

The Future of Computing and Artificial Intelligence (AI)

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ABSTRACT

This study reviews the future of computing and Artificial Intelligence. In computer science, artificial intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans. Leading AI textbooks define the field as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals. mathematicians in antiquity. The study of mathematical logic led directly to Alan Turing's theory of computation, which suggested that a machine, by shuffling symbols as simple as "0" and "1", could simulate any conceivable act of mathematical deduction. This insight, that digital computers can simulate any process of formal reasoning, is known as the Church-Turing thesis. Today, data is streaming in real time, fueled by the booming growth of digital devices, social media, cloud

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computing, and the Internet of Things (IoT). These data make great dataset for training AI systems. In a few years time, AI will touch nearly all the industries on this planet and there are plenty of ways AI is and can transform certain industries. The automation by AI can bring about the unemployment crisis among humans since AI can outperform us in more and more fields. Another concern is the potential abuse of AI by hackers, rebel states, and attackers. The advent of computers propelled society and spurred into action a lot of businesses and industries that would otherwise have been impossible. Computers and computer technology changed the way humans worked and functioned. The very first computer was a behemoth. Today, everything that you need is available on the computer through the internet and even the most complex computations can be carried out by these modern wonders.

INTRODUCTION

In computer science, artificial intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans. Leading AI textbooks define the field as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals [1]. Colloquially, the term "artificial intelligence" is often used to describe machines (or computers) that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving" [2]. Computing is any activity that uses computers to manage, process, and

communicate information. It includes development of both hardware and software. Computing is a critical, integral component of modern industrial technology. Major computing disciplines include computer engineering, software engineering, computer science, information systems, and information technology.

Computer vision, or the ability of artificially intelligent systems to "see" like humans, has been a subject of increasing interest and rigorous research for decades now. As a way of emulating the human visual system, the research in the field of computer vision purports to develop machines that can automate tasks that require visual cognition. However,

the process of deciphering images, due to the significantly greater amount of multi-dimensional data that needs analysis, is much more complex than understanding other forms of binary information. This makes developing AI systems that can recognize visual data more complicated.

But, the use of deep learning and artificial neural networks is making computer vision more capable of replicating human vision. In fact, computer vision is becoming more adept at identifying patterns from images than the human visual cognitive system [3] [4]. For instance, in the field of healthcare, computer vision-based technology has said to have exceeded the pattern recognition capabilities of human physicians. Researchers have tested an AI that can detect neurological illnesses by reading CT scan images faster than radiologists.

With similarly astounding feats by AI with computer vision technology becoming increasingly common in different industries, the future of computer vision appears to be full of promise and unimaginable outcomes. Read on to know the state of computer vision technology today and where it is heading in the future. [5] defined "computing" as follows: in a general way, we can define computing to mean any goal-oriented activity requiring, benefiting from, or creating computers. Thus, computing includes designing and building hardware and software systems for a wide range of purposes; processing, structuring, and managing various kinds of information; doing scientific studies using computers; making computer systems behave intelligently; creating and using communications and entertainment media; finding and gathering information relevant to any particular purpose, and so on. The list is virtually endless, and the possibilities are vast.

However, [6] also recognizes that the meaning of "computing" depends on the context:

Computing also has other meanings that are more specific, based on the context in which the term is used. For example, an information systems specialist will view

computing somewhat differently from a software engineer. Regardless of the context, doing computing well can be complicated and difficult. Because society needs people to do computing well, we must think of computing not only as a profession but also as a discipline.

As machines become increasingly capable, tasks considered to require "intelligence" are often removed from the definition of AI, a phenomenon known as the AI effect.[3] A quip in Tesler's Theorem says "AI is whatever hasn't been done yet." [7] For instance, optical character recognition is frequently excluded from things considered to be AI, having become a routine technology [8]. Modern machine capabilities generally classified as AI include successfully understanding human speech [9]. competing at the highest level in strategic game systems (such as chess and Go) [10]. autonomously operating cars, intelligent routing in content delivery networks, and military simulations.

Artificial intelligence was founded as an academic discipline in 1956, and in the years since has experienced several waves of optimism,[11] [10] followed by disappointment and the loss of funding (known as an "AI winter"), [12] [13] followed by new approaches, success and renewed funding. [14] [15] For most of its history, AI research has been divided into subfields that often fail to communicate with each other.[16] These sub-fields are based on technical considerations, such as particular goals (e.g. "robotics" or "machine learning"),[17] the use of particular tools ("logic" or artificial neural networks), or deep philosophical differences. Subfields have also been based on social factors (particular institutions or the work of particular researchers) [18].

The traditional problems (or goals) of AI research include reasoning, knowledge representation, planning, learning, natural language processing, perception and the ability to move and manipulate objects.[19] General intelligence is among the field's long-term goals [20]. Approaches include statistical methods, computational intelligence, and

traditional symbolic AI. Many tools are used in AI, including versions of search and mathematical optimization, artificial neural networks, and methods based on statistics, probability and economics. The AI field draws upon computer science, information engineering, mathematics, psychology, linguistics, philosophy, and many other fields.

The field was founded on the assumption that human intelligence "can be so precisely described that a machine can be made to simulate it" [21]. This raises philosophical arguments about the nature of the mind and the ethics of creating artificial beings endowed with human-like intelligence. These issues have been

THEORETICAL REVIEW

The study of mechanical or "formal" reasoning began with philosophers and mathematicians in antiquity. The study of mathematical logic led directly to Alan Turing's theory of computation, which suggested that a machine, by shuffling symbols as simple as "0" and "1", could simulate any conceivable act of mathematical deduction. This insight, that digital computers can simulate any process of formal reasoning, is known as the Church-Turing thesis.[24] Along with concurrent discoveries in neurobiology, information theory and cybernetics, this led researchers to consider the possibility of building an electronic brain. Turing proposed changing the question from whether a machine was intelligent, to "whether or not it is possible for machinery to show intelligent behaviour".[25] The first work that is now generally recognized as AI was McCulloch and Pitts' 1943 formal design for Turing-complete "artificial neurons" [26].

The future of computing is software, not hardware. We are living in an age in which powerful cloud computing networks make supercomputing ubiquitous and relatively inexpensive. Within two years, 5G wireless networks will kill latency. Add optical, audio, GPS and other sensors commoditized by smartphone mass production, and you have the ingredients for a computing device that is all-

explored by myth, fiction and philosophy since antiquity.[22] Some people also consider AI to be a danger to humanity if it progresses unabated. Others believe that AI, unlike previous technological revolutions, will create a risk of mass unemployment [23].

In the twenty-first century, AI techniques have experienced a resurgence following concurrent advances in computer power, large amounts of data, and theoretical understanding; and AI techniques have become an essential part of the technology industry, helping to solve many challenging problems in computer science, software engineering and operations research.

knowing, blazing fast and contextually aware.

The odd of that computer being an aluminum clamshell is nil. Understanding this transformation is key. It explains why Alphabet, Microsoft and Amazon are betting their future on powerful cloud computing networks and artificial intelligence, the branches of computer science that teach computers to learn like humans by recognizing and understanding patterns.

These companies also have key scale advantages that will ensure future profitability. Building large cloud and AI environments is prohibitively expensive for smaller enterprises. Training AI sucks up a lot of computing power. In March, Recode reported the triumvirate spent a record \$20 billion in 2017 total to equip and build new data centers. The outlay was more than the previous three years combined. Let that sink in for a moment. At the same time, they are leading a gold rush of new AI investment. In December 2017, The Economist reported the largest technology companies had acquired 110 AI companies since 2010. The value of those investments surged beyond \$22 billion.

At Alphabet, machine learning is in its corporate DNA. Machine learning is trial-and-error on a massive scale. Legions of computers crunch through enormous sets of data, learning through progression. Since 1994, the company has depended

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on it for Google Search and the development of its digital advertising model. Today, it is the engine that powers every service at Alphabet. In 2016, Jeff Bezos, chief executive officer at Amazon, declared AI is its fourth pillar, behind e-commerce, Amazon Prime, its membership service, and Amazon Web Services, its cloud division. And in 2017, Satya Nadella, chief executive officer at Microsoft, changed its corporate mission from mobile and cloud first, to AI first. The new strategy involved building AI into every software application and service to ensure the user experience spanned every device [27].

All three companies have made voice a cornerstone of their AI efforts. Developers can build applications for Google Assistant, Alexa and Microsoft Cortana that run everywhere. It is not hard to see the future of computing. It begins with a personal digital assistant that lives in the cloud. That assistant is unique to its user and will have access to all personal data. It will also be in a constant state of refinement. It will learn.

It's the future promised in the 2013 film, "Her." The Spike Jonze dark romantic comedy is the story of a man and his love affair with his AI digital assistant. It is a strange concept. But, it is not too far from the realm of possibility given how quickly AI is progressing.

[28], the noted futurist and chief engineer at Google, was a technical adviser to the film. Today, Kurzweil is tasked with bringing AI to Gmail, the popular email client. AI networks quickly scan every email, looking for keywords and context, before offering an automated response. It is all still rudimentary, but you can see the direction.

The company is using billions of emails as data to refine AI algorithms that understand written context. It is a small first step toward digital assistants capable of conversation. Amazon uses AI to tailor recommendations at its giant online marketplace and to choreograph its 80,000 warehouse robots. And Microsoft is working with partners to build always on thin and light computers enhanced by Cortana.

It's important for investors to look forward. The future of computing is not complicated, and it is going to be a big business. Thankfully, it is all being carefully laid out right now. The field of AI research was born at a workshop at Dartmouth College in 1956,[29] where the term "Artificial Intelligence" was coined by John McCarthy to distinguish the field from cybernetics and escape the influence of the cyberneticist Norbert Wiener.[30] Attendees Allen Newell (CMU), Herbert Simon (CMU), John McCarthy (MIT), Marvin Minsky (MIT) and Arthur Samuel (IBM) became the founders and leaders of AI research.[31] They and their students produced programs that the press described as "astonishing":[32] computers were learning checkers strategies (c. 1954)[33] (and by 1959 were reportedly playing better than the average human),[34] solving word problems in algebra, proving logical theorems (Logic Theorist, first run c. 1956) and speaking English.[35] By the middle of the 1960s, research in the U.S. was heavily funded by the Department of Defense[36] and laboratories had been established around the world.[37] AI's founders were optimistic about the future: Herbert Simon predicted, "machines will be capable, within twenty years, of doing any work a man can do". Marvin Minsky agreed, writing, "within a generation the problem of creating 'artificial intelligence' will substantially be solved". [8]

They failed to recognize the difficulty of some of the remaining tasks. Progress slowed and in 1974, in response to the criticism of Sir James Lighthill [18] and ongoing pressure from the US Congress to fund more productive projects, both the U.S. and British governments cut off exploratory research in AI. The next few years would later be called an "AI winter",[10] a period when obtaining funding for AI projects was difficult.

The Future Is Now: Ai's Impact Is Everywhere

There's virtually no major industry modern AI more specifically, "narrow AI," which performs objective functions using data trained models and often falls into the categories of deep learning or

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machine learning hasn't already affected. That's especially true in the past few years, as data collection and analysis has ramped up considerably thanks to robust IoT connectivity, the proliferation of connected devices and ever-speedier computer processing. Some sectors are at the start of their AI journey, others are veteran travelers. Both have a long way to go. Regardless, the impact artificial intelligence is having on our present day lives is hard to ignore.

Applications of Artificial Intelligence in future technologies

Today, data is streaming in real time, fueled by the booming growth of digital devices, social media, cloud computing, and the Internet of Things (IoT). These data make great dataset for training AI systems. In a few years time, AI will touch nearly all the industries on this planet and there are plenty of ways AI is and can transform certain industries.

Health Care

AI system can help medical physicians deliver faster and accurate treatment by analyzing a large amount of clinical data like demographics, medical notes, recordings from medical devices and laboratory images [8]. For instance, AI can help in detecting epithelial ovarian cancer in stage 1A when it has a 94% cure rate [15]. Whereas, by a normal process, it is usually undetected or is detected in stage 3 or 4, when the symptoms start appearing and chances of cure start plummeting. Moreover, Elon Musk's Neural Lace could be the next AI advancement in the field of healthcare. It is an ultra-thin mesh that can be embedded in the skull creating an interface between the machine and the brain. Gradually, it would become a part of the brain and help in treating brain disorders [26]. Researchers are hoping that in future AI may enhance the ability of a human to provide better healthcare services [5] and will enhance life expectancy of human civilization.

Space Industry

Historically machine learning algorithm has been used in health monitoring of spacecraft, navigation, intelligent control and object detection for navigation.

Nowadays private firms are becoming the protagonists rather than operating as a contractor in the space industry [29]. One of the notable examples is of SpaceX, in 2018 they launched 21 rockets in the space [10]. Blue Origin plans to start space tourism by 2021. NASA is using AI for trajectory and payload optimization to increase the efficiency of the next rover mission to Mars [21]. AI will extend the boundaries of human compatibilities and will help scientist to reach Europa, Jupiter's moon where scientist believe there could be a subsurface ocean. NASA is currently planning to launch James Webb Space Telescope in the orbit around 1.5 million kilometers from the earth in 2020, part of the mission will be overlooked by the AI. AI is still gathering momentum in the space industry [1]. The coming years' mission will be turbocharged with AI as we voyage in comets, planets, moons and explore the possibility of mining the comets [2].

Environmental Protection

With the impending unprecedented stress caused by global warming, natural disasters, and other human activities, AI can help us take concrete steps to better protect our environment. For instance, by using Youtube videos to uniquely identify and track the movement of animals, AI can help scientists to identify and protect the endangered animals [33]. In future AI can help in greenhouse gas reduction through proper traffic optimization, route planning of autonomous public transport and ride-sharing services [4]. It will augment agriculture with the help of automated data collection and take corrective action using robots to detect crop diseases which will eventually increase the efficiency and reduce the use of pesticides and fertilizers. AI will also help in monitoring the coral reefs by processing the plethora of images collected by drones and NASA's satellites [24]. This information can help in protecting the reefs from collapse. The intelligence and productivity gains that AI will deliver can unlock robust solutions to the environment's pressing challenges like these.

Artificial General Intelligence

Highly specialized machines like Deep Blue, Watson and AlphaGo are single-purposed AI systems whose intelligence is very domain-specific known as Artificial Narrow Intelligence(ANI) [35]. There is ongoing experimental work on Artificial General intelligence that would be flexible enough to learn without supervision and adapt to multiple and unexpected situations like humans. In the field of legal systems, it would implement concepts like “fairness” and “justice”. After decades, emotional robots won’t be a thing of sci-fi fantasy.

Others

In other fields like cybersecurity, Artificial Neural Network will play a significant role by consistently accumulating intelligence on attacks, breaches, new threats, malware and given all this information AI can learn from it and detect abnormalities within an organization’s network and flag it quicker than a member of cybersecurity [26]. Harnessing AI, chat-bots will be more effective which will make a great transition from the Graphical User Interface (GUI) to the Conversational User Interface (CUI) [17]. Moreover, Automated vehicles will be tremendously substituted by driverless cars that would reduce road

accidents and better fuel efficiency due to smoother braking and acceleration than human drivers. In the military, by harnessing satellite photo interpretation capabilities, AI programs could identify potential targets and threats. The next evolution that we might see in AI is Neuromorphic Computing, which will be similar to the human brain model. AI can be harnessed further to help in getting rid of the errors that human brains are prone to make [11]. Moreover, we might see the integration of quantum hardware and software with AI, to solve complex problems within seconds [29].

Challenges of Artificial Intelligence

The automation by AI can bring about the unemployment crisis among humans since AI can outperform us in more and more fields. Another concern is the potential abuse of AI by hackers, rebel states, and attackers. For instance, a commercial drone can be turned into a targeted weapon. Moreover, Scientists believe after Artificial General Intelligence, next we might see is Artificial Super Intelligence, which would surpass human intelligence. Such super intelligence might rule the world and see humans as a threat and a waste of resource.

CONCLUSION

The advent of computers propelled society and spurred into action a lot of businesses and industries that would otherwise have been impossible. Computers and computer technology changed the way humans worked and functioned. The very first computer was a behemoth. Today, everything that you need is available on the computer through the internet and even the most complex computations can be carried out by these modern wonders. Computers are already ubiquitous, but, they possess the ability to enhance their presence even more. Computers are on desks and countertops, in bags and pockets, but, soon, they might be a part of everything imaginable. Yes, everything conceivable, even the

tinest of devices and commodities, might soon have computers embedded within them. There is an increasing demand for products that can carry out the computations that they need on their own and this has led to the need for devices that have computers embedded in them. Some people perceive the final goal of computers to be that of ensuring that computers are inextricable from society and human life. Computers would be so involved in every process that the very thought of its non-existence would make life impossible! The aim is to ensure that computers are entangled with human life in such a way that computers would be indistinguishable from human life.

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