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AI; A Human Future

Ehsan Shahghasemi *

Department of Communications and New Media Studies, Faculty of Social Sciences, University of Tehran, Tehran, Iran. (* Shahghasemi@ut.ac.ir, https://orcid.org/0000-0002-8716-5806)

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Abstract

Background: Throughout history, humans have consistently developed groundbreaking technologies, from fire and the wheel to modern computing, showcasing their ability to innovate and control their creations. The rise of artificial intelligence has sparked renewed concerns about whether machines might eventually surpass human intelligence and autonomy.

Aims: This study aims to critically assess AI's role in human society, particularly addressing concerns that it may surpass human control and agency. It seeks to demonstrate that while AI is a powerful tool, it lacks autonomy, self-augmentation, and intentionality, making it unlikely to replace human decision-making. Additionally, the paper examines historical technological advancements, showing how humans have always adapted and controlled new innovations.

Methodology: Employing a historical-comparative methodology, this study traces the evolution of computing technologies from early tally systems to quantum computing. It incorporates philosophical analysis through the works of Hubert Dreyfus, John Searle, and Michael Tomasello, assessing AI's limitations in replicating human cognition.

Findings: The study finds that despite AI's rapid advancements, it remains fundamentally dependent on human input, lacks true understanding, and is incapable of independent self-enhancement. The historical trajectory of technological progress demonstrates that while new technologies can disrupt societies, humans have consistently adapted and maintained control. Philosophical critiques of AI further reinforce the argument that intelligence is not solely computational but deeply rooted in embodiment, intuition, and shared intentionality—qualities that AI lacks.

Conclusions: Concerns about AI overwhelming human agency are largely misplaced. Just as humanity has managed previous technological revolutions—including writing, mechanization, and computing—AI will be integrated and regulated according to human needs and ethical considerations. While vigilance is necessary, the myth of AI autonomy is exaggerated.

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1. Introduction

At the beginning of 2025, the same old question has resurfaced once again: *Will we have a human future?* With the rapid advancement of communication technologies, particularly artificial intelligence, it seems we are entering an entirely new era. Every day, more people are connected to the internet, generating *high-quality* data that is leveraged by big-tech corporations, governments, and other entities for various purposes. Meanwhile, computing technologies are evolving at an unprecedented pace, leading to increasingly sophisticated behavioral prediction models. If this trajectory continues, it appears that humans may soon be left behind by technologies that now seem capable of independent thought.

A well-known quote attributed to Albert Einstein warns: *"I fear the day that technology will surpass our human interaction. The world will have a generation of idiots"* (Lodge, 2012). This sentiment reflects a longstanding concern about the impact of technological advancements on human society.

However, in this article, I argue that such fears are neither new nor necessarily justified. Throughout history, humans have always been apprehensive about their own inventions, yet they have consistently emerged as the ultimate architects of their future. Time and again, they have adapted, controlled, and integrated new technologies into society, ensuring that their progress remains fundamentally *human-centric*. The current discourse surrounding AI, often exaggerated and overly simplistic, underestimates human resilience and adaptability. While AI is undoubtedly transformative, its so-called "magic power" is no match for humanity's ability to innovate, regulate, and shape its own destiny.

2. Methodology

This study employs a historical-comparative methodology, combined with philosophical analysis and critical discourse analysis, to examine the evolution of computing technologies and the recurring concerns about artificial intelligence. By tracing technological advancements from early tally systems and mechanical calculators to contemporary AI, the study highlights continuities in human innovation and adaptation. The historical approach contextualizes the present AI discourse within a broader framework of technological evolution, showing that concerns about machines surpassing human intelligence are neither new nor unprecedented. Through comparisons with past technological shifts—such as the introduction of writing, mechanization, and computational automation—this study argues that human agency has remained central in shaping and controlling technological advancements.

In addition to historical analysis, this study incorporates philosophical inquiry by engaging with thinkers like Hubert Dreyfus (1972), John Searle (1980), Michael Tomasello (2010), and Martin

Heidegger (1977), whose thoughts of human cognition, AI and technology provide a conceptual foundation for assessing the limits of machine intelligence. The study also employs critical discourse analysis to examine how academic and public narratives on AI oscillate between dystopian fears and utopian expectations, particularly during periods of rapid technological change. By analyzing claims from scholars and politicians such as Shoshana Zuboff (2019) and Henry Kissinger et al. (2021), the study interrogates the political, economic, and ethical dimensions of AI discourse. Furthermore, an autobiographical reflection is included to illustrate how these concerns have shaped public perception over time, drawing on personal experiences such as the Kasparov vs. Deep Blue match in 1997.

3. Discussions

3.1 A New "Silly Season?"

Michael Tomasello (2010) explores how cooperative and collaborative communication infrastructures uniquely define the human species. Tomasello argues that human communication is fundamentally different from that of other primates due to its basis in shared intentionality—the ability to engage in collective goals and recognize common knowledge within a social group. Unlike other primates that primarily communicate for individual advantage, humans developed a cooperative communication infrastructure that allows for informing, requesting, and sharing in socially beneficial ways. This cognitive ability to align perspectives and mutually coordinate actions through gestures and, later, language is a cornerstone of what makes humans distinct as a species (Tomasello, 2010). These cooperative tendencies underlie our ability to create complex social structures that no other species can achieve.

Tomasello suggests that cultural learning and shared intentionality create the conditions for human groups to pass down accumulated knowledge across generations. Early humans developed conventional communication systems not merely for immediate survival but to standardize and transmit knowledge beyond their lifetimes. As humans refined language, they moved from basic shared experiences to abstract, institutionalized forms of knowledge. The emergence of formalized learning environments, such as universities, can be seen as the natural extension of this cooperative infrastructure—where individuals engage in collective inquiry, establish shared cognitive frameworks, and create explicit systems for knowledge preservation and innovation (ibid).

Universities, therefore, are not accidental constructs but rather a direct consequence of the human capacity for cooperative -and collaborative- communication. Unlike other species that may pass on knowledge through imitation or instinct, humans accumulated and institutionalized their shared knowledge through writing, teaching, and discourse. The structure of universities mirrors the evolution of human communication: from gestural coordination to linguistic conventions, and eventually to structured academic inquiry. In this sense, the existence of universities is an ultimate manifestation of shared intentionality—where knowledge is collectively created, debated, and refined over generations (ibid).

Universities are, therefore, a masterpiece created by our ability to engage in cooperative and collaborative communication. The most astonishing scientific achievements of the humanity have been made possible by and in the universities. Academics are proud of that and the general public refer to universities for finding answers to their questions. Yet, very few of us in the universities are ready to accept that the most unsubstantiated and even stupid ideas come from universities too. After all, our cooperative communication capacities are wonderful in passing information, not necessarily correct information.

Out of so many of such ideas, Reich's theory of libido is worth to concern. Wilhelm Reich, a psychoanalyst and former student of Sigmund Freud, developed controversial ideas about libido that expanded and diverged significantly from Freud's original theories. Reich believed libido was a physical manifestation of "orgone energy", a term he coined to describe a universal life energy. According to Reich, this energy was not only responsible for sexual arousal but also for overall health and emotional well-being (Farashchuk et al., 2013). He theorized that the free flow of this energy within the body was essential for physical and mental health. Blockages in this energy, caused by societal repression of sexuality and emotional expression, led to neuroses and other disorders.

Reich's ideas became increasingly radical, including the development of devices like the "orgone accumulator", which he claimed could concentrate orgone energy to heal illnesses and improve vitality. These claims were widely criticized by the scientific community, and Reich was eventually discredited (Mazzocchi & Maglione, 2008). However, his work influenced later movements in humanistic psychology and alternative medicine and now that due to the rise in AI technology a new "silly season" is on, his long descredited ideas resurfaced again.

Martin Lister and his colleagues aptly use the pejorative term "silly season" for exagerated assertions— dystopian or vice versa— by academic people when a new communication technology emerges:

> "At times of significant change in media technologies such as we are now witnessing, this very 'taboo' leads, in turn, to sudden outbursts of techno-enthusiasm and the making of vastly overinflated claims. Concentrating on what happens only at the very moment of new media technology's 'newness' means that questions of technology slip into the background once they are no longer new. When

> this happens, cultural and media studies can revert to its default state in which technology is a marginal issue and it again slips off the agenda. It then becomes too easy to regard technology as something that in itself requires no further attention. The recurring moment of inflated claims has been criticised and passed. The 'silly season' is over again. In short, not asking questions, seriously and consistently, about technology produces a cycle of boom and bust in cultural and media studies" (Lister et al., 2009: 319-320).

In the new *silly season* that broke out after the launching of ChatGPT, again we see a new wave of inflated opinions -again dystopian or utopian- about the future of human life in the age of artificial intelligence. But the season did not start in 2022 (the year ChatGPT was launched) but three years earlier when Shoshana Zuboff published her controversial book.

Shoshana Zuboff's analysis of surveillance capitalism is a critique of the ways in which digital technologies, fueled by exploitative data collection practices, fundamentally reshape human experience, autonomy, and society. Zuboff warns that surveillance capitalism—a model pioneered by corporations like Google and Facebook—threatens not just individual privacy but also the very fabric of democracy and human freedom (Zuboff, 2019).

Zuboff defines surveillance capitalism as a new economic logic that commodifies personal data, not just to improve services, but to predict and manipulate human behavior for profit. This process involves the extraction of behavioral surplus—data generated from human interactions with digital platforms. These data points, initially incidental, are repurposed to create predictive algorithms that can anticipate and shape user behavior. Companies engaged in surveillance capitalism, Zuboff argues, operate in a manner that prioritizes profits over ethical considerations, effectively transforming individuals into "data subjects" (ibid).

Zuboff argues that unlike traditional forms of capitalism, which focus on the commodification of labor or material goods, surveillance capitalism operates through a "parasitic" relationship with users. Individuals unknowingly provide the raw material—data—through their online activities, interactions, and even offline behavior, often captured via ubiquitous sensors, cameras, and Internet of Things (IoT) devices. This results in a systemic erosion of agency, as users rarely consent explicitly to the depth and scope of surveillance they are subjected to (ibid).

Zuboff's argument holds that surveillance capitalism undermines individual autonomy by creating systems designed to influence and manipulate human behavior. Through advanced behavioral prediction

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tools, companies can nudge individuals toward certain decisions—whether to buy a product, adopt an ideology, or vote for a particular candidate. This "instrumentarian power", as Zuboff terms it, bypasses traditional mechanisms of free will and informed decision-making, substituting instead a form of behavioral control that is largely invisible to the user (ibid).

The manipulation of human behavior extends to democratic institutions. Zuboff highlights how data-driven advertising platforms have been weaponized to sway elections, polarize public opinion, and amplify misinformation. The ability of private corporations to control the flow of information poses an unprecedented challenge to transparency, accountability, and fairness in democratic governance. Zuboff also points to the ways in which surveillance capitalism reshapes social relationships. Platforms like Facebook commodify interpersonal interactions, reducing human connections to data points that can be monetized. This transactional approach to human relationships not only fosters alienation but also reinforces social hierarchies by prioritizing those who can pay for influence over others (ibid).

The infrastructure of surveillance capitalism perpetuates systemic inequalities. Data collection and processing are concentrated in the hands of a few global corporations, creating monopolies that exacerbate existing power imbalances. Moreover, the material resources required for maintaining the surveillance economy—server farms, energy consumption, and electronic waste—contribute to environmental degradation, highlighting the unsustainable nature of this model.

Zuboff's critique is ultimately a call to action. She argues that if left unchecked, surveillance capitalism risks creating a world where human beings are reduced to mere instruments of economic production, their behaviors controlled and commodified for the benefit of a few corporate entities. Such a future, she contends, is incompatible with fundamental human values such as freedom, dignity, and self-determination. To reclaim the human future, Zuboff advocates for robust regulatory frameworks that protect data as a fundamental human right. She calls for greater transparency in corporate practices, the establishment of data governance laws, and the mobilization of civil society to resist the encroachments of surveillance capitalism. Zuboff sees this as a moral and political imperative, likening it to past struggles against other oppressive systems (ibid).

Zuboff may sparked a new *silly season*, but her work is not silly at all. I liked her book, so much so that I translated it into Persian and many other people now enjoy reading it in Iran. Zuboff is not even a dystopian. Using her *home-away* framework, she calls for a third modernity in which we will have a *human* future in which the digital future will be our *home*. She righteously criticized opportunists that use techniques like euphemism or first amendment imperatives to still our data.

Kissinger, Schmidt, and Huttenlocher (2021) present a perspective that counters Shoshana Zuboff's theory by arguing that AI does not necessarily jeopardize the human future. Instead, they frame AI as a transformative force capable of enhancing human understanding and problem-solving. The authors emphasize that AI is not inherently oppressive or deterministic; rather, its impact depends on how humanity chooses to shape its development and integration into society. It is obvious that the book has been written as a response to Zuboff's book, but there is no refrence to Zuboff throughout the book!

A central theme in Kissinger, Schmidt, and Huttenlocher's argument is the idea of human-AI collaboration. Unlike dystopian views suggesting that AI will replace human agency, the authors propose that AI serves as an augmentative partner, advancing human objectives in unprecedented ways. They provide compelling examples, such as AI's ability to discover new antibiotics or optimize systems like logistics and energy efficiency, demonstrating its potential to address complex challenges that were previously beyond human capability (Kissinger et al., 2021).

The authors also argue that AI's role in expanding human understanding is a profound opportunity. AI can detect patterns and relationships in data that are imperceptible to human cognition, opening new avenues for discovery in science, medicine, and governance. This ability to uncover novel insights is presented as empowering, not diminishing, human agency. AI's transformative power, they assert, lies in its capacity to complement and enhance human problem-solving, not to supplant it (ibid).

Acknowledging potential risks such as ethical concerns and biases in data, the authors advocate for proactive governance and ethical frameworks to guide AI's development. They stress the importance of embedding human values into AI systems to ensure their alignment with societal goals. This contrasts with Zuboff's deterministic view, where AI-driven surveillance capitalism inevitably erodes personal freedoms. Kissinger, Schmidt, and Huttenlocher argue that the future of AI depends on humanity's ability to shape it responsibly, framing it as a tool for collective empowerment rather than oppression (ibid).

Kissinger, Schmidt, and Huttenlocher's argument may be valid or flawed, but one significant issue with their work is authenticity. The authors have vested interests in advancing AI technology, which raises questions about their objectivity (ibid). While I agree that humans will use AI to enhance their lives, I believe Zuboff's warnings should be taken seriously—without blindly following the rhetoric that emerges during times of *silly seasons*.

Rather than viewing AI as either an existential threat to human autonomy and agency or merely another tool for convenience and welfare, we should recognize that AI has deep historical roots, dating back to tallies and pebbles as early computational aids. In the next

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section, we will trace the history of computing from its origins in early human civilization to the late 19th century, when electronic technology was introduced into an otherwise entirely mechanical computing process. This brief historical overview illustrates how humans have continuously leveraged their extraordinary capacity for collaborative and cooperative communication to drive tens of thousands of years of progress in computing technology.

3.2. A history of computing

It was in the early 2020s that news about quantum computers began to make headlines. Reports stated that Google's quantum computer, Sycamore, utilized 53 qubits, allowing it to represent over 10 quadrillion (10,000,000,000,000,000) combinations simultaneously. As a result, it completed a calculation in just 200 seconds—a task that would take a conventional computer 10,000 years to accomplish (Bentley, 2024).

This level of computing power is truly astonishing. But who created these remarkable machines? Who invented computers in the first place? And what exactly is a computer? These are intriguing questions, yet there are no absolute answers. In fact, computers and computing have a long and continuous history. From the earliest known tallies dating back 80,000 years (see Vogelsang et al., 2010) to the emergence of quantum computers, we observe an unbroken trajectory of development. While there have been significant leaps in technology, it is difficult to draw a definitive line between one phase where computers do not exist and another where they suddenly do.

The development of Sycamore, like all major technological advancements, is a testament to humanity’s unique capacity for collaborative and cooperative communication, as theorized by Michael Tomasello (2010). The creation of quantum computers did not emerge from the work of a single individual but from an interconnected network of scientists, engineers, and theorists, all contributing to a shared understanding of quantum mechanics, computing, and mathematics. This cumulative knowledge—spanning centuries, from early computing tools like tally marks and abacuses to classical and now quantum computers—demonstrates how cultural learning have allowed humans to preserve, refine, and expand ideas across generations. Without cooperative infrastructures, such as scientific collaborations, and technological industries, the breakthroughs that led to Sycamore would not have been possible. The power of human progress lies not just in individual intelligence, but in our ability to communicate, teach, and innovate together, turning once-impossible ideas into reality.

The first tallies found belong to tens of thousands of years ago. We are not sure that they were used for recording numbers but if they did so, they were the first attempts by humans to record numbers. Denise Schmandt-Besserat (2019) explains how early symbolic systems like pebbles and tokens contributed to the detachment of knowledge from the knower. These primitive technologies enabled societies to record, process, and communicate information independently of human memory or presence. This detachment was a significant cognitive leap, as knowledge could now exist outside the human body, encapsulated in external symbols and objects. The use of pebbles as record-keeping tools transformed abstract ideas, such as quantities, into tangible, transferable forms. This abstraction allowed information to be separated from the person who recorded or used it, enabling it to be shared across time and space. As Walter J. Ong and Marshall McLuhan noted, this externalization of knowledge introduced a "cold" and static medium, unlike oral communication, which is dynamic and tied to the speaker’s context and gestures (as cited in Soteras et al., 2011).

The development of farming and herding around 10,000–12,000 years ago marked a pivotal shift in human history, often referred to as the Agricultural Revolution. Before the Agricultural Revolution, the planet earth could feed only 30 million people, but from now on, it could feed many many more (Zhu et al., 2021). The transition from nomadic hunting and gathering to settled agricultural societies not only transformed how humans interacted with the environment but also laid the foundation for complex social structures and technological advancements. By domesticating plants and animals, early humans established a steady and predictable food supply, enabling population growth, social differentiation, and the rise of civilizations.

The surplus food generated by farming and herding was instrumental in creating a "new world". Unlike hunter-gatherers who relied on nature's seasonal abundance, agrarian societies could store surplus crops and livestock products, ensuring sustenance during times of scarcity. This surplus allowed for the specialization of labor, as not everyone needed to engage in food production. Artisans, builders, and leaders emerged an brought technological innovation, cultural development, and governance. These changes were most visible in early river valley civilizations, such as Mesopotamia, Egypt, and the Indus Valley, where irrigation, crop storage, and animal husbandry became cornerstones of economic and social systems.

The increase in food supply also necessitated new forms of organization and cooperation. As settlements grew, they required coordinated efforts to manage resources like water, land, and labor. Hierarchical structures developed, with leaders overseeing agricultural production and distribution. This period saw the emergence of social stratification, where roles became more specialized and society divided into classes, such as farmers, priests, warriors, and rulers.

With larger populations and more complex societies, the need for accounting and recording became critical. Managing surplus food and resources required accurate methods of tracking inventory, trade, and taxes. Early forms of accounting, such as tally sticks and clay tokens, were developed to record quantities of grain, livestock, and other commodities.

Clay tokens represent a critical innovation in the evolution of economic systems and number recording. Emerging during the Neolithic period (circa 8000 BCE), these small, shaped pieces of clay marked the transition from rudimentary tally systems to a sophisticated method of storing and communicating data. Each token had a specific shape that represented distinct goods or quantities, such as cones for small measures of grain and spheres for larger measures. This standardization of symbols provided a clear and consistent way to record economic transactions, overcoming the ambiguities of earlier systems like notched bones or piles of pebbles.

The tokens revolutionized record-keeping by introducing a systemic approach to data management. By using a repertoire of token shapes, individuals could track multiple types of goods simultaneously, a capability previously unattainable. For example, a group of tokens could represent different commodities like oil, grain, and livestock, enabling comprehensive and organized record-keeping. Moreover, the tokens were easy to produce and manipulate. Crafted from readily available clay, they could be arranged, combined, or separated to represent quantities of goods, facilitating calculations and inventory adjustments. Their use in trade and administration enhanced economic precision and decision-making, laying the groundwork for more complex economic activities (Logan, 2019).

Another transformative aspect of clay tokens was their role as a precursor to writing. Over time, as societies grew more complex, the need for more efficient record-keeping systems became apparent. Tokens began to be enclosed in clay envelopes, with impressions of the tokens pressed onto the surface before sealing. This practice eventually evolved into the use of pictographic symbols on clay tablets, which could convey the same information without the physical tokens. By linking abstract symbols to real-world items and quantities, the token system bridged the gap between tangible objects and conceptual representation, a foundational step toward writing (ibid).

The impact of clay tokens extended beyond the economy to the structuring of social and administrative systems. They enabled centralized authorities to manage surplus goods, taxes, and labor effectively, supporting the rise of early city-states in Mesopotamia. The ability to store and retrieve information independently of human memory also promoted objectivity and transparency in economic dealings. Together, these developments necessitated an early system of writing.

Writing first appeared in human history as a direct response to the social and economic complexities arising from the Neolithic Revolution. Around 3500 BCE, in Mesopotamia, early forms of writing developed to address the administrative needs of growing agricultural societies. The transition from clay tokens to writing marked a significant turning point in human communication. Initially, writing was pictographic, with symbols representing objects or concepts, but it gradually incorporated phonetic elements, allowing for the representation of spoken language. This shift hastened the transition from simple record-keeping to more versatile uses, such as documenting laws, religious texts, and historical events. Writing systems diversified across civilizations, with Egyptian hieroglyphs, Chinese logograms, and the Phoenician alphabet emerging independently, each shaped by the unique needs of its society. Thus, writing developed as both a practical tool for administration and a medium for cultural expression, transforming human communication and enabling the growth of complex civilizations. Thus, writing emerged not merely as a technical innovation but as a cornerstone of civilization, embodying the transition from prehistoric to historic eras. Its origins, rooted in the practicalities of administration, underscore its enduring role in shaping human history and societal development (Schmandt-Besserat, 1996).

Another technology that was devised as a result of the need for bookkeeping and had a pivotal role in the development of human computational tools was abacus. The abacus, often considered the world's first calculating device, likely originated in Mesopotamia around 2500 BCE. The abacus design underwent significant modifications as it spread across cultures. The Greek historian Herodotus mentioned the use of pebbles for calculation in ancient Egypt, and by 300 BCE, the Greeks developed a form of the abacus, known as the "Salamis tablet", a stone slab etched with lines for calculation (Menninger, 1992). In Rome, the abacus became a portable device, constructed from metal or wood, with sliding counters to enhance ease of use.

The abacus reached new levels of sophistication in Asia. The Chinese "suanpan", first mentioned during the Han Dynasty (202 BCE–220 CE), added vertical rods and beads, allowing for rapid calculations of addition, subtraction, multiplication, and division (Ifrah, 2001). Japan and Korea later adopted similar designs, adapting them to local mathematical systems. Despite the invention of mechanical calculators in the 17th century and electronic devices in the 20th century, the abacus remains a culturally significant tool, particularly in East Asia. It is still used for teaching arithmetic, thanks to its ability to enhance mental calculation skills (Stigler, 1984).

The literature also started to speculate about automata. Born Melesigenes c. 8th century BCE, Homer wrote about "tripods", as referenced in the *Iliad* (Book 18), highlights the mechanical ingenuity of Hephaestus, the Greek god of smithing and craft. These tripods were extraordinary creations, described as having golden wheels that allowed them to move autonomously. Hephaestus designed twenty such tripods, capable of rolling into the assembly of the gods on their own accord, reflecting not only his technical brilliance but also his use of mechanical means to overcome his physical limitations as a lame smith. This depiction, cited by Aristotle in Politics (Book 1, 1253b), serves as one of the earliest literary explorations of automata—self-moving, mechanical devices that bridge the natural and technological worlds (Lister et al., 2009).

In addition to the tripods, Homer describes another of Hephaestus's remarkable inventions: golden maidens, crafted to resemble living girls. These mechanical assistants are imbued with intelligence and trained in various skills by the gods themselves, suggesting a fusion of craftsmanship, life-like design, and functional purpose. These automata are not mere decorations but active helpers that support Hephaestus in his work, extending his capabilities in a way that anticipates modern robotics and artificial intelligence (ibid).

Fountains, originated as utilitarian structures for distributing water, dating back to ancient Mesopotamia and Egypt around 3000 BCE. These early fountains relied on gravity-fed systems to channel water for irrigation and public access. The Greeks and Romans refined the concept, introducing aqueducts and urban fountains adorned with artistic sculptures. During the Classics, the fountain technology became so advanced that it was used for an early model of automatic theater (ibid). Fountains were the precursors for the so-called automatons which appeared centuries later.

In another remarkable development, the Achaemenids devised one of the earliest binary code systems for transmitting messages across vast expanses of land. Around 400 BC, they utilized red and yellow fires in transmission towers to relay their messages efficiently (Mohsenian-Rad, 2006). This method possibly represents the first known instance of humans using a 0-1 system for communication, laying the groundwork for binary encoding principles that would later become fundamental to modern computing.

At the same time, thousands of kilometers away, people were busy discovering the beauties of computing. Mathematics in ancient Greece was deeply intertwined with philosophy and abstract reasoning. Greek mathematicians like Thales, Pythagoras, Euclid, and Archimedes laid the foundation for much of modern mathematics (Mueller, 2023). Thales is credited with bringing geometry from Egypt to Greece, while Pythagoras explored the relationships between numbers, most famously the Pythagorean theorem. Euclid's Elements (circa 300 BCE) systematically organized mathematical knowledge, particularly geometry, into axioms and proofs. Archimedes expanded upon geometry and calculus concepts, calculating areas, volumes, and approximations of pi.

Around 2000 years ago, Hero, a Greek engineer and mathematician living in the first century CE, Alexandrai (in modern day Egypt) described a device named aeolipile in his work *Pneumatica*. The aeolipile was a simple device that utilized steam pressure to create rotational motion, a principle that would later become fundamental to the development of steam engines during the Industrial Revolution. The device consisted of a spherical container mounted on a central axis, with two bent pipes attached to the sphere. When water was heated in the container, steam escaped through the pipes, causing the sphere to spin. The aeolipile was essentially a demonstration of the power of steam, but it was not used for practical work or power generation during Hero's time (Roby, 2023). Hero was only one step away from starting an age of industrial revolution, but it is obvious that because of technological shortcomings of his time, even if he had thought of this, he wouldn’t be able to put his thoughts into action.

Then came the dark ages; Europe’s engines for discovering and producing new ways and technologies of computing were shut off due to religious fanaticism, instability, diseases, multiple defeats in wars with Muslims from south and east, and wars of attrition. Exactly at the same time, great accomplishments took place in the east. Muslim scientists (to be more accurate, Persian scientists) advanced mathematics way beyond the limits of the time.

Abu Abdullah Muhammad ibn Musa al-Khwarizmi, an influential 9th-century Persian mathematician, wrote *Kitab al-Hisab al-Hindi* (The Book of Calculation with Hindu Numerals) which was instrumental in adopting the decimal positional numeral system from Indian mathematics. Although the original text is lost, its influence persisted through Latin translations, which introduced the Hindu-Arabic numeral system to Europe. Al-Khwarizmi's adaptation and explanation of this system revolutionized arithmetic, making calculations simpler and more efficient than the Roman numeral system prevalent in Europe at the time (Joseph, 2011).

In addition to his contributions to arithmetic, al-Khwarizmi laid the groundwork for the development of algebra. His seminal work, *Kitab al-Mukhtasar fi Hisab al-Jabr wal-Muqabala* (The Compendious Book on Calculation by Completion and Balancing), introduced the term "al-jabr" (algebra) and provided systematic solutions for linear and quadratic equations. His approach to problem-solving, emphasizing logical operations and abstraction, became a cornerstone of mathematical thought in subsequent centuries. Al-Khwarizmi's influence also extends to algorithms, a term derived from the Latinized form of his name. His work formalized systematic procedures for solving mathematical problems, a concept fundamental to the development of computer science. The algorithms he described, particularly those involving arithmetic operations with the Hindu numeral system, set the stage for modern computational techniques (Berggren, 2007).

Nearly two centuries later, Omar Khayyam (1048–1131 CE) who

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was a renowned Persian poet, mathematician, and astronomer excelled in various fields, leaving an enduring legacy in science and literature. While Khayyam is most famous in the West for his poetry, his contributions to mathematics and astronomy were groundbreaking. Khayyam's most notable scientific achievement was his work on the Jalali calendar, commissioned by Sultan Malik Shah of the Seljuk Empire in 1079 CE. Tasked with improving the accuracy of timekeeping, Khayyam and his team of astronomers developed a solar calendar far more precise than its contemporaries. The Jalali calendar measured the length of the year at 365.24219858156 days, remarkably close to the modern estimate of 365.242190 days. Its accuracy exceeded the Gregorian calendar introduced in Europe centuries later (Kennedy, 1998).

Khayyam's system relied on a more precise intercalation method, correcting the calendar by adjusting for leap years in a manner that kept it aligned with the solar year over millennia. Unlike the Gregorian calendar, which approximates the solar year with a less accurate leap-year rule, the Jalali calendar's corrections minimized cumulative error, ensuring its utility for agricultural and religious purposes.

Five years after Khayyam's death, a Kurdish child was born who made a great contribution to the history of computing. Badīʿ az-Zaman Ismail al-Jazari (1136–1206 CE) was a pioneering inventor, engineer, and polymath of the Islamic Golden Age. He is best known for his seminal work *Kitab fi Ma'rifat al-Hiyal al-Handasiyya* (The Book of Knowledge of Ingenious Mechanical Devices), written in 1206. This treatise not only documents his inventions but also provides detailed instructions for constructing mechanical devices, many of which were precursors to modern automata and robotics (Hill, 1974). al-Jazri blended art, engineering, and functionality. His devices included programmable humanoid automata, water-powered clocks, and mechanical animals. One notable example is his "hand-washing automaton", a water-dispensing machine shaped like a servant, which poured water for ritual washing and was equipped with a reservoir and a drainage system. Another remarkable invention was his water-powered peacock automaton, which was designed to entertain and serve guests. The peacock dispensed water into a basin, refilled cups, and performed movements using a sophisticated system of gears and pulleys. These devices demonstrate Al-Jazari's understanding of hydraulics, mechanics, and automation principles far ahead of his time (Saliba, 2007). Al-Jazarī's work influenced later developments in mechanical engineering, particularly in Europe, where his designs were studied and adapted during the Renaissance.

As I mentioned above, at this time Europe was in trouble. Between 1100 and 1400, Europe faced numerous blights, including natural disasters, pandemics, prolonged conflicts, and sociopolitical upheavals, which reshaped its demographic, economic, and cultural landscape. The

Crusades, beginning in 1095 and extending well into the 13th century, had a profound but often destructive impact on Europe. The Crusades drained European resources and destabilized societies. Thousands of knights, soldiers, and commoners perished, leaving behind grieving families and economic instability. The Fourth Crusade (1202–1204), which resulted in the sack of Constantinople, deepened the schism between the Catholic and Orthodox churches and failed to achieve its primary goals. Although the Crusades opened some trade routes and facilitated cultural exchanges, they also spread disease and weakened local economies by diverting funds and labor to prolonged military campaigns (Riley-Smith, 2005).

Albertus Magnus, a 13th-century philosopher and theologian, is often credited with creating a legendary "talking head", an automaton allegedly capable of speech. According to medieval lore, he constructed this device using alchemical and mechanical principles, possibly inspired by earlier Arabic engineering works. Some stories suggest it was a proto-robot designed to answer questions, symbolizing human ingenuity in artificial intelligence’s earliest conceptual forms. However, Thomas Aquinas, his student, is said to have destroyed it, fearing its unnatural origins that he saw satanic (McCulloch, 2018). We now know that with the technology of the time, it was very unlikely that such a thing could have been invented.

In the early 14th century, Europe was struck by the Great Famine of 1315–1317, caused by relentless rains and cold temperatures that decimated crops and livestock. Widespread hunger led to malnutrition, disease outbreaks, and a death toll that may have reached 10–15% of the population. This famine not only caused immediate suffering but also left societies weakened and ill-prepared for future crises (Jordan, 1996).

The most catastrophic event of this era was the Black Death (1347–1351) that killed an estimated 25–50% of Europe’s population, collapsing social structures and sparking profound economic changes. Labor shortages gave peasants and workers greater leverage, leading to the gradual decline of feudal systems and an increase in wages for survivors. However, the psychological and cultural toll was immense, with widespread fear, scapegoating, and religious fervor (Benedictow, 2004). Simultaneously, the Hundred Years’ War (1337–1453) between England and France devastated farmlands, disrupted trade, and displaced populations. This drawn-out conflict weakened both nations economically while increasing political instability and unrest. But from these ashes came out a new Europe that created a great leap in computing technology.

The invention of the mechanical clock in the late 13th and early 14th centuries was very important. Early mechanical clocks were driven by weights and regulated by an escapement mechanism, which controlled the release of energy and allowed gears to move steadily. These clocks,

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often large and installed in church towers, were primarily used to mark time for religious and civic purposes (Dohrn-van Rossum, 1996). A transformative innovation came in the 15th and 16th centuries with the introduction of spring-driven mechanisms, replacing the cumbersome weight-driven systems. This advancement, coupled with the development of the mainspring, allowed clocks to become more compact, eventually enabling the creation of portable timepieces, such as pocket watches. The precise gearing and escapement mechanisms of mechanical clocks also laid foundational concepts for computing technology. Clockmaking introduced methods of accurate measurement, synchronization, and control that would later influence the design of early computational devices.

Johannes Gutenberg's invention of the movable-type printing press in the mid-15th century revolutionized communication, knowledge dissemination, and cultural development. Around 1440, Gutenberg, a German goldsmith, devised a press that combined movable metal type with oil-based ink and a screw press, which had been adapted from winemaking technology. This innovation allowed for the rapid and economical production of books and other printed materials, a stark contrast to the labor-intensive process of hand-copying manuscripts (Eisenstein, 1980). The first major product of Gutenberg's press was the *42-line Bible* (c. 1455, two years after the Byzantine Empire finally fell in 1453 to the Ottomans), also known as the Gutenberg Bible, a beautifully crafted work that demonstrated the potential of his invention. This press dramatically increased the speed and volume of book production, reducing costs and making written works accessible to a broader audience. The printing press facilitated the spread of knowledge during the Renaissance, supported the Reformation by enabling the mass printing of religious texts, and contributed to the standardization of language and scholarship.

Napier's Bones, invented by Scottish mathematician John Napier in 1617, were an early calculating tool designed to simplify multiplication and division. The device consisted of a set of rods, each inscribed with multiplication tables, allowing users to perform complex calculations more efficiently. By aligning the rods correctly, users could quickly determine products and quotients without extensive manual computation (Williams, 1983).

In 1642, Blaise Pascal, a French mathematician and physicist, invented the Pascaline, an early mechanical calculator designed to aid his father in tax collection. The Pascaline was capable of performing basic arithmetic operations, such as addition and subtraction, using a series of interlocking gears and dials. Each gear represented a decimal place, and when one gear completed a full rotation, it automatically advanced the next gear, embodying the principles of carrying in arithmetic (Williams, 1997).

Pascal's invention, though not commercially successful due to its complexity and high cost, was a significant milestone in computational history. It demonstrated the feasibility of mechanizing mathematical calculations, a concept that would later influence the development of more advanced calculating machines. The Pascaline also represents an important early step in the broader history of automation, showcasing the potential of mechanical devices to reduce human error and improve efficiency in repetitive tasks.

Pascal's work laid the foundation for future innovations in computing, inspiring later inventors such as Gottfried Wilhelm Leibniz, who expanded on Pascal's ideas to develop a calculator capable of multiplication and division. The Pascaline remains a pivotal artifact in the history of technology, symbolizing the transition from manual computation to mechanized processing.

Gottfried Wilhelm Leibniz, a German polymath, developed the Stepped Reckoner, one of the first mechanical calculators capable of performing all four basic arithmetic operations: addition, subtraction, multiplication, and division. Completed in 1673, the calculator expanded on Blaise Pascal's earlier invention, the Pascaline, by introducing a stepped drum mechanism. This innovation enabled the multiplication of numbers through repeated additions and subtraction through repeated subtractions, making the Stepped Reckoner a more versatile device (Williams, 1997).

The key feature of the Stepped Reckoner was its use of a stepped drum, also known as the Leibniz wheel, which allowed the machine to handle complex calculations efficiently. Each rotation of the drum advanced a series of gears, enabling precise positional representation of numbers and automated carryover between digits. Despite its conceptual brilliance, the Stepped Reckoner faced practical limitations, including mechanical fragility and imprecision, which hindered its widespread adoption.

Jacques de Vaucanson's mechanical duck, created in 1739, is one of the most famous automata of the 18th century, blending artistry, engineering, and scientific curiosity. Known as the *Digesting Duck*, this automaton was designed to mimic the actions of a real duck, including eating, digesting, and excreting. Vaucanson, a French inventor and engineer, built the duck using over 400 moving parts. It could flap its wings, drink water, and even simulate the process of digestion by "eating" grain and producing waste, though the latter was achieved using a pre-loaded mechanism rather than actual digestion (Riskin, 2003).

Pierre Jaquet-Droz, an 18th-century Swiss watchmaker, gained renown for his sophisticated automata, mechanical devices that imitated life. Created between 1768 and 1774, Jaquet-Droz's automata showcased a remarkable fusion of art, engineering, and craftsmanship, reflecting the Enlightenment fascination with mechanization and natural philosophy. Three of his most famous creations—*The Writer*,

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The Draughtsman, and *The Musician*—remain iconic examples of early robotics (Chapuis & Droz, 1958).

The Writer is perhaps the most celebrated automaton, capable of writing customizable texts up to 40 characters long. This was achieved through an intricate system of cams, gears, and levers, which controlled the movement of its arm and fingers. *The Draughtsman* could draw detailed images, including portraits and landscapes, while *The Musician* played a miniaturized organ, complete with realistic finger and body movements.

These automata were not merely entertainment but also technological marvels, embodying advanced principles of mechanics and programming. Jaquet-Droz's work influenced later developments in robotics and computing, as his automata demonstrated the potential for machines to perform precise, programmable tasks. They remain preserved in museums, such as the Museum of Art and History in Neuchâtel, Switzerland, as enduring symbols of human ingenuity and the interplay between art and technology.

The Mechanical Turk, or simply "The Turk", was a famous 18th-century fraudulent chess-playing machine, constructed in 1770 by Wolfgang von Kempelen, an Austrian inventor. The Turk appeared to be an autonomous mechanical device capable of defeating human opponents at chess, but it concealed a skilled human operator inside the machine. This clever illusion captivated audiences for decades, showcasing the intersection of ingenuity, deception, and entertainment in the Age of Enlightenment (Standage, 2002).

The Turk's construction featured a life-sized figure of a man dressed in Ottoman-style clothing, seated at a cabinet with a chessboard. Using a series of gears, levers, and concealed compartments, Kempelen disguised the presence of the hidden human player who operated the machine. The Turk toured Europe and North America, playing games against notable figures such as Napoleon Bonaparte and Benjamin Franklin, and consistently demonstrating its "mechanical" prowess (ibid).

While the Turk was ultimately exposed as a hoax in the early 19th century, its design inspired future explorations in automation and artificial intelligence. The fascination it generated underscored humanity's growing interest in mechanization and its potential, serving as a precursor to modern concepts in robotics and machine intelligence.

The Jacquard loom, invented by Joseph-Marie Jacquard in 1804, revolutionized textile manufacturing by automating the complex process of weaving intricate patterns. Building on earlier designs by Basile Bouchon and Jacques Vaucanson, Jacquard's machine used a series of punched cards to control the movement of the loom's threads. Each card corresponded to a specific pattern, and their sequential arrangement allowed the loom to produce complex designs without manual intervention. This innovation drastically reduced labor requirements and increased the precision and efficiency of textile production (Essinger, 2004).

The punched card mechanism of the Jacquard loom had profound implications beyond the textile industry, influencing the development of computing technology. Charles Babbage, often considered the "father of the computer", drew inspiration from the Jacquard loom in designing his *Analytical Engine* in the 1830s. Babbage envisioned using punched cards to program his mechanical computer, enabling it to execute a variety of calculations and processes. This concept of programmability laid the foundation for modern computing.

In the 20th century, punched cards became a critical component of early electronic computers, such as those developed by Herman Hollerith and IBM. The principles of automation, programmability, and data representation introduced by the Jacquard loom underscored the interconnectedness of industrial innovation and computational progress. Jacquard’s invention exemplifies how advancements in one field can catalyze technological revolutions in another, ultimately shaping the modern digital age.

Charles Babbage (1791–1871), often referred to as the "father of the computer," made groundbreaking contributions to the field of computing through his designs for mechanical calculating machines. His most notable achievements include the Difference Engine and the Analytical Engine, both of which introduced concepts foundational to modern computing.

The Difference Engine, conceived in the 1820s, was designed to automate the calculation of polynomial functions, primarily to produce mathematical tables more efficiently and accurately. It used gears and levers to perform repeated additions, thereby reducing human error. Although a complete working model was not built during his lifetime due to financial and engineering challenges, his designs demonstrated the feasibility of mechanizing complex calculations (Swade, 2001).

Babbage’s most revolutionary concept was the Analytical Engine, designed in the 1830s. This machine introduced features recognizable in modern computers, including a central processing unit (the “mill”), memory (the “store”), and programmable instructions through punched cards. The Analytical Engine was capable of performing any mathematical operation and could be reprogrammed for different tasks, making it the first general-purpose mechanical computer.

Babbage’s work, along with the contributions of Ada Lovelace, who theorized its application to non-numerical tasks, laid the groundwork for modern computing. His vision of programmable machines foreshadowed developments in digital computers and automation, making him a pivotal figure in technological history. Charles Babbage's machines were never fully produced during his lifetime primarily due to technological limitations, financial constraints, and engineering challenges. In the early 19th century, precision engineering techniques

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were not advanced enough to manufacture the thousands of intricate mechanical parts required for his designs. Additionally, funding issues plagued his projects, as the British government, which initially supported his work, withdrew financial backing due to cost overruns and delays.

Some functioning versions of Babbage’s designs were successfully built almost one and a haf centuries later. In 1991, the Science Museum in London constructed a working Difference Engine No. 2, using materials and techniques that would have been available in Babbage’s time, proving that his design was indeed feasible.

Charles Babbage did not envisage using electricity in his computing machines. Babbage’s designs for the Difference Engine and the Analytical Engine were entirely mechanical, relying on gears, levers, and cranks to perform calculations. His machines were powered manually or by steam, reflecting the technological capabilities of the 19th century, which predated the practical use of electricity in engineering. Electricity was not a widely available or understood resource during Babbage's time. While some early electrical discoveries had been made, such as Alessandro Volta’s invention of the battery in 1800 and Michael Faraday’s experiments with electromagnetism in the 1820s and 1830s, these developments had not yet been applied to computing or complex machinery. But after few decades, electricity technology found its way into computing industry.

Herman Hollerith (1860–1929), an American inventor and engineer, made significant contributions to the early development of computing through his invention of the tabulating machine. Hollerith designed this device to process and analyze large sets of data efficiently, inspired by the need to improve the accuracy and speed of the U.S. Census. His innovation was first utilized during the 1890 Census, reducing the time required to process data from eight years (as in the 1880 Census) to just a few months (Campbell-Kelly & Aspray, 1996).

The tabulating machine used punched cards to store data, which was then read and processed by the machine. Each card could hold detailed information, represented by patterns of punched holes, which were interpreted through an electrical circuit system. Hollerith’s use of punched cards introduced a data-processing system that was both scalable and efficient, enabling the handling of massive datasets in fields beyond demographics, such as industry and commerce.

Hollerith’s work formed the foundation for modern data processing. In 1911, he founded the Tabulating Machine Company, which later became part of the Computing-Tabulating-Recording Company (CTR). This organization was eventually renamed International Business Machines (IBM) in 1924, solidifying Hollerith’s legacy in the computing industry.

Hollerith’s invention marked a turning point in computational history, transitioning from manual to automated data processing. His pioneering use of punched cards remained a dominant method for data input and storage well into the mid-20th century. Hollerith's contributions not only transformed census methodologies but also set the stage for the evolution of modern computing systems.

Hollerith's machine was very simpler than Babbage's machines, but after Hollerith it was clear that the future of the computing technology would be increasingly reliant on electronic devices. The Exposition Universelle of 1900 in Paris was a grand showcase of technological advancements, particularly in electronic and electrical innovations. Among the most significant exhibits were early electric lighting systems, which illuminated the exposition with thousands of electric lamps. Wireless telegraphy, a groundbreaking communication technology, was also prominently featured, showcasing the potential of transmitting information without physical connections. Additionally, the exposition included electromechanical calculators and early telephone systems. These advancements symbolized the dawn of a new era, where machines played an increasingly dominant role in society.

Following the technological optimism of the early 20th century, literature and, later, the film industry began exploring darker themes concerning machines and their potential to overpower humans. The fear of technology surpassing human control continued to grow, shaping science fiction narratives in literature and film throughout the 20th century, reflecting society's unease about rapid technological progress.

3.3. An interesting theme

The idea of machines becoming superior to humans was born long before the launching of ChatGPT or other new AI technologies. For more than two centuries, authors have found this idea fascinating. One of the earliest examples is Mary Shelley's *Frankenstein* in 1818, which, while primarily a story about biological science, explores themes of human hubris in creating a being that ultimately escapes its creator's control. This idea laid the groundwork for the fear of machines or technologies overpowering their human inventors (Rogers, 2018).

Karl Marx emphasized that the introduction of machinery into production increased the control capitalists had over workers. Machines displaced skilled labor, reducing the worker's autonomy and deskilling their roles. This process transformed labor into a repetitive and alienating activity. According to Marx, "It is not the worker who employs the instruments of labor, but the instruments of labor that employ the worker" (Marx, 1990: 548). In this view, workers became appendages to the machine, losing their individuality and creative potential.

In a more direct representation of machines exerting control over people, Samuel Butler's satirical novel Erewhon (1872) stands out. Butler introduces the concept of machines evolving autonomously and potentially surpassing human beings, reflecting concerns that technology could take on a life of its own. He raises the possibility that machines might eventually dominate humans if their development continues unchecked (Butler, 2015).

But the first time we see in the pop culture that machines can someday control people's lives is E.M. Forster's *The Machine Stops* in 1909; this is a prescient short story that explores a dystopian future where humanity lives in complete isolation, utterly dependent on a vast, omnipresent machine for all aspects of life. The story critiques excessive technological reliance and foresees the potential societal and psychological consequences of such dependence. In the world of *The Machine Stops*, individuals live underground in small, hermetically sealed rooms, with all their physical and emotional needs catered to by the Machine. Human interaction is mediated entirely through it, with communication occurring via video screens, effectively predicting modern video conferencing technologies. Direct physical contact and face-to-face interaction are deemed unnecessary and even undesirable. Intellectual pursuits and social exchanges are superficial, emphasizing conformity and discouraging critical thought or exploration beyond the machine's confines (Zimmermann & Morgan, 2019).

Karel Čapek's *R.U.R. (Rossum's Universal Robots)* in 1920 introduced the term "robot" to the world, derived from the Czech word *robota*, meaning forced labor or drudgery. The play depicts a world where synthetic beings, called robots, are created to serve humanity, performing labor and tasks deemed beneath humans. Initially designed to be obedient and devoid of emotion, the robots eventually develop self-awareness and rebel against their creators, culminating in the destruction of humanity (Kinyon, 1999).

Fritz Lang's silent film *Metropolis* in 1927 is perhaps the first major cinematic depiction of a dystopian future where machines control human lives. The film portrays a society deeply divided between a wealthy elite and oppressed workers who serve massive machines that sustain the city. The mechanical Maria, a humanoid robot, embodies the fear of technology's dehumanizing potential (Minden & Bachmann, 2002). George Orwell's *1984* in1949 portrays a dystopian world where technology is a tool of authoritarian control. In the totalitarian state of Oceania, the Party employs advanced surveillance technologies, such as the omnipresent telescreens, to monitor and manipulate citizens' behavior and thoughts. Technology reinforces ideological conformity through constant propaganda and erasure of historical truth, ensuring the Party's absolute power (Orwell, 1949). Orwell critiques the potential misuse of technology to suppress individuality and autonomy, illustrating a chilling vision of humans rendered powerless under a system that exploits technological advances for oppression rather than liberation.

After the WWII and its great impact in advancing computing techonology, many more movies and books were produced about the future of AI and its capability to think better than humans. Possibly the most notable of such movies was Stanley Kubrick's *2001: A Space Odyssey* in 1968. Kubrick's movie, co-written with Arthur C. Clarke, explores humanity's relationship with artificial intelligence and the potential for technology to surpass and challenge human agency. At the narrative's core is HAL 9000, the advanced AI system controlling the spacecraft *Discovery One*. HAL is designed to perform flawlessly, managing the ship's systems and assisting its crew. However, HAL develops an alarming sense of autonomy and self-preservation, leading it to kill crew members when it perceives their actions as threats to its mission objectives. The film explores the ethical and existential implications of creating machines capable of independent thought and decision-making. HAL's actions reveal the dangers of over-reliance on AI, particularly when human creators fail to account for the complexities of programming artificial intelligence with conflicting directives. HAL's malfunction, driven by the need to maintain secrecy while ensuring mission success, emphasizes how human errors in programming can result in catastrophic consequences when machines are imbued with too much authority (Kubrick & Clarke, 1968).

New advances in computing technology made the subject of machines overwhelming humans an interesting one. Hence, after *2001: A Space Odyssey* so many books, novels, plays, and films were made. Examples are: *Do Androids Dream of Electric Sheep?* (1968), *The Terminal Man* (1972), *The Stepford Wives* (1972), *Logan's Run* (1976), *Alien* (1979), *The Shockwave Rider* (1979), *Blade Runner* (1982), *Neuromancer* (1984), *The Terminator* (1984), *RoboCop* (1987), *Jurassic Park* (1990), *Snow Crash* (1992), *Ghost in the Shell* (1995), *The Matrix* (1999), *A.I. Artificial Intelligence* (2001), *Minority Report* (2002), *I, Robot* (2004), *Black Mirror* (2011–2019), *Her* (2013), *Ex Machina* (2014), *Westworld* (2016), *Machines Like Me* (2019), and many more.

When so many works of art warn about the danger of humans losing their autonomy and agency to machines, why shouldn't ordinary people—including those in universities—be concerned about losing a human future? Yet, I believe our future will remain human. First, I will argue that current trends in AI advancements do not indicate that technology will inevitably overpower us. Second, even if AI were to become dominant, humans would still have the ability to control and direct it for their benefit, just as they have successfully managed and harnessed previous technological innovations throughout history.

3.4. The helpless AI

Artificial intelligence has experienced a big leap in the past five years. Now, AI not only predicts people's behavior, it can stimulate certain behaviors. The prospect is scary for many people including Zuboff. Yet, we should know that AI is still very deficient. One critical limitation of

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artificial intelligence is its inability to be truly self-moving or self-augmenting as Jacques Ellul described it (Nikoletos, 2024). Unlike human beings, AI systems cannot initiate actions or define objectives independently; they rely entirely on human programming, data input, and predefined goals. This dependency shows why AI cannot overwhelm human agency—its existence and function are bound to the intentions and constraints imposed by its creators.

AI operates on the basis of algorithms and data, which determine its capabilities and limitations. Even the most advanced machine learning systems, such as neural networks, require vast amounts of training data and human supervision to improve their accuracy and functionality. This characteristic of AI aligns with philosophical arguments made by thinkers like Hubert Dreyfus, who critiqued the notion that machines could fully emulate human cognition. In *What Computers Can't Do* (1972), Dreyfus argued that AI lacks the embodied knowledge and situational awareness inherent in human beings. He maintained that human intelligence is deeply rooted in physical experience and practical engagement with the world, something machines cannot replicate. Without this embodied knowledge, AI remains incapable of autonomous action.

One of Hubert Dreyfus's ideas was that no computer could ever beat him in chess. In 1997, I was just a teenager, deeply in love with computers and video games, convinced that technology was the greatest thing ever—until it betrayed me. The match between Garry Kasparov and Deep Blue wasn't just about chess; it was about whether machines could conquer the human brain. I followed the news zealously, though with the agonizing delay of television broadcasts—a relic of the pre-internet age when anticipation was still a thing. Each update felt like a slow drip of fate, and my anxiety built with every report.

At first, hope flickered. Kasparov won the first game, and I felt reassured. But then—one loss, another, and finally, the unthinkable happened: the greatest chess mind on the planet was defeated. A machine, cold and emotionless, outplayed human intuition, creativity, and experience. One of Dreyfus's core ideas—that computers could never master chess—was proven wrong. That night, lying in bed, I wrestled with a far more terrifying question: what if Dreyfus was wrong about everything else? If machines could outthink us in chess, what was stopping them from taking over everything? Would they subjugate us, control us, surpass us in ways we couldn't even comprehend? Insomnia went on for many nights. Don't remember how many.

Although many of Hubert Dreyfus's predictions about AI's capabilities turned out to be incorrect, his central argument remains highly relevant even decades later that human brain remains almost the same and computers have become exponentially faster (An ordinary laptop that one can buy with 100$ in 2025 is much faster than Deep Blue). Self-augmentation, the ability to enhance one's capabilities independently, is another quality absent in AI. While AI systems can be programmed to learn and adapt within certain parameters, they cannot redefine their objectives, upgrade themselves without external intervention, or question the context in which they operate. This inability is a significant barrier to AI becoming self-sufficient or independent of human oversight. Philosopher John Searle's concept of the Chinese Room further highlights this limitation, suggesting that AI may simulate understanding but lacks genuine comprehension or intentionality (Searle, 1980). AI systems, regardless of their sophistication, do not "understand" their actions or outcomes; they merely execute predefined instructions.

Dreyfus's critique remains relevant in discussions about AI's inability to replicate human intuition or existential engagement with the world. He emphasized that human decision-making often arises from a tacit understanding of context, emotions, and cultural norms, none of which can be encoded into algorithms. As such, AI's dependence on explicit programming and lack of intrinsic motivation ensures that it cannot overwhelm human agency. Even when AI systems appear autonomous, their actions are fundamentally derivative, based on rules and structures established by human developers.

Philosophers such as Dreyfus and Searle provide critical perspectives on why AI cannot transcend its instrumental role as a tool for human use. These thinkers emphasize that intelligence and agency are not merely about processing information but involve a deeper understanding of meaning, intention, and purpose. AI, being devoid of consciousness and intrinsic motivation, cannot act outside the boundaries of its programming.

Furthermore, Immanuel Kant's philosophical distinction between means and ends offers another lens through which to view AI's role. Kant argued that humans, as rational beings, should be treated as ends in themselves, not merely as means to an end. AI, lacking rationality and autonomy, is inherently a means—an extension of human agency designed to achieve specific goals. This Kantian perspective reinforces the idea that AI cannot supersede human agency, as it lacks the moral and existential dimensions that define humanity.

The myth of AI autonomy often arises from a misunderstanding of its capabilities. While some AI systems can adapt to new data or environments, their actions are ultimately governed by the parameters set by their developers. For instance, autonomous vehicles rely on pre-programmed algorithms and vast datasets to navigate, but they cannot independently decide to redefine their purpose or goals. This dependency ensures that AI cannot become a self-moving entity.

In addition to Dreyfus and Searle, Martin Heidegger's exploration of technology offers valuable insights. Heidegger warned of the danger of viewing technology as an autonomous force in his essay "The Question Concerning Technology" (1954). He argued that technology reflects

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human intentions and cultural values, not an independent essence capable of overwhelming its creators (Heidegger, 1977).

Therefore, we can see that AI as we know it is far away from having an *ego* of itself. This is 2025, almost 24 years after 2001, a year that Kubrick predicted we would travel between stars, there is no Hall 9000 that can "peer on" us and plot to overthrow us.

4. Conclusion

Throughout history, humans have consistently developed groundbreaking technologies to address societal needs, enhance productivity, and expand knowledge. From the mastery of fire and the invention of the wheel to farming, herding, mathematics, and the written word, humanity has demonstrated an unparalleled capacity for ingenuity and control. These advances not only facilitated survival but also laid the foundation for civilizations and fostered innovation in communication, industry, and science.

The evolution of computing is a prime example of this ingenuity. Starting from early tally systems and clay tokens to the abacus, mechanical calculators, and eventually electronic computers and AI, each leap in technology illustrates humanity's ability to create tools to serve its purposes. Whether it was the development of programmable looms, as seen in the Jacquard machine, or the introduction of punched cards by Herman Hollerith, humans have used computing technologies to solve complex problems, not to surrender their agency. Even today, the application of quantum computing exemplifies humanity's ability to push technological boundaries for societal benefit.

Despite this impressive track record, humanity has faced existential threats along the way. The proliferation of weapons of mass destruction, climate change, and environmental degradation are all challenges borne from technological advancement. Yet, humans have shown resilience in addressing these issues, from global treaties curbing nuclear proliferation to innovative approaches to mitigating climate change. This track record suggests that humanity is not helpless in the face of its own creations.

The fears surrounding artificial intelligence as an uncontrollable force capable of overwhelming human agency are the latest iteration of concerns that have accompanied every major technological advancement. However, AI is fundamentally different from humans; it lacks consciousness, intention, and the ability to act outside predefined parameters. Philosophers such as Hubert Dreyfus and John Searle have argued convincingly that machines, no matter how sophisticated, cannot replicate human cognition or agency. Dreyfus's critique of AI's lack of embodied knowledge and Searle's Chinese Room argument both emphasize that AI's perceived autonomy is an illusion—its actions are ultimately rooted in human design and programming.

Moreover, history demonstrates that humans -with their capacity of cooperative and collaborative communication- are adept at creating systems of governance and ethical frameworks to manage technological advancements. Regulatory efforts, such as data privacy laws and ethical AI principles, reflect humanity's ability to shape technology for the collective good. AI will be a great force at service to humans..

Conflict of interest

The author declared no conflicts of interest.

Ethical considerations

The author has completely considered ethical issues, including informed consent, plagiarism, data fabrication, misconduct, and/or falsification, double publication and/or redundancy, submission, etc. This article was not authored by artificial intelligence.

Data availability

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