

Research Article

Research, Challenges, and Triumphs in the Age of Artificial Intelligence

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ABSTRACT



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During the industrial revolution, significant technological developments made it possible to successfully replace numerous manual labor jobs and procedures that had been around for decades and in situations where human understanding had reached its limit. Artificial intelligence (AI) holds the potential to both disrupt and replace human work in a wide range of intellectual, social, and financial situations. The speed at which this new AI era is developing is astounding, and advancements in algorithmic machine learning and autonomous decision making have the potential to stimulate even greater innovation. The current resurgence of AI is among the greatest illustrations of a significant shift in the nature of human-computer interaction. Because AI technology and the abundance of information on the internet complement one other, traditional computer functions are changing. AI-enabled solutions boost productivity in a world where change is happening faster than ever before by managing enormous volumes of data and enhancing decision-making skills. Artificial intelligence (AI) is still in its infancy and needs a lot more research before it can be proven to be a workable concept, despite being hailed as a game-changing technology. Every day, new knowledge is created at an unfathomably rapid pace, and the Big Data Driven World has already arrived. Artificial intelligence (AI) concepts and software have shown impressive results in addressing difficult and complex societal problems. However, the industry also has a lot of disadvantages and difficulties, which has made some individuals wary about AI. One of the main issues with AI is the distinction between correlation and causality, which is important in AI research. The study offers significant and pertinent perspectives on artificial intelligence (AI) technology and its potential impacts on scholarly inquiry and society at large. It explores in detail how people's interactions with computers and decision-making processes are being altered by artificial intelligence. An overview of artificial intelligence's accomplishments and obstacles is given in this paper, with a focus on the technology's application in the field of educational research.

1. Introduction

The difficulties, dangers, threats, and problems that humanity is currently dealing with are unlike anything it has ever encountered (World Economic Forum, 2019). They also have an international scope and call for solutions involving multiple organizations. These difficulties encompass a wide range of topics, including energy, the environment, health, ecology, trade, economics, international peace, stability, global famine, and spiritual degeneration. Devastating natural disasters happen all around the world more often each year. It is a common misconception that environmental factors are the only causes of these occurrences. We are not entirely blameless in this entire circumstance. It is imperative that the underlying causes of these problems are identified, thoroughly examined, and then addressed with long-term, cost-effective solutions (OECD, 2007). Artificial intelligence is expected to have a greater influence in the fields of educational technology, management sciences, and operational research. In general, intelligence is the capacity to learn in order to tackle challenging issues. Very clever machines will soon take the place of humans in many different types of jobs. Artificial intelligence is the study of computers and software that can think, learn, acquire knowledge, communicate, operate, and recognize objects.

Artificial intelligence (AI) is not a novel notion; in fact, over the years, it has sparked a lot of public discussion. It is occasionally brought up in conversations about the potential dominance of intelligent computers, which would force people to live in a subservient role in an AI-dominated society, or it is depicted in science fiction movies. Despite the seeming sarcasm of this graphic, artificial intelligence is real and is used by people today. From being a theoretical field of study, AI technology has developed into a crucial part of many businesses' business plans. Furthermore, it is strategically vital to the goals of many other sectors, such as industry, the government, and the medical field. The literature has put out a number of definitions of artificial intelligence (AI), all of which revolve around the idea that AI is non-human intelligence that has been educated to do particular tasks. Russell (2016) described artificial intelligence as the simulation of cognitive processes like learning, communication, and problem-solving that is frequently attributed to humans (Russell, 2016). Artificial intelligence (AI) is described as a system's capacity to autonomously evaluate and deduce information from outside sources in order to achieve predetermined goals through flexible modification (Kaplan, 2019). Artificial intelligence (AI) was defined by Juniper (2018) research as a computer program that combines data, algorithms,

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and mathematics to solve issues and carry out tasks that are normally completed by humans. One factor unites all these ideas: computers are getting better at doing tasks that people used to complete in the business and in society at large (Juniper, 2018).

John McCarthy coined the term in 1956 to describe the branch of computer science that focuses on teaching robots to think and act like humans. Being able to compute allows one to reason and behave rationally. Unlike computer science and psychology, artificial intelligence emphasizes computation over observation, reasoning, and action. It increases the intelligence and utility of the machine. It is powered by artificial neural networks (ANNs) and scientific theorems, which are logics and if-then expressions. Thanks to advancements in technology, many applications of AI are now producing real, practical benefits. Among the primary areas of artificial intelligence are computer vision and scene identification, robotics and sensory systems, speech recognition, natural language processing, intelligent computer-aided instructions, expert systems, and neural computing. These expert systems provide the basis of a rapidly evolving sector of technology that is profoundly influencing many different aspects of daily life. Artificial intelligence techniques include neural networks, fuzzy logic, evolutionary computing, computer-aided instructions, and hybrid artificial intelligence. The late 1960s and early 1970s saw the establishment of the fields of robotics and mechatronics (Sajadi, 1960). The diverse fields of computer science and robotics are primarily focused on creating intelligent machines that can aid humans in different ways and do tasks that are similar to those performed by humans. The field of "robotics" has grown to encompass a wide range of subjects since the 1950s, when the term was first used. Some of these themes include probabilistic robotics (Thrun, 2005), the possible benefits of robots for humanity and the use of artificial intelligence in robots (Spong, 2006). Notable studies include those on holism and chaotic systems. In the 1950s, AI also started to develop, despite being a relatively new topic, artificial intelligence (AI) is seen by many as innovative and groundbreaking (Nilsson, 2005). Many individuals have high expectations that artificial intelligence would provide a solution for every issue facing humanity. Actually, since the 1950s, a variety of scientific disciplines have emerged to address problems and difficulties that society encounters. Regrettably, there's not much synthesis or collaboration between these disparate scientific viewpoints. It is both exciting and concerning because artificial intelligence (AI) is replacing other scientific fields and contributing significantly to the resolution of global issues (Buchanan, 2007). However, not enough attention has been paid to the complex issues that society is currently dealing with. It is well known that no single field of science is able to offer all of the solutions. Thus, a comprehensive strategy incorporating a range of concepts, methodologies, and strategies is required to adequately examine and address these difficulties.

2. Meaning and scope

Artificial intelligence is a concept that is created by combining the terms "artificial" and "intelligence". A popular definition of intelligence is the ability to reason logically, generate original ideas, analyze information, and learn new things. On the other hand, everything that is deemed "artificial" is something that is not real or happens naturally. The goal of the computer science field known as artificial intelligence is to build machines with human-like cognitive and behavioral characteristics. It includes learning, solving puzzles, recognizing speech, and creating artificial intelligence in computers, among other things. What distinguishes an intelligent system from

others is its capacity to adapt and integrate with its surroundings. Put differently, artificial intelligence is the ability to teach computers to simulate human thought and behavior. The clever use of limited resources is the fundamental component of artificial intelligence. The creation of computer systems that can handle complex problems by mimicking human cognitive processes is known as artificial intelligence, or AI. As such, it is split into two separate sections: one devoted to problem solving by machines and the other to solving problems by humans. "Artificial intelligence" is the term used to describe computer systems' ability to display intelligence. The combination of science and technical principles to create self-governing machines with the ability to reason cognitively is known as artificial intelligence. It combines a number of scholarly fields, including computer science, psychology, and philosophy. Although it hasn't quite reached the point where artificial intelligence (AI) can completely replace human grading, it is moving quickly in that direction. At this time, teachers can evaluate almost every kind of multiple-choice question automatically. The utilization of fill-in-the-blank tests and automatically scored student papers in big lecture courses may be made possible in the near future by the division of labor among teaching assistants (TAs) for grading assignments and exams. Nevertheless, essay grading software is still in its infancy and is not very effective. Teachers often view grading as a tedious task, even when working with younger kids. Engaging with peers, preparing for class, or focusing on professional development might be more beneficial. From elementary school to graduate school, the application of cutting-edge artificial intelligence technology will have a significant impact on education at all levels by facilitating the creation of increasingly complex tailored learning strategies. Part of this has already happened because adaptive learning software, games, and applications are so widely used. These systems prioritize the needs of the pupils and include the appropriate adaptations.

3. Historical Voyage and Future Horizons

Artificial intelligence (AI) has a long and rich history, more than most people realize. Its origins can be traced back to ancient Greece and encompass a variety of disciplines, including philosophy and science. Still, Alan Turing and the 1956 Dartmouth College meeting are largely responsible for the current situation. The phrase "Artificial Intelligence" was introduced during this occasion by John McCarthy, who defined it as "the science and engineering of creating intelligent machines (Russel, 2020). Artificial intelligence was first conceptualized with a major emphasis on highly developed cognitive capacities. Their ability to recognize concepts, identify objects, or perform complex motor tasks—abilities that the majority of animals possess—do not set them apart. Instead, it characterizes the capacity for multi-step reasoning, understanding the meaning of natural language, producing unique objects, coming up with novel approaches to problems, and even critically analyzing one's own method of reasoning. This general intelligence that was on par with human intelligence is referred to as "strong AI". Since symbolic reasoning views computers as general symbol manipulators rather than merely calculators, strong AI has mostly concentrated on this area. According to (Newell, 1976) physical symbol system concept, intelligent behavior seems to necessitate the comprehension and application of symbolic structures. Several AI fields have subsequently given up on the technique despite its initial promise because of its inherent obstacles and the lack of improvements observed in the 21st century. When or

whether strong AI will be possible is still up in the air. This also includes the distinction between strong AI and rule adherence. This article discusses how rules and machines interact, differentiating between rule-following and rule-based decision making. Rule-following decision making involves machines adhering to rules that may not have been explicitly stated to them, while rule-based decision making involves computers strictly following the rules that developers have established. While rule-based decision-making is linked to the concept of weak AI, rule-following decision-making is an endeavor that leans toward strong AI. One example of rule-following decision making is made possible by neural networks (NN), which enable algorithms to learn on their own. The hypothetical scenario in which robots are able to formulate and then abide by their own laws is referred to as "strong AI". However, it is currently impossible to reach this level of AI.

Artificial intelligence has the ability to usher in a utopian future because it is fundamentally altering many aspects of civilization. Thanks to genetics, nanotechnology, and robotics, people can utilize the computational power, speed, memory, and knowledge-sharing capabilities of computers and human brains. This data is kept on the cloud for convenient access. Advances in genetic engineering might make it possible for us to modify our genetic makeup in order to prevent disease and potentially even stop the aging process. This might lengthen and improve our lifetime, and it might even aid in the pursuit of immortality. The combination of 3D printers with nanotechnology may facilitate the creation of a wide range of tangible objects by leveraging data and low-cost materials. All practical tasks would eventually be completed by robots, allowing people to pursue careers that interest them and engage in pastimes of their choosing. This would thus fundamentally alter the labor market. Joy (2020) expressed his concerns that the most advanced technologies of the twenty-first century—such as genetic engineering, robotics, and nanotechnology—might jeopardize human life. According to (Joy, 2020) people have grown more accustomed to depending on computers to make intelligent decisions for them as their intelligence has increased. People will eventually become dependent on computers and be unwilling to exercise their own autonomy as a result of their making crucial decisions, even though at first this may make people feel more at peace. Artificial intelligence proponents vastly overstate the hazards that cognitive robots may pose. Humans will be relegated to a supporting role, as robots become the norm. When robots perform everything, people won't be motivated to work. It could eventually result in people becoming the pets of computers. The implementation of initiatives such as Open AI can successfully achieve AI regulation. According to (Markoff, 2016) artificial intelligence is defined by two distinct sets of beliefs. According to them, people may use artificial intelligence (AI) to better themselves, keep up with AI, or at least avoid falling behind, by utilizing computer power. The pragmatists also believe that, in the worst case, it is possible to install a microchip into each cognitive machine or robot, rendering them incapable of responding to any threat. The greatest human ability, creativity, is not something that computers can replicate (Dreyfus, 1979). This is because creativity necessitates breaking norms and being anti-algorithmic. To put it another way, algorithmic AI technology will never be able to offer meaningful insights that can match those generated by the human mind, and artificial intelligence (AI) algorithms that attempt to forecast creative breakthroughs will always fall short. The paintings produced by the masters are far greater than the collective work of millions of subpar painters. As a result, an algorithm could not perform creative tasks like generating original ideas, making strategic plans, launching enterprises, evaluating risks, and so forth. This implies that humans would continue to have a distinct advantage over intelligent machines, at least in the near future.

4. Advancements in AI: From Decision-Making to Healthcare and Beyond

There has been a substantial body of research in the field of literature that focuses on the utilization and impacts of artificial intelligence (AI) systems in decision-making contexts. The study conducted by Abbot and Marohasy (2013) examines the utilization of artificial intelligence-based neural networks to predict monthly precipitation in Nebo, Queensland, Australia (Abbot, 2013). The study showcased that the integration of many non-linear interactions with neural networks can produce precise forecasts of rainfall patterns up to a month in advance. The objective of artificial intelligence technology is to accurately forecast weather patterns that may indicate an imminent risk of flooding in real-time. Cleophas and Cleophas (2010) analyzed data utilizing back propagation (BP) artificial neural networks in their research. Artificial neurons are organized in layers inside these networks. The scientists compared the predicted body surface, derived using a hidden layer BP neural network, with the real body surface (Cleophas, 2010). The findings indicated that BP neural networks exhibited comparable levels of accuracy in predicting clinical diagnoses as other methodologies. Studies have investigated the capacity of intelligent automation to replace human labor with artificial intelligence (AI) in different areas, including supply chain management, manufacturing, construction, and even manufacturing itself (Parveen, 2018). It is increasingly important to analyze existing industrial processes to assess their potential for automation. AI-centric systems can significantly enhance efficiency compared to manual operations due to its capacity to monitor and regulate activities in real-time. Companies have advocated for the benefits of employing artificial intelligence (AI) technology to create intelligent manufacturing and the future smart factory. The idea that AI-based robots will completely replace human work, which was once considered outdated, has mostly been discarded in the literature. Academic research has recognized the practical limitations of the current automation trend and has placed greater emphasis on the idea of the "human in the loop." This artificial intelligence strategy seeks to enhance human capabilities rather than supplant them (Kumar, 2017). Individuals are likely to advance to more demanding roles such as design and integration within a labor force consisting of artificial intelligence, robots, and humans. According to Haeffner (2017), it is anticipated that manufacturing businesses will incorporate AI technology into their production processes. This will involve integrating intelligent robots into the manufacturing process, allowing them to work alongside human workers to complete crucial tasks or respond to urgent situations (Haeffner, 2017). Khanna et al. (2013) emphasized the importance of artificial intelligence (AI) in healthcare, particularly in the realm of medical informatics. Modern technology is becoming crucial because it can understand the complexities of hospital operations and implement necessary enhancements in resource efficiency and patient service delivery (Khanna, 2013). Artificial intelligence (AI) has the capacity to enhance the interpretation of medical imaging, facilitate diagnosis, and improve patient care, particularly in the field of radiology. Artificial Intelligence (AI) has the capacity to enhance the precision and efficiency of breast cancer screening for diseases associated with it. Houssami et al. (2017) investigated the utilization of artificial intelligence (AI) in the screening of breast cancer (BC), with a particular focus on the technology's capacity to reduce false-positive results and errors in human detection. The integration of artificial intelligence with big data has been extensively explored in academic literature. Studies have shown the benefits of utilizing artificial intelligence (AI) technologies for handling vast amounts of data and the significance of having analytical and predictive capabilities in

various contexts (Houssami, 2017). The utilization of artificial intelligence (AI) and big data in medical research has been investigated, leading to the determination that these technologies have the potential to greatly improve the accuracy and forecasting of patient health-related diagnoses. Big data analytics, also known as BDA, is characterized by its systematic examination of large data sets, which sets it apart due to its rapidity, variety, precision, magnitude, and potential for added worth. The integration of artificial intelligence (AI) with big data analytics (BDA) has the capacity to transform various industries, such as business intelligence, manufacturing, and health, by offering advanced insights within a predictive framework (Shukla, 2018). Businesses are increasingly utilizing data visualization techniques and tools to obtain valuable insights into their intricate big data infrastructures. Given the constraints of human vision and cognition, the utilization of AI technologies in data processing and display has the potential to enhance comprehension and interpretation. Processing and analyzing complex and diverse data might provide challenges. Advanced AI-driven visualization tools empower enterprises to extract useful managerial insights and significant value from vast datasets.

5. AI and educational research

The level of proficiency at which generative AI can produce text that closely resembles human speech is remarkable. Its versatility makes it well-suited for various natural language processing (NLP) tasks, including question answering, summarization, and language translation. Generative AI algorithms have the ability to create original text, such as articles. These algorithms have the ability to generate fresh content that is both coherent and grammatically correct, and can be accessed in several languages. This is made possible by training them on extensive amounts of textual data. In addition, they can be utilized to retrieve important textual components such as keywords, subjects, or comprehensive summaries (Alto, 2023). Experts forecast that during the next decade, artificial intelligence (AI) will surpass human performance in several tasks. The subsequent dates provided are the approximated deadlines for the acquisition of these abilities: By 2024, the field of language translation will have advanced. By 2026, there will be significant advancements in high school essay writing. By 2027, there will be improvements in truck driving. By 2031, there will be advancements in retail employment. And by 2053, there may even be progress in writing a best-selling book or operating a surgical equipment. Research suggests that during the next 120 years, all human labor is expected to be completely automated, and artificial intelligence (AI) is projected to outperform humans in every task by the next 45 years (Grace, 2018). We have recently concentrated on a limited number of jobs in which AI methods can be advantageous for academics. Artificial Intelligence (AI) shows potential as a valuable tool for various research tasks, such as data collecting, participant recruitment, research networking, public involvement, and other related activities. Researchers can utilize artificial intelligence (AI) technology at various stages of their study to exploit AI's flexibility and time-saving capabilities, resulting in more remarkable and noteworthy research outcomes. However, it is crucial to bear in mind that AI applications and tools are merely tools and should only be utilized alongside professional discernment and expertise. In order to guarantee the precision and dependability of the results, it is crucial to conduct a comprehensive evaluation of both the research subject and the study approach, as is customary in other research endeavors (van Dis, 2023). University libraries have played a crucial role in the research ecosystem for a long time, serving as information centers and making significant contributions to various sectors

such as digital humanities, digital scholarship, and research data duration. Librarians' knowledge management expertise can significantly reduce the obstacles presented by artificial intelligence-driven research and teaching in the future. Artificial intelligence (AI) and machine learning (ML) have the potential to enhance knowledge management operations in libraries, especially in the domains of knowledge organization, storage, and integration. Applications like ChatGPT and others have the capacity to generate information that may not always be fair or reliable, which is a notable disadvantage. The presence of biases in the training dataset may have influenced the model's outputs, potentially resulting in unjust or inaccurate findings. Artificial intelligence programs have the ability to present false hyperlinks and allude to unreleased research or articles, which is called fabrication. This chat system issue is often characterized by the labels "hallucination" and "delusion". This poses a significant risk to academic integrity since it has the potential to result in the spread of inaccurate information or unverified research findings (Dwivedi, 2023). Regularly evaluating and modifying texts, along with verifying citations and references, is crucial to guaranteeing accuracy, dependability, and comprehensiveness. No text is currently accessible. AI chatbots, including ChatGPT, may struggle to comprehend the context and intricacies of scientific content, thereby leading to the generation of writings that do not consistently meet appropriate or acceptable criteria. Furthermore, despite being trained just on samples from 2021, ChatGPT-3 may lack the latest contextual information. AI chatbots has the ability to generate textual content that may be subject to copyright laws. AI chatbots provide a potential security threat as they have the capability to generate and handle sensitive information, including financial, health, and personal data (Dwivedi, 2023). Due to the fact that AI chatbots primarily acquire knowledge from English-language sources, their capacity to provide reliable and high-quality responses in other languages may be restricted. Due to the rapid development of tools, their capabilities will continue to expand. The ethical standards of publications and organizations must advance in parallel with the utilization of generative AI. The writers have already garnered endorsements from several journals. As an illustration, Nature has established guidelines to assist writers in utilizing and appropriately acknowledging ChatGPT when attributing generative AI text. Although AI does not fit the criteria for authorship, it should nevertheless be acknowledged in the techniques section (Dwivedi, 2023).

6. Challenges

Artificial intelligence (AI) technology is no longer the domain of futurists; it is already widely used in daily life. The inevitable changes that the emergence of Artificial Intelligence (AI) technologies, services, and applications will bring about in a number of sectors, including research and academic communication, have been the subject of much discussion. The rapid development and acceptance of AI raises significant issues related to automation, justice and privacy, intellectual freedom, the production of literary works, relevant intellectual property laws, and other topics. The main dangers associated with AI are those that could impede critical thinking through acts of bias, data fabrication, and falsification—all of which constitute transgressions of academic integrity. But because technology is always evolving, it is hard to ignore or ban AI services and applications. These days, they are used by academics for a wide range of work-related tasks, including writing, editing, translating, and searching texts; locating and summarizing sources; analyzing and visualizing data; mining text and data; coding, and more. There will undoubtedly be a plethora of highly developed technologies in the future that are tailored to scientists' requirements. In order to investigate this quickly

evolving subject, we carried out this brief study, mainly citing the most trustworthy and pertinent literature. A lot of attention has been focused on generative chatbots in the last year because of ChatGPT's potential impact on a wide range of academic fields. Researchers need to assess the immediate advantages and disadvantages of incorporating AI into their work, as well as any future advantages and challenges.

7. Conclusions

There are still many significant obstacles to overcome in the field of AI tools and application research. Biases, outdated training data, and a lack of dependability and openness are major issues. To avoid plagiarism, fabrication, and falsification, the generated text (data) must be reviewed and edited. Therefore, it is crucial that the scientific community is aware of the main risks and repercussions associated with bias and inaccuracy, as well as the potential applications of these technologies. The research's core findings cannot be attributed to AI. Artificial intelligence (AI) is only used by writers to make writing easier to compose and read. It doesn't assume responsibility for crucial research duties like developing ideas, assessing and interpreting data, or producing scientific discoveries. AI programs need to be overseen and managed by humans, and authors need to carefully review and edit the results. Legislation must be passed and enforced in order to prevent the misuse and exploitation of generative AI. However, since we think AI will be employed eventually, we cannot ignore it or forbid its application. As artificial intelligence (AI) advances, more sophisticated tools for researchers and academics may become accessible in the near future. When using these technologies for certain research processes, accelerating the research process, and sharing research findings, prudence is needed. AI has the power to advance academics and librarianship to unprecedented levels. However, it is crucial to discuss the moral and proper application of this technology. Librarians and academics should work together to make the most of technology in order to improve their positions, produce new scholarly knowledge, and teach the next generation of specialists, rather than misusing or allowing it to be exploited.

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