

Artificial Intelligence: History, Concept and Challenges

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Abstract— Artificial intelligence is the science of automating intelligent behaviors currently achievable by humans in future. Intelligent machine will replace or enhance human capabilities in many areas. AI is the intelligence exhibited by machines or software. It is subfield of computer science. In last two decades it has greatly improved performance of the manufacturing and service system. Application areas of AI is having huge impact on various fields like autonomous transportation, education powered by AI, employment in the era of AI, healthcare re-imagined, robots, predictive policies, etc. Autonomy and adaption further support AI for the betterment of human generation. AI doesn't have a single definition but it can be termed as artificial life forms that can surpass human intelligence and almost any technology can be called artificial intelligence. We will have a look on lot more definitions of AI throughout this paper. Artificial intelligence is reshaping economies, promising to generate productivity gains, improve efficiency and lower costs. It contributes to better lives and helps people make better predictions and more informed decisions. These technologies however are still in their infancy, and there remains much promise for AI to address global challenges and promote innovation and growth. This paper gives an overview of this technology and the history of this technology. Challenges in implementation of this technology are also discussed in further part of this paper.

Keywords: Artificial Intelligence, Neural Networks, Natural Language Processing, Machine Learning, Data

I. INTRODUCTION

We have chosen this topic to spotlight one of most technological trends these days known as AI. It is claimed that artificial intelligence is playing and increasing role in the research of management science and operational research areas. Intelligence is commonly is considered as ability to collect knowledge and a reason about knowledge to solve complex problems by application of processes that are analogous to human reasoning processes. It is the study of computation that makes it possible to perceive reason and act. Artificial intelligence is different from psychology because it emphasis on computation and is different from computer science because of its emphasis on perception, reasoning action. The central problems (or goals) of AI research include reasoning, information planning, learning communication and ability to move and manipulate objects. There are enormous number of tools used in AI, including versions of search and mathematical optimization, logic, methods based on probability and many other functions.

The various techniques applied in AI are neural network, fuzzy logic, hybrid AI, evolutionary computing. It makes machines smarter and more useful. It works with the help of artificial neurons and scientific theorems. Artificial

intelligence makes it possible for machines to learn from experience, adjust to new inputs and perform different tasks in simple manner such that it consumes less human interaction and less power consumption. The main aim of AI is to improve computerized and machinable functions which are related to human knowledge like reasoning, learning, problem solving. Artificial intelligence is completely capable of impacting the future of every industry and human being virtually. AI has acted as main driver of emerging technologies like big data, robotics and IOT and it will continue to act as technology innovator in foreseeing future.

II. HISTORY

To be informed about the history of artificial intelligence, it is necessary to go back previous dates in Milat. In ancient Greek era, it is proven that various ideas about humanoid robots have been carried out. An example of this is Daedalus, who is said to have ruled mythology of wind, to try to create artificial humans. Modern artificial intelligence has begun to be seen in history with the aim of defining philosopher's system of human thoughts. 1884 is very important for artificial intelligence. Charles Babbage, on this date, has worked on mechanical machine that will exhibit intelligent behavior. However, as a result of these studies, he decided that he would not be able to produce a machine that would exhibit as intelligent behaviors as a human being, and he took his work suspended.

Artificial intelligence a part of computer science was first used technically in 1956 although the beginning of modern AI could be traced back to scientists, philosophers and mathematicians who thought human thinking as a symbolic system. AI was the first used in Ferranti Mark machine. In Japan, Waseda University initiated the WABOT project in 1967, and in 1972 completed WABOT-1, the world's first intelligent humanoid robot and similarly many events took place that brought us to the era of human Alexa and Siri. Several philosophers had strong objections to the claims being made by AI researchers and all these reviews cause cutoff funding which lead to delayed inventions. One of them was Joseph Weizenbaum. He had some serious ethical doubts when a dedicated psychiatrist wrote a program so in 1976 Joseph Weizenbaum published Computer Power and Human Reason which argued the potential to devalue the human life.

In last 2 decades, AI is evolved into power full system that enables machine to think and act as human being. It is proved that artificial intelligence has contributed to increase productivity efficiency and development of resources. The 1980 was the year of artificial intelligence. AI introduced expert system in 1980 which corresponds to decision making ability of human experts. During 1990-2000 AI completed big milestones as IBM's deep blue chess playing program defeated world champion and grandmaster

Garry Kasparov. In 2009, Google developed an autonomous car. In 2014, Deep Mind technologies introduced “AlphaGo”, a computer program which plays board game named Go, which defeated many champions in Go. Apple discovered Siri, Google discovered Google Now, Microsoft discovered Cortana are the smartphone applications which uses natural language to answer the human questions and act accordingly. Thus, intelligent machines are now becoming an everyday reality that would change all of our lives.

III. CONCEPT

Artificial intelligence is generally considered to be subfield of Computer Science, though there are some computer scientists who have only recently and grudgingly accepted this view. There are several disciplines outside computer science, however, that strongly impact AI and which AI strongly impacts. There have been many definitions of Artificial Intelligence offered over the years. Perhaps a good one is: “Artificial Intelligence is a field of science and engineering concerned with the computational of what is commonly called intelligent behavior, and with the creation of artifacts that exhibit such behavior.” This may be examined more closely by considering the field from the points of view of three goals AI researchers have, which might be called Computational Psychology, Computational Philosophy and Advanced Computer Science.

There are some fundamental components of artificial intelligence which are required to run AI based machines or computers. Here we have discussed them in a bit detail.

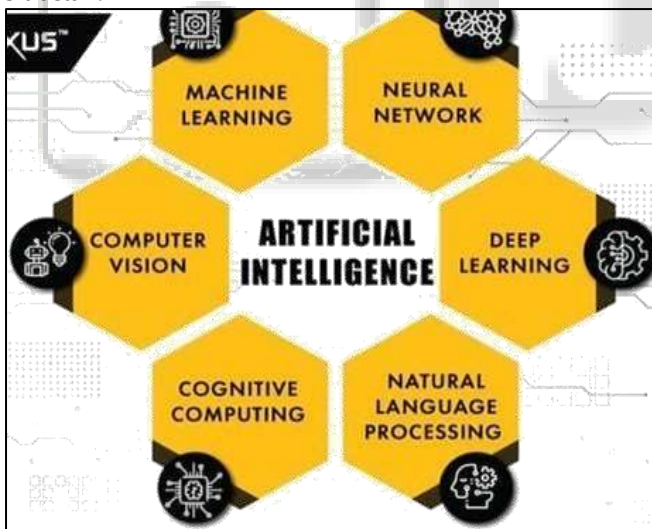


Fig. 1: Key components of AI

A. Neural network:

It is a well-known algorithm in artificial intelligence. The neural network is same as neural transmission of the human brain, from one input unit to the next input unit to get result. This is the principle of a simple neural network, which is to simulate the transmission of information from nerves in the human brain. The human brain comprises of a network of neurons that process information. Since the 1940's AI scientists have been working on replicating the structure of the human brain to manufacture similar cognitive capabilities for AI. This AI research subfield is known as

‘Artificial Neural Network’. Initially, the development of ANN's was slow because of weak computer processing power. Recently, AI researchers have rapidly developed fully-functional ANN's because of advances in the processing power of computers in the 4th industrial revolution.

B. Machine Learning:

Machine Learning or ML, is an application of AI that provides computer systems with the ability to automatically learn and improve from experience without being explicitly programmed. ML focuses on the development of algorithms that can analyze data and make predictions. Beyond being used to predict what Netflix movies you might like, or the best route for your Uber, machine learning is being applied to healthcare, pharma, and life science industry to aid disease diagnosis, medical image interpretation, and accelerate drug development.

C. Deep Learning:

Deep learning is a subset of machine learning that employs artificial neural networks that learn by processing data. Artificial neural networks mimic the biological neural networks in the human brain. Multiple layers of artificial neural network work together to determine a single output from many inputs, for example, identifying the image of the face from the mosaic of tiles. The machine learns through positive and negative reinforcement of the tasks they carry out, which requires constant processing and reinforcement to progress.

D. Cognitive Computing:

Cognitive computing describes technology platforms that, broadly speaking, are based on the scientific disciplines of artificial intelligence and signal processing. Cognitive computing is another essential component of AI. Its purpose is to imitate and improve interaction between humans and machines. Cognitive computing seeks to recreate the human thought process in a computer model, in this case, by understanding human language and meaning of images. Together, cognitive computing and artificial intelligence strive to endow machines with human like behaviors and information processing abilities.

E. Natural Language Processing (NLP):

Natural Language Processing or NLP allows computers to interpret, recognize, and produce human language and speech. The ultimate goal of NLP is to enable seamless interaction with the machines we use every day by teaching systems to understand human language in context and produce logical responses. Real-world examples of natural language processing include Skype Translator, which interprets the speech of multiple languages in real-time to facilitate communication.

F. Computer Vision:

Computer vision is a field of artificial intelligence that trains computers to interpret and understand the visual world. Machines can accurately identify and locate objects then react to what they see using digital images from cameras, videos, and deep learning models. A computer vision evolved, programming algorithms were created to solve

individual challenges. Machines became better at doing the job of vision recognition with repetition. We now have the ability to program supercomputers to train themselves, self-improve over time and provide capabilities to businesses as online applications.

IV. CHALLENGES

Artificial intelligence is poised to be one of the biggest things to hit the technology industry in the coming years. But just because it holds enormous potential does not mean it does not come with any challenges in implementation. Artificial intelligence challenges and possibilities are not small, which is why recognizing and working towards resolutions to problem can help further propel artificial intelligence's rapid growth. Following are some of the major challenges in the field of artificial intelligence.

A. Bias:

It is one of the biggest challenges AI is facing. An inherent problem with AI system is that they are only as good or as bad as the data they are trained on. Bad data is laced with racial, gender, communal or ethnic biases. In the future, such biases will probably be more accentuated, as many AI recruiting systems will continue to be trained using bad data. Hence, the need of the hour is to train these systems with unbiased data and develop algorithms that can be easily explained.

B. Computing Power:

The technical industries have faced computing power challenges. But, the computing power is necessary to process massive volumes of data to build an AI system, and utilizing techniques like deep learning, is unlike any other computing power challenge that has been faced in the tech industries. Obtaining and funding that level of computing power can be challenging for businesses, particularly startups.

C. Legal Issues:

One of the newest challenges of artificial intelligence include the recent legal concerns being raised that organization need to be wary of AI. If it is collecting sensitive data, it might be in violation of state or federal laws, even if the information is not harmless by itself but sensitive when collected together. Even if its not illegal, organizations need to be careful of any perceived impact that might negatively affect their organization. If the data collected is perceived by the public as violating their data privacy, the improvement for the organization might not be worth the potential public relations backlash.

D. Implementation Strategies:

Artificial intelligence can transform almost every industry, but one of the major challenges of AI is the lack of clear implementation strategy. In order to be successful a strategic approach needs to be established while implementing AI. This includes identifying areas that need improvement, setting objectives with clearly defined benefits, and ensuring a continuous process improvement feedback loop. To compound this issue, managers will need to have a solid understanding of current AI technologies, their possibilities

and limitations, as well as keeping up to date on the current challenges with AI. This will enable organizations to identify areas that can be improved by AI.

E. Collecting and Utilizing Relevant Data:

For an organization to successfully implement AI strategies and programs, they must have a base set of data and maintain a constant source of relevant data to ensure that AI can be useful in their selected industry. Data can be collected on various applications with a multitude of formats such as text, audio, images, and videos. The wide range of platforms to collect this data adds to the challenges of artificial intelligence. In order to be successful, all this data must be integrated in a manner that AI can understand and transform into useful results.

V. CONCLUSION

In this way, artificial intelligence can achieve great discoveries and advances for humanity due to its multiple possibilities. Most artificial intelligence systems have the ability to learn, which allows people to improve their performance over time. The adoption of AI outside the technology sector is at an early experimental stage. The evidence suggests that AI can provide real value to our lives. AI bases its operation on accessing huge amount of information, processing it, analyzing it and, according to its operation algorithms, executing tasks to solve certain problems. Due to the new computing architectures of the cloud, this technology becomes more affordable for any organization.

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