Technological failures, controversies and the myth of AI

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Abstract

Since the emergence of the notion of artificial intelligence (AI) in the 1950s, the dream of developing a thinking machine has been the focus of a series of failures and revivals. While some computer scientists, scientists, and philosophers have endeavored to prove the impossibility of an AI equivalent or superior to the human mind, others have continued to renew their hopes of achieving it. This chapter sets out to investigate the problem of technological failure in the case of AI, analysing the way in which the controversy has continued to fuel itself over several decades. This debate can be considered functional to the maintenance and renewal of the myth of the thinking machine, which has exerted a constant influence on intellectual debate and popular culture from the late 1950s to the present day. The controversy can therefore be considered not as an obstacle but as a functional element in the construction of the technological myth of AI.

Technological controversies and the myth of AI

In the popular imagination, the history of computing is often represented through a dynamic of linear progress, made of dazzling engineering inventions and scientific insights that advance technical and scientific areas. Yet, the evolution of computers and the software that animate them have followed very different paths. While hardware has seen decades of marked improvement in terms of memory and computational speed, the history of software, as noted by Nathan Ensmenger, "is full of tensions, conflicts, failures, and disappointments" (2010, p. 10). At various points in the evolution of computing, as machines became cheaper and more powerful, programming them to perform useful tasks proved costly and frustrating (Ceruzzi, 2003). Developing an approach that considers the role of failure, in this sense, is an urgent task for a critical history of digital media that takes into account the fundamental role played by software and the programming of computers and other digital tools (Balbi & Magaudda, 2018).

From the perspective of a cultural history of technological failures in computer science, Artificial Intelligence (AI) represents a particularly interesting case. At various times throughout the evolution of computer science, AI has been regarded as a failed technology, unable to meet the grandiose promises and goals set by the researchers and proponents of its paradigms; at other stages, including the present day, it has been shot through with

considerable, perhaps excessive, enthusiasm, attracting considerable investment and attention from the techno-scientific world and the public sphere (Ekbia, 2008). Its tumultuous history, consequently, has been read by historians as a schizophrenic alternation of failures and triumphs (McCorduck, 1979; Crevier, 1993; Russell & Norvig, 2021).

This chapter questions this narrative in order to propose a different point of view, according to which the alleged failure of AI does not concern specific stages of decline of its various paradigms, but constitutes an inescapable element of it along its entire historical trajectory. By highlighting the functional role of skepticism and controversies between AI proponents and critics, such a perspective suggests that the construction of a technological myth around AI has been facilitated and enabled by the ongoing controversy between those who emphasize its successes and those who emphasize its failures. In order to understand the impact of technological failures — understood as cultural constructions rather than objective events (Gooday, 1998; Lipartito, 2003) — it is therefore necessary to abandon a dichotomous dimension that opposes success too rigidly to failure. The possibility of failure of techno-scientific projects represents instead a symbolic and material resource that should be considered an integral part of their development. Addressing the issue of failure in regard with AI, moreover, is particularly urgent in the ongoing phase, in which AI systems are heralded as the defining technology of our era, often with the promise of infinite possibilities.

1. The myth of the thinking machine

Arising in the mid-20th century at the intersection of cybernetics, control theory, operations research, cognitive psychology, and the nascent computer science, AI is a field of study

based on the hypothesis that it is possible to program a computer to perform tasks that equal or exceed human intelligence (Russell & Norvig, 2021). Analytic philosopher John Searle proposed a distinction between strong AI, which aims to create general human-level (or superhuman) intelligence, and weak AI, which mimics human behaviors in circumscribed contexts (Searle, 1980). While applications of weak AI are ubiquitous in everyday technologies, from search engines to any smartphone app, what can be called the technological myth of the thinking machine revolves around the possibility of strong AI, which has not yet been achieved at a material or even proved possible at a theoretical level (Boden, 2016). It has been the idea that it is possible to create a kind of artificial brain that articulated the technological myth of AI (Taube, 1961); such a myth became over the past decades a technological project and at the same time an inescapable component of popular culture (Natale & Ballatore, 2020).

The concept of "technological myth" does not indicate naïve and bogus beliefs, but rather a complex of beliefs about technology that become pervasive in social, cultural and political contexts. As recognized by authors such as Mosco (2004) and Ortoleva (2009), a myth is in fact not defined by the question of its authenticity, but rather by its ability to enter the collective imagination of a particular era. Technological myths are far from being mere fantasies, but are cultural formations with concrete effects, as observed in cases including the Web (Bory, 2020; Natale & Ballatore, 2014), geospatial technologies (Ballatore, 2014) and AI itself (Bareis & Katzenbach, 2021).

Analyising the historiography and the large production of popular culture on the topic (e.g., Crevier, 1993; McCorduck, 1979, Bory & Bory, 2016), we have identified the core beliefs that undergird the myth of the thinking machine (Natale & Ballatore, 2020): (1) cognitive processes can be reduced to calculations based on the manipulation of symbols;

(2) the human brain is equivalent to a computer; (3) the development of a thinking machine is feasible in the near future; (4) computer scientists are Promethean heroes who are about to realize the thinking machine; and (5) computers will surpass humans in all fields, altering all cultural, social, and political processes. This last belief has raised both utopian hopes and dystopian fears around AI as increased informational automation was identified as a harbinger of unemployment, alienation, surveillance, and excessive bureaucratic control. Unlike other myths that are projected into the past, the myth of the thinking machine resides in a "near future" of technological possibilities (Dourish & Bell, 2011).

This myth has rapidly taken over the public sphere, moving from elite laboratories to the rest of Anglo-American and global societies. In this regard, Martin (1993) collected sociological observations on the imaginary of computers as powerful and mysterious artificial brains. Attributing to the mythical dimension of the imaginary an overtly negative connotation, Martin argues that the mass media in the 1950s and 1960s employed exceedingly misleading metaphors and technical exaggerations. When computers found their first large-scale commercial applications in the 1970s, the myth of the thinking machine lost some of its credibility. Yet two decades later, though further diminished, the myth was still present in the American public sphere, particularly in its dystopian forms. With reasonable caution, later entirely justified, Martin concedes that even if the perception of the computer as a thinking machine was on the wane in the 1990s, it was not permissible to take the myth for dead. The AI myth not only survived the “AI winter” of the 1970s and the failure of the Fifth Generation project and the Strategic Computing Initiative in the 1980s (Russell & Norvig, 2021), but found new and surprising articulations, making a powerful comeback since the 2010s.

As we will see, the alternation between periods of great popularity of the myth and periods in which AI was largely disavowed as a field of study is in fact one of the most peculiar aspects in the historical trajectory of AI.

2. The winters and summers of Artificial Intelligence

Between 1943 and 1956, a period that Russell & Norvig (2021) refer to as the "gestation of AI", researchers such as John McCarthy, Arthur L. Samuel and Marvin Minsky gained rapid access to substantial funding from the US scientific and technical apparatus. In such a favorable context, these AI pioneers achieved promising results in several areas, including formal games such as checkers and chess, mathematical problem solving, and robotics (Rasskin-Gutman, 2009; McCorduck, 1979). Such encouraging progress in the short term generated many optimistic predictions (Crevier, 1993), fueling the plausibility of the myth among journalists, in the public sphere, as well as among scientists. In the early 1970s, however, the AI myth was challenged by the lack of concrete results beyond experimental prototypes. In a paradoxically opposite sense to what has been noted in the context of "big data" in recent years (Kitchin, 2014), as the volume of data increased, the results of the AI pioneers deteriorated and became difficult to apply on a practical level. This situation prompted major funders in the field to reduce their investment especially from 1974 onwards, and more generally, generated widespread scepticism about AI as an idea and techno-scientific project. Fearing this sentiment, for a decade many researchers avoided using the term "AI" to describe computer science research projects, preferring terms like machine learning and pattern recognition, so much so that historians describe this phase as the first "winter of AI" (Crevier, 1993; see Natale & Ballatore, 2020).

Far from signifying a definitive decline for the AI myth, the winter of the 1970s was followed by new ‘summer’ (or ‘spring’) phases of splendour. The wave of "expert systems" in the 1980s generated great expectations and profitable industrial applications, and the "connectionist" approach, based on neural networks, followed a similar path. Since the 2000s, the availability of vast amounts of data and a major increase in computational and storage power have triggered advances in the areas of data mining, machine learning, and natural language processing and understanding, developing automated solutions to complex problems thought intractable even just two decades earlier — see, for example, the recent boom of deep learning (LeCun et al. 2015). This rapid expansion of the horizon of technical possibilities has revived the debate on the AI myth, replicating once again the clash in the public sphere between what Umberto Eco would have called "apocalyptic and integrated" (Eco, 1965), i.e., the enthusiasts and critics of the technological prospect of AI. Although the possibility of strong AI remains technically remote (and we remain epistemologically agnostic on this issue), the new applications of weak AI are enough to generate bitter controversies in all the fields involved, on the one hand about the feasibility and technical maturity of the proposed solutions, and on the other hand about the social, political, and cultural effects of the introduction of these technologies in the socio-technical apparatuses (Kurzweil, 2005; Bostrom, 2012).

The story of how AI went from "winters" to "summers" relies on a key storytelling device, that of the "rise and fall," which is one of the most popular interpretive keys to represent the dynamics of technological innovation (Natale, 2016). An example in this sense is the "hype cycle" theory, popularized by Gartner, an American company specializing in consulting on technology and information. According to Gartner, a technology can undergo a 'hype' or enthusiasm phase, stimulated by a technical innovation or more simply by some

form of public demonstration of its potential. In this phase, expectations grow, even under the pressure of media attention, until they reach a peak of excessive optimism about its prospects. In economic terms, the natural consequence is a growth in investment in the sector. However, the rise is followed by a decline: since the technology is not able to achieve, at least in the short term, the hoped-for successes, optimism gives way to growing scepticism about its real prospects. Media coverage begins to take a critical stance, and funding collapses inexorably. Every year, Gartner publishes a report in which various technologies are placed in a particular position along the "hype cycle" (see http://www.gartner.com).

Gartner's theory, as is often the case with historical simplifications, is suggestive and seems at first glance to find confirmation in the development not only of AI, but also of other technologies. 3D cinema, for example, was launched with great fanfare and then disavowed numerous times throughout the history of cinema (Elsaesser, 2013); virtual reality was the object of a collective fascination in the 1990s, only to be relegated to the role of a failed expectation and finally come back into vogue in very recent times (see for example http://www.oculus.com).

On the other hand, the rise-and-fall narrative tends to underestimate the fact that elements such as expectations, fascination, and even skepticism are an ongoing, rather than a cyclical, presence in the evolution of certain technological propositions (Messeri & Vertesi, 2015; Borup et al., 2006). It is desirable, in this sense, to read the history of AI according to a different narrative that emphasizes the permanent role of controversy, rather than a series of discrete phases marked by either optimism or disillusion. To follow this second narrative is to acknowledge that skepticism and controversy have been a constant component in the construction and development of the AI myth - and this not only during the winters, but

throughout the entire historical trajectory of the discipline, from its origins in the 1950s to the present day.

3. The role of techno-scientific controversies

As suggested by Russell & Norvig (2021), the term "artificial intelligence", coined by John McCarthy in 1955, contains such a problematic premise from a practical and conceptual point of view that it is destined to attract controversy. Indeed, since the early 1960s, a period of prevailing optimism about the prospects for AI, skeptics and critics have been playing a notable role in the debate about the present and future of the field. In popular science and technology journals such as *The New Scientist* and *Scientific American*, which featured contributions from leading representatives of the field, enthusiastic statements travelled hand in hand with critical interventions (for example, Moore, 1964; Voysey 1974; Albus & Evans 1976; for a more detailed analysis of the sources, see Natale and Ballatore, 2020). This debate continued in the following decades and has continued to the present day, without ever abandoning the technological myth of AI (Geraci, 2008).

Scientific controversies have become a well-established area of inquiry in sociology of science, as an important element to understand the inner functioning of scientific and technical work (e.g., Raynaud & Bunge, 2017). Although they have mostly been studied as elements that tend to hinder the success of a theory or a field of study (Besel, 2011; Ceccarelli, 2011), historians such as Gieryn (1983) or Pinch and Bijker (1987) have pointed out how controversies can also play a functional role in the development of scientific and technological innovations. In the specific case of AI, such an approach means taking into account the fact that the myth of the thinking machine has emerged as a set of theories,

hypotheses and speculations whose complex and ambiguous character constitutionally invites contestation and skepticism.

It is within this dialectic that the AI myth has emerged and progressed, passing through incessant disputes between critics and proponents. As we have noted, technological myths are defined not by whether they are true or false, but rather by their ability to become pervasive in particular societies and cultures (Mosco, 2004; Ortoleva, 2009). In this sense, controversies are a constitutive component of the AI myth, as they help to keep it alive and able to attract attention and space in scientific debate and the public sphere. In fact, as proposed by Delborne (2011), scientific controversies represent a context through which paradigms, theories and fields build their influence within the scientific world and, at the same time, in the public and popular arena.

The presence of extensive and seemingly endless controversies is a feature that AI shares with a field of study with a far more problematic character and less impressive empirical results, parapsychology. According to David J. Hess (1993), author of one of the most comprehensive studies on this topic from the point of view of the sociology of science, it would be wrong to consider the supporters and opponents of parapsychology as mere antagonists. The American sociologist noted in fact how skepticism is evoked not only by those who criticize the scientific nature of these studies, but also by the parapsychologists themselves, who present themselves as skeptical against the certainties of the scientific establishment. Controversy, Hess suggests, should be considered not an impediment, but an essential condition for the existence of this field of study.

Emphasizing the functional role of controversies in the development of a field, in this sense, means abandoning the traditional narrative based on rise and decline, and instead proposing an alternative model of historical evolution in which controversies and apparent

failures play a primary role in the construction and persistence of the myth. The AI myth is to be understood as a dialogue, rather than a monologue: a narrative based on an underlying question ("is it possible to create a thinking machine?") whose survival relies precisely on the lack of definitive answers and on the openness to conflicting and deeply conflicting answers, as well as to the redefinition of the question according to new technical and cultural developments.

The open-ended nature of the question of whether a strong AI can exist thus becomes an essential condition for the continued generation of ideas and, ultimately, for ensuring the ability of AI to exert an ongoing influence on our culture over such a wide span of time. Winter, in this sense, is not to be viewed as an episodic event, but rather as a stable and functional component of the development of this techno-scientific field.

Conclusion

Since the beginning of its intellectual and scientific trajectory, the idea of AI has sparked great debate and controversy. During the initial enthusiasm of the 1950s and 1960s, AI generated a socio-technical myth centered on the possibility of creating a thinking machine based on the new digital computers. In the fierce dialectic between believers and skeptics, the possibility of a machine with human (or superhuman) cognitive capabilities moved from the realm of science fiction to journalistic discussions, and continues to occupy a prominent position in the public sphere.

In this chapter, we have traced the development of this complex interdisciplinary techno-scientific field from the perspective of the cultural imagination, emphasizing in particular the role of the frequent failures of AI, attributable to the excessive enthusiasm and tendency to promise unrealistic results of its practitioners. The historiography of

computer science conceptualizes the phases of AI enthusiasm and skepticism cyclically, as a succession of "summers" and "winters," in a rise-and-fall narrative very common in popular versions of media history.

Our thesis, however, is that the controversies and failures of AI, rather than hindering its development, are a functional element in the construction and maintenance of myth in the technological and scientific imagination. Instead of a simple cyclical narrative, we propose a perspective that does justice to the constructive and generative role of controversies, drawing parallels with very different areas of inquiry such as parapsychology. Paradoxically, recent successes in the context of autonomous vehicles, machine learning, and the so-called “big data”, can be seen as instances of “weak AI” that keep fuelling hope for strong AI, rather than diminishing it. In this sense, none of the winters that the thinking machine myth has spent in its short history have been fatal. The vitality of the techno-scientific myth of the thinking machine is evident from the popularity of the topic in the public sphere, where it is interpreted through the familiar (and problematic) lenses of utopia and dystopia, focused on a technical horizon that is constantly being redefined.

The recent controversies on Google LaMDA can be fruitfully examined through this very same lens. LaMDA, a software trained to entertain conversation with human users, attracted extensive public attention after Google engineer Blake Lemoine argued that he believed the software had become sentient, while his company dismissed this claim as deceptive. The controversy, on the one side, reanimated the AI myth, while on the other, contributed to stimulate discussions about what happens if even expert users can be led to overstate the performances and capacity of an AI system (Natale, 2021).

The historical trajectory of AI, where success and disillusion constantly intertwine, provide a useful corrective to the current enthusiasm for neural networks and machine

learning. This does not take into account, in fact, that while these technologies bear enormous potential for a wide range of applications, some of our wildest expectations, such as reaching strong AI or sentient machines, are still likely to be disappointed (Moore, 2020). Considering the role of failure and controversy as an entry point to the critical study of AI, in this sense, provides a useful corrective to ongoing discourses about this technology, highlighting its strengths as well as its limits, and reminding us that we have been believing for a long time in the myth of thinking machines.

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