

THE ARTIFICIAL INTELLIGENCE: A REVIEW

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ABSTRACT

Major researches are going on in the field of Artificial Intelligence these days. Many aims have already been achieved and some are still in progress. Artificial intelligence has impacted our lives a lot and from business to healthcare and from shopping to stock market has made things easier for us. The tasks which were very difficult and time taken for a human to complete, AI accomplish them in fraction of seconds and with great accuracy. It is continuously evolving for better. In this paper a brief review of what Artificial intelligence is, its types (like Reactive machines, Limited Memory, Theory of Mind and Self – Aware), the technologies working behind to make AI systems work are discussed and finally different areas of applications with examples are mentioned.

Keywords: *AI (Artificial Intelligence), ANN (Artificial Neural Networks), Deep learning, Machine Learning*

Introduction:

From asking weather condition from Google assistant to asking Siri or Alexa to do some task for you, the artificial intelligence has become part of our lives. It's not just limited to robots only but has entered in wide areas of applications, be it finance, medical healthcare, automation industry etc. It enables the machines to make decisions as human does. With passing time and invent of different technologies like deep learning and lots of researches AI is getting better and better and it is believed that soon it will surpass the human intelligence.

What is Artificial Intelligence?

Artificial Intelligence is the intelligence possessed by machines. It is ability to mimic human intelligence and perform tasks that a human can do. The qualities which were possessed by humans only like learning, reasoning, perception, creativity is now being mimicked by AI using different algorithms. In other words Artificial intelligence combines computer science and a vast data set, to solve a problem. It includes machine learning and deep learning which help machine to get better at a task even without specifically designed to perform that task. Thus it eliminate the need of writing a huge program for the task. One of the example of AI is, Live Chat on different company websites that answers customer's questions on the basis of vast data set of different questions that a customer may ask. It has been asserted by many researchers that soon AI will replace many human in many areas but till now it has not happened.

History of Artificial Intelligence:

The term intelligence was introduced by Alan Turing in back 1950 in his work “Computing Machinery and intelligence” in which he asked the question that “Can machines think?” He also

conducted a test called “Turing Test” in which a human interrogator would try to differentiate a computer and human text response. This was an important test in the history of AI. In 1955 Allen Newell and Herbert A. Simon wrote “Logic Theorist”, the first artificial intelligence program. This program was able to prove mathematical theorems and also found new proofs for some theorems.

In 1956 the term Artificial intelligence was first coined by American computer scientist John McCarthy at Dartmouth conference. In 1966 algorithms were developed which were able to solve mathematical problems. Also first chatbot named ELIZA was created by Joseph Weizenbaum. In 1972 the first humanoid robot named WABOT-1 was built by Japan. In 1980 Expert systems were designed that were able to make decisions like a human. In 1987 IBM came up with computer Deep Blue which defeated the world class chess champion Gary Kasparov. It became the first computer to win a chess game. In 2002 an AI Vacuum cleaner named Roomba was also designed. In 2006 companies like Twitter, Facebook and Netflix started using Artificial Intelligence in their business. In 2011 IBM's computer Watson won a quiz show by solving difficult questions. In 2012 Google came up with Android App “Google Now” that gave user the

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requested information as a prediction [3]. Over the years Artificial intelligence has developed a lot. Its application areas are not just confined to robots or computers it has reached a vast areas of applications from Business, education to medical and what not.

Types of Artificial Intelligence:

1. Reactive Machines

This is the most basic and oldest type of AI machines that just react to current situation and does not use memory or any past experience while making a decision. This type of AI machines respond in a same way to a situation every time. They don't learn from their past experience. They can only respond to a situation on the basis of data or combination of inputs already saved in them. Thus it is reliable for those applications where repetitive work has to be performed by the machine. Examples of Reactive AI is IBM's Deep Blue which defeated the Chess Grandmaster Garry Kasparov in 1990s. It could take the best decision about the next move but didn't have any memory or experience of past moves. Another example is Google's AlphaGO which has more sophisticated analysis method than Deep Blue but still it can't predict all future moves as these AIs don't use past experience and limited to only information stored in them. They are suitable for a particular task but can't be modified or used for other tasks [4].

2. Limited Memory AI:

This type of AI can react to current situation on the basis of past experience as well. It uses deep learning. A large amount of data is stored in their memory which is used as reference

to make a better decision. All present day AI systems falls under the category of Limited memory AI. For example Image recognition AI, chatbots, virtual assistants and self – driving car etc. these also have limitation that all the data which is used as reference can become obsolete. It can't make efficient decisions as human makes on the basis of his past experience.

3. Theory of Mind AI:

This type of AI will be seen hopefully in future. Many researches and work is going on this. Machines under this category will not only respond on the basis of data stored in the memory but will also be able to understand the people, their thoughts, emotions and their need to be treated in a certain way. This AI will have to act accordingly to the situation.

4. Self – Aware AI:

This is the final goal of the AI to build such machines that have consciousness or are self - aware. This is one step ahead theory of mind AI. This type of AI will not only understand thoughts, beliefs and emotions of the person it interact with but will also have thoughts, emotions and beliefs of its own. Till now it exists only hypothetically. This AI will have its own share of advantages and challenges. [5]

Self-Evolving Artificial Intelligence:

Softwares have been created by researchers that write AI programs that improve themselves without any input from human. These programs are able to produce same results that take years by human. [6] Generally an AI program takes lots of time to build. But in recent years programmers has reduced this time by automating some steps of algorithm but all these programs are finally need to be combined by human, thus still human dependency is there but recently Google developed a program called AutoML – Zero that is able to develop AI programs that does not need human input.

How does Artificial Intelligence Work?

AI systems works on the basis of large amount of data, fast iterative processing, and lots of algorithms that make the system analyse the data and form patterns to come to a conclusion. It uses a lot of theories, physics, technologies and some subfields mentioned below:

1. Machine Learning:

It is a subfield of AI that works on Algorithms that can work on different data given to AI system and make conclusions and give predictions by analysing data. It uses neural networks, physics and statistics to find hidden information in the data even without being

programmed to how do it. For example Netflix predict movies that the viewer might like and online shopping sites give recommendations on type and size of clothes and even brand from which to purchase clothes.

2. Deep Learning:

It is a subset of Machine learning and uses artificial neural networks. Artificial Neural Networks as the name suggests works on the data as a human brain does. It mimics the operation of brain. Deep learning makes the machine able to process data through different layers of ANN and classify data, infer and make predictions. For example Google Voice Assistant that uses speech recognition which is form of deep learning to understand the question asked.

3. Neural Networks:

Neural network helps in deep learning. They are a series of algorithms that works exactly like human brain does. Data is processed by a layers of neural network and passed to next layer for further processing. This way data is processed in all possible manner to deduce maximum knowledge from it to make right inference. Machine is provided a large amount of data and then trained on it. For example a machine is trained to identify a flower, first by giving a huge amount of data in form of pictures or text related to flower. Now when machine is given a flower image as input it will identify it correctly on the basis of previous training given on flowers.

4. Cognitive Learning:

It is a subfield of AI that uses various algorithms to form a natural human like interaction with machines. This enables machines to think like humans by understanding and interpreting data and images as human does. It aims at creating human like capabilities in machines to process information.

5. Natural Language Processing:

It is ability of the machine to understand, interpret, process and produce the human language and speech. This enables human to communicate with machines with their natural language and get their tasks done. Example of natural language processing is voice text messaging [9].

6. Computer Vision:

It is a technique that works on pattern identification. It uses different algorithms that break the image into different parts and study them, classify them and learn from a set of images to make better decisions which are based on previous observations. It not only work with images but also with graphs, text, videos and pdf documents. For example Computer vision in self-driving car would enable the system to distinguish between traffic lights, pedestrians and other things on the road and enable the system to make best decision [10].

Application Areas of Artificial Intelligence:

1. Automatic Speech Recognition:

In this AI system recognizes the human speech and converts it into text. Now a days all smart phone and web browsers also have speech recognition to voice search. For example Google, Siri etc. works on speech recognition.

2. E- Commerce:

Many E-commerce websites like HDFC bank, HP use online chatbot that provide customer services to users. They answer frequently asked questions, provide advices, suggest size for customers etc. They are replacing the human agents very efficiently. AI is also used for product recommendation which has increased the sales of the products. For example Amazon and flipkart etc. use this feature of AI. It is also used in search optimization so user can find the exact product he is looking for. It is also used in supply chain in which demand for different product on different times are predicted by AI in advance [7]

3. Transportation:

Self - driving cars and trucks are the vehicles that can sense its environment through different cameras and sensors and take decision on the basis of all the data available and can move safely on the roads with little or

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no help from human. The work is still going on to make such AI driven vehicles. Many companies like Toyota are working on it.

4. Health Care:

AI systems in healthcare can handle non-emergency situation of patients can perform various tasks like analysing their symptoms and decide whether an urgent medical attention is needed or not. MRI reports of the patients can be checked by AI with very less chances of error. Robot assisted surgeries can also be performed with a very high degree of accuracy.

5. Manufacturing Industries:

Many AI based robots are used in many manufacturing units to perform different tasks like assembly, installation and stacking quickly, with a high degree of accuracy.

6. In Offices:

AI is used to help in selection of right candidate for the company by going through a large number of CVs in a short time. This selection will be fair as there will be no human error or biases and also would complete in a short time. AI can also analyse employee data and assign right project to them according to their skill and expertise. Feedback is also collected on the basis of which reviews about a workplace is generated.

7. Travel Industry:

With the help of AI we can book our hotels, flight tickets, make travel arrangements online very efficiently. Chatbots are being used by various travel websites for this purpose. They make human like interactions with the customers and give very fast and efficient suggestions.

8. Entertainment Industry:

AI is being used by Netflix and Amazon to recognise users interest areas and give recommendations accordingly.

9. Education Industry:

Digitization of books are being done with the help of AI [8]. Grading of students can be made possible with AI and a chatbot can answer frequently asked question to students. Virtual tutor can be designed with the help of AI who can take classes any time anywhere.

10. Stock Industry:

AI is being used in stock industry to by various trading platforms to predict rise or fall of stocks of a particular company. It also give recommendation on the basis of previous history of the market. Thousands of trades are done on these platforms on the basis of AI only.

Conclusion:

Artificial intelligence has become a part of our lives some way or other. It has entered in almost all fields and has made complex and almost impossible tasks possible to achieve. Till now we have reached limited memory AI but the day is not far when we will see AI based on Theory of Mind concept which will be able to understand and work according to human thought process. Even researches to develop Self-aware AI are also going on. Despite so many advantages of AI still it can be dangerous as well, posing different challenges for us. So care should be taken that our AI and human goals are aligned. They are used only for helping mankind.

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