some niche thing. Uh, that's probably where you would still have people, because if you, if

you see like competition between like, uh, technology and the human technology wins when you have like this ethical scale while with uh, humans doing to restaurants is twice as expensive as the income. So if you have like a small places, that's where humans would stay or it would die else. But yeah, that's probably the reality. But still it's you know, it's like every TEDx technology, it like it usually, you know, removes like little use, uh, languages, little players, you know, everything is gathered together in countries and so on because you need an effect of scale, but in return it improves lives of everyone. So I, I don't think this technology would follow a different trend.

Karina Abdala [00:35:54] The last the last question, I want to know if you find people with open mind for this project or maybe, do you find people who think about the transformation of the chef's job?

Expert 5 [00:36:31] Is there is a whole spectrum of reactions, and most of them are probably dependent more on emotion and politics than kind of technology and, and tend to kind, kind of prognosis. Uh, from history, we know that technology always gets through and always wins, but it's not always bad for, uh, the workers we've had, um, atm, which kind of replace pretty much all bank employees and also increased the number of, of bank employees that just the job changed. So. Well, I don't think there is any force in like, you know, uh, free markets, uh, the democracies that can stop, uh, the technologies. So that's kind of just a philosophical questions because it has never, never happened in like technology where it was abandoned because it's it to create jobs. So that's just the classical question. Is it going to take away jobs? Uh, well, they will be less work to do maybe, uh, because digital job, it can, uh, and, uh, take it. The question is, do we mind, uh, it because it it's not necessarily taken from cooks in the restaurants. Maybe it's taken from you preparing the breakfast in the morning. Which you probably would like this work to be taken away from you. No. I would so. So, you know, um, it's really a strange thing that people want more work. Uh, what they actually want is more salaries. Uh, not more work. Yeah. And if if the work taken away is unpaid, everyone is suddenly happy. So. Yeah.

Karina Abdala [00:38:40] Thank you. Thank you so much for your time and for your opinion.