ARTIFICIAL INTELLIGENCE: THE 8th NEW WONDER OF THE WORLD

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Introduction

Artificial Intelligence is the latest and the fastest growing sector of the technological world. Though AI was always talked about great thinkers and philosophers, it was never applied in real life. Even a century back, AI was simply a pipe dream, but now there has been such a massive advancement in this area that it is unprecedented in the history of the technological world. Once considered as an impossible task, is now becoming a part-and-parcel of life. It would not be a mistake to call Artificial Intelligence the 8th New Wonder of the World. What's more interesting is that the wonders of AI are yet to be completely unveiled. In order to understand this complex world of AI, we should start from the basics, that is, by comprehending what 'Artificial Intelligence' actually means.

What is AI?

[1] Artificial intelligence is the science of making computers comprehend and replicate human intelligence in a detailed manner. Complex computer programs are created to perform human tasks, giving importance to the smallest of details that may escape the human eye. AI focusses on studying different challenging problems around the globe. [2] It learns from data gathered from external sources, and utilises them to complete tasks assigned to it in the future. In simple words, AI works similar to its biological opponent, human intelligence. According to the Dartmouth Research Project of 1955, a system is said to possess AI, when it performs tasks in a manner that if it were human, would have been called intelligent. Simply put, as the name suggests, AI is a machine that works intelligently. Though what can be defined as 'intelligent,' is yet to be decided.

History and Growth of AI

[3] The idea of Artificial Intelligence started, among philosophers, with the thought of understanding the essence of human existence, using an intelligent device. When the first calculators were invented by Blaise Pascal and Gottfried Wilhelm Leibniz, it was also a step towards AI; until then, calculations were something that only a human mind could perform. Similarly, with the successes in mechanical engineering grew the possibility of incorporating intelligence into devices. This endeavour of centuries bour its fruits through robotics in the recent decades.But it is to be noted that AI is not only about robots. Computers and robots are just experimental equipment to experiment the potential of AI.Though ideas about AI have been on the table for over a century, they were merely assumptions and theories. These theories could only be experimented after the development of computers and programming language. Such experiments have accelerated in the last 50 years.[4] A different approach to these experiments was brought by the English Mathematician Alan Turing. Instead of building machines, he turned to computer programs to explore artificial intelligence. He was followed on these lines by many researchers towards the late 1950s. [5] The first leap towards AI was taken in 1956 at the 'Artificial Intelligence' Conference at Dartmouth College. In 1965, ELIZA, an artificial intelligence program was invented. This was soon

overtaken by the first animated robot 'Shakey' in 1966. By 2010, ASIMO took over the world with its remarkable performance in imitating the human intelligence. [6] In 2011, IBM Watson, a revolutionary AI System, defeated world famous players, Ken Jennings and Brad Rutter. Deep Learning became a critical part of AI with the experiments conducted by Yoshua Bengio, Geoffrey Hinton, and Yann LeCun. They were honoured with the Turing Award for their exemplary work. Another astounding achievement in the field of artificial intelligence is the development of the GPA^2 in 2019. It successfully carried out complex language-related problems with no prior training. After the revolution in mobile phones and cloud, AI is now considered as the fourth industrial revolution.

AI in Healthcare Appliances

[7] Diagnostic systems, based on AI, are being developed by many researchers recently. For example, the Caduceus program (Miller82) suggests the medical tests that have to be performed, by interpreting the symptoms inputted and later, performs disease diagnosis with the test results. [8] One of the most popular application of AI in the medical field can be seen in the manufacture of Artificial Neural Network (ANN). With networks resembling the biological neuron, ANNs have 'neurons' that use raw data from various inputs to give precise, specific outputs. All credit goes to McCulloch and Pitts who used binary threshold functions to achieve this in 1943. Another fascinating application of AI is evident in Evolutionary Computation. By applying the rules and patterns in natural selection and survival of the fittest, evolution is utilised in giving solutions to real-life challenges. For clinical diagnosis and image analysing in radiology and histopathology, ANNs are being increasingly used. An algorithm called ProstAsure Index was programmed to distinguish between harmless and malignant prostates. It had an accuracy of 90%. Another such algorithm is PAPNET which helped cytologists in diagnosis. This was even introduced in a commercial scale. Accurate diagnosis and predictions can be made with the help of ANN systems. Even survival rates of patients can be calculated with this technology. Another method employed isEvolutionary Computation. This utilises evolutionary data like natural selection and survival of the fittest to solve real world problems. One of the many algorithms that follow this method is the 'Genetic Algorithm' by John Holland. It collected large amounts of data regarding natural selection and evolution. Then, solutions were designed based on these data. Through the method of elimination and selection, the best solution for the problems were designed. This data is utilised for diagnosing melanoma, lung cancer and brain tumours. Mammographic microcalcification is also analysed using genetic algorithm. Fuzzy Expert Systems are used for diagnosis of acute leukaemia, lung cancer, breast cancer and pancreatic cancer. Vasodilators for controlling blood pressure are installed using Fuzzy controllers. It is also used for administering anaesthesia in operating rooms. [9] Due to its higher precision and accuracy rates, AI is used by dermatologists to discover malignant skin growths. The only input required for this complex diagnosis is a digital photograph of the disordered skin. This application of AI is extended to other branches of medical science like radiology. In areas where experts of a disease are not present, AI diagnosis systems can be used. For example, in many TB-ridden places, AI interprets radiographs and diagnosis is made. This is particularly useful in remote areas. In medicine, there is an added advantage of using AI. There is no risk of doctors losing their jobs because of more efficient AI systems. This is because an AI system cannot connect with the patients on an emotional level. Moreover, in many situations, ethical moves have to be taken, instead of following an algorithm.

AI in Manufacturing and Production

[10] Deep-learning has been introduced into manufacturing systems for inspecting production, detecting errors and maintaining the system. AI and tradition manufacturing methods are being combined to produce better results. AI is extensively used in manufacture of semiconductor. Feasibility of models before complete production can be assessed through complex AI systems. This saves the manufacturers extra cost, during the experimenting phase. Similarly, smart factories are being set-up in a large-scale to create a more efficient workplace. With the collaboration of Data-driven manufacturing and Additive manufacturing, Smart Factories are no longer a fantasy. Machine learning, feature selection and sensor data are being employed to increase the level of detection. [11] In traditional factories, though computers were present for large scale storage of data, to make any decision-small or big- human interruption is necessary. With the introduction of Artificial Intelligence in factories, the system itself can take many decisions without the supervision of a manger. This facilitates higher productivity. Humans can be reserved for other major tasks. If needed, mangers can monitor the performance of the system in the end of the day or week. Automated systems in factories are basically AI systems given high managerial positions. The system carries out supervision and work-station control. It facilitates processing of large amounts of data in a short time. Some AI systems are specifically designed for making decisions for problem solving. These systems can handle larger amounts of data than usual. [12] Advanced robotics is applied in assembling parts of various products. AI robots carry out repetitive tasks accurately, without getting tired. This increases efficiency, saving time and money. AI can be used to inspect the quality of products manufactured.One of the industries that make use of this is the aircraft manufacturing industry. The system can check parts of the aircraft for even the smallest of mistakes or errors. Another commercial use of AI can be in supermarkets and other stores where AI systems can keep track of the quantity, quality, sales and demands of products. They can be designed to make automatic orders depending on sales and demand of products. Expired products can be disposed without human intervention. AI can be installed to keep a check on other systems in the factory. For example, in Mueller Industry, a major error in one of there machines with the help of their AI system. This saved them from a huge catastrophe. In factories, simulations, using AI, can be conducted on the model of products before actually building the product. With this, each model can be tested and evolved before creating the final perfect product. This not only saves time, but also money. Augmented Reality devices can be given to factory workers to provide them with useful information, while performing a task. This can improve the efficiency of the workers and also improve the quality of work done.

AI in Security and Surveillance

[13] The role of AI in surveillance is increasing exponentially on a global scale. More than 176 countries are utilising Artificial Intelligent systems for monitoring purposes. Nearly 64 countries have employed facial recognition and 56 countries are experimenting smart cities. Smart policing is also popular now, with nearly 52 countries installing this system. Governments of many countries are adopting AI systems for remote surveillance, unmonitored by humans. Facial recognition cameras and complex analytical software are utilised for this purpose. [14] Providing access to only authorized personnel and intrusion detection are the main jobs of AI in security systems. Some advanced systems can even detect suspicious behaviour, following a set algorithm.Movements can be detected by AI-installed surveillance cameras. Advanced AI cameras record only when there is

motion, instead of unlimited recording. This saves large amounts of storage space. High level systems can particularly distinguish human motion and other motions. Thus, they can be programmed to record when there is a human nearby, instead of creating large files of useless data. While face recognition identifies faces, human detection distinguishes particular human actions from other movements in the surrounding. [15] Object-detection can be installed in CCTV surveillance to detect the presence of weapons. AI system processes the images and set-off an alarm, if dangerous items are recognized. In countries where firearms are legal, the surveillance system can alert the CCTV operators to further assess the situation. Convolution Neural Networks (CNN) are powerful tools for weapon detection. Michał Grega and Andrzej Matiola have worked towards designing systems for recognising dangerous tools. The algorithm that they created has a sensitivity of 81.8% and specificity of 94.93%.

AI in Education

[16] Artificial Intelligence was incorporated with education more than two decades back. Some of the first such AI Systems are Computer-based training (CBT) and Computer Aided Instruction (CAI). Though they do not provide the ideal student-teacher bond, they were quite useful to learners. Recent researches are directed towards Intelligent Tutoring Systems (ITSs) to enhance the interaction between the system and the learner. ITSs are more flexible in these lines. It forms a connection between the course content and the learner's knowledge. Based on study, it has been proven that students using ITSs have shown improved performance and are more motivated academically than students under traditional educators. ITSs have various methods for teaching. Some advance ITSs teach with the help of simulations of real-life situations. This helps students to comprehend information in great depth. Advanced Cardiac Life Support (ACLS) is one such ITS that creates realistic simulations of medical emergencies and monitor the actions of the student in such situations. This equips the learner to take quick action in real life. Students can also experiment their hypotheses and assumptions with the help of these stimulations. ITSs typically have five parts: the expert model, the domain knowledge, the student model, the communications module and the pedagogical module. Among this, pedagogical module is still undergoing large-scale research. [17] ITSs have currently taken over the education field under AI. Unlike the older Computer Based Learning systems, ITSs have incredibly flexible teaching methods and strong reasoning capacity. These systems have expertise in machine learning, natural language, planning, reasoning, explanation and knowledge representation. ITSs have also facilitated a platform for testing cognitive theories. Researches concerning collaborative learning is taking place in different ways. For example, Computer-based collaborative tasks (CBCT) are designed to enable students to work together by connecting their respective tutors. Thus, many students can interact and collaborate, while sharing their files and data in a common area that everyone can access. Sherlock and The Envisioning Machine are two most known examples of CBCT. Intelligent Co-operative Systems behaves as learning partners to students. Co-operative Tools (CT) perform lower-order jobs, during the learning process, and thereby, taking some burden off the student's shoulder. Computer Mediated Communication (CMC) acts as a platform for interaction among several students. Groupware systems and Email Conferencing come under CMC. Hypermedia systems are another means for collaborative learning. One such example is the CSILE environment. This has a database, created by students. Students can use this system to make notes, refer others' notes and help each other in the learning process. It facilitates quick searches and rapid access of accurate data. [18]

Artificial Intelligence has brought about the 'Black Box of Learning.' It gives the learner a deeper, precise knowledge of the subject. On the basis of this, new software is being developed to aid education. Certain features like tracking the learner's path to gaining knowledge to understand the entire process of learning. Thus, AI in education helps to connect human intelligence to the AI world. This collaboration of AI and education can be made more sophisticated. Each learner's progress, achievements, approach to learning, methods of learning can be intricately studied and appropriate steps can be taken easily to improve the learning process. A personalised teacher for each student was always the best way for learning. Now, AI has made such teachers a reality.Repetitive, time-consuming tasks that were traditionally assigned to teachers can be given to AI systems, allowing teachers to engage in other more important tasks. Research skills of students can be enhanced with the help of AI assistants. Other skills that are necessary for surviving in the coming technological world can be inculcated in students. With the advanced facilities that only AI can provide, students can invest more time in experimenting different areas of knowledge and finding their true passion in life.

Advantages of AI

[19] In traffic management system, AI sensor network can quadruple its efficiency and usefulness. Traffic sensors can be further modified to intelligent agents that monitor traffic. Using microscopic traffic data collected from vehicles, traffic predictions can be made via AI Systems. Recent researches have shown that robotics can be applied in controlled environments without much need of system intelligence, thus, increasing its feasibility and cost effectiveness. AI systems can make the process of decision-making much easier and faster. Extremely complex problems can be solved very fast with the help of the complex algorithm of AI. Expenses of companies can be reduced by reducing the number of staff for a particular task that can be replaced by a system. Employees can be given bigger more meaningful tasks. Both qualitative and quantitative data can be handled efficiently by AI, unlike other analytical systems. [20] AI systems have been designed to maintain computer security, using knowledge along the same lines as biological immune systems. They detect intrusion in the computer and take necessary dynamic actions simultaneously. From Classis AI, we have moved on to Distributed AI that can collect and share data with other systems by interacting with them. This works similar to human social interactions. Artificial Intelligence has advanced enough to make flexible choices, according to the data collected from its environment. Thus, they can be employed in cybersecurity systems. Neural networks, evolutionary computation, fuzzy logic, and so on, have empowered AI Systems greatly. Genetic algorithms are now the robust and accurate technique for solving complex scenarios and problems. Mimicking natural selection process, this machine learning approach has now gained much importance in the real world. [21] AI has the greatest advantage over human intelligence, when it comes to taking decisions based on facts and not emotion. This means that more logically accurate decisions can be taken faster with maximum accuracy rates. AI machines are robust and never get tired. In addition to that, adding new information or knowledge is much easier in AI Systems than in humans. Spreading knowledge, among systems, can also be carried out by a simple method of copy and paste, saving time on human training. [22] It can be said that AI has more successes in carrying out intellectual task in a short time than other systems. Computer Aided Instruction (CAI) studies human behaviour and executes tasks, utilising that knowledge in a better and faster manner. [23] Construction Ontology-based NPD Process Recommendation Smart System (ONPS) help in detecting cancer in an earlier stage than any other systems yet manufactured. It has the best knowledge and reasoning ability in this field. Additionally, it is easy to maintain. [24] Since the expenses of the AI system is mainly restricted to

initial installation and maintenance, in the long run, it is more profitable and cost-effective than paying employees on a monthly basis. Installation of AI is relatively simple. Areas where its actually dangerous for humans to work, like in mines and petroleum extractors, AI machines can be used. Moreover, work accidents can be prevented using AI. Humans are prone to make mistakes, irrespective of the number of years of experience is there. But AI is free of errors, as long as it is programmed correctly in the beginning of the task. Companies now-a-days make use of digital assistants as part of their customer-service team. Interactions these days with chatbots are so similar to human interactions that it is almost impossible to distinguish between a chatbot and an employee. IT companies have developed assistant applications for their clients which are now being utilised on a global scale. Undoubtedly, Artificial Intelligence makes our lives easier and it will continue to do so in the coming years.

Challenges or Dis-advantages of AI

It goes without saying that AI has its evils too.[24] AI Machines are not only expensive to build, their maintenance and repair uses much more money than what it actually brings into the company. There is a huge risk of creating a lazy generation because of the extensive use of AI. Machines are incapable of creating bonds like humans that boost team performance. They are also not as flexible as humans, with respect to work-related problems. Any unexpected scenario outside their programming cannot be dealt by these AI systems. Many industries are trying to replace the less-qualified workers with AI robots. This can affect utilization standards.[25] Improper use and mishandling of AI can lead to huge disasters. So, in the wrong hands, AI is a dangerous weapon. Even a minute error in the program can bring about completely opposite results. Moreover, AI Systems have taken over a large number of jobs that were, until recently, done by humans, leading to unemployment. Many AI projects and systems are not cost and time effective yet. It takes more time and money than any other systems or methods. [26] It goes without saying that AI has 0% creativity. Most systems are incapable of explain their decision to a particular problem. In the present systems, if the problem is beyond its scope, it will never know the solution. Since all the solutions of AI systems are blindly believed, even if there is an error or malfunction, it will not be discovered until its very late. Situations were common sense and emotion has to be applied will leave AI systems handicapped. [27] In many scenarios, the analyst or programmer will have to carry out a tedious process of trial-and-error before the data can be fed into the system. For example, in neural networks, it is only after the analyst makes important decisions regarding the nature of the search, that the system can interpret the situation. This applies for other branches of AI like genetic algorithm. [28] Another obvious shortcoming of AI is that it functions with 'deep-learning,' unlike humans who use 'one-shot learning.' One-shot learning is much more flexible and human intelligence is capable of that because of the meticulous process of natural selection. It has taken generations for humans to develop it through evolution. Such a huge feat has not been achieved by Artificial Intelligence till date. Unlike a human brain, AI cannot adapt to a change in environment without a major change in its algorithm. [29] AI also can further decrease the credibility of the information found on the internet. This is because AI can pretend to be a human and spread fake information online. Spamming and phishing attacks can also be carried out by AI which will go undetected. Social networking platforms can become preys to automated spread of inaccurate data. This will make it impossible for the public to believe any content found on the internet. Many activists around the globe are also raising the ethical issues concerned with widespread use of AI. How far the we can trust Artificially Intelligent machines is still a debatable topic.

Conclusion

Artificial Intelligence has achieved great feats in the past few decades. It is, truly, the next Industrial Revolution. There is no sector of the industrial world that AI does not touch. This also poses a threat to humanity.It is predicted that soon unemployment would rise exponentially. Many jobs will be wiped out completely. Despite being a recent invention, AI has already overtakenhuman intelligence. Once it grasps its power over common sense, logic, and ethics, AI would rule the world. Professionals claim that new jobs will be created in this process. From one side, that is also true. No system can replace a man. Human intelligence may not be as fast as AI in calculations, but we have the best survival instincts in this world. I believe that nothing can ever defeat human instincts and intuition. According to me, AI will be a useful tool for us to enhance our performance. Though it is a creation of humans, who have finite lifespans, AI has infinite capabilities that we can keep on unfolding for generations to come. AI will undoubtedly live for an eternity.

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