

Artificial Intelligence- Is Our Future Bright or Bleak

Gaurav Govind Keswani

Abstract— The paper reviews the meaning of artificial intelligence and its various advantages and disadvantages. It also considers the current progress of this technology in the real world and discusses the applications of AI in the fields of heavy industries, gaming, aviation, weather forecasting, expert systems and heuristic classification, with the focus being on expert systems. This is because Expert Systems are primarily being used for cyber defense as information stored in computers and in transit is facing increasing threats. It focuses on the concept, architecture and working of Expert Systems while also considering its work in other fields. The paper concludes by analyzing the future potential of Artificial Intelligence.

Keywords— Artificial Intelligence, Expert Systems, Heuristic Classifications.

I. WHAT IS ARTIFICIAL INTELLIGENCE?

Before one defines the term Artificial intelligence, it is imperative that the meaning of intelligence is clearly understood. A very black box definition of intelligence would be something that gives one the ability to solve a certain set of problems or allows one to compete and survive in an intellectually demanding environment.

Artificial Intelligence (abbreviated as AI) is the capability of a device to perform activities, which would otherwise only be expected of the human brain. These activities include the capacity for knowledge and the ability to acquire it. It also comprises of the ability to judge, understand relationships and last but not least produce original thoughts.



AI comprises of that branch of computer science that aims to make an intelligent machine that can react in ways similar to humans and thus, one can say that artificial intelligence is the simulation of human thinking. [1] This imitation of the human brain can be done in two ways- one via a structural simulation where the structure mechanism used is similar to that of the human brain while the other is the functional simulation which involves putting aside the internal structure and concentrating the efforts solely on the functionality.

Also, there is a huge different between short term memory and RAM. Short-term memory holds pointers to the long-term memory where all the information is actually stored while RAM stores data that is isomorphic to data being held on a hard disk. Also, RAM has a memory limit while there seems to be no capacity limit when it comes to short-term memory.

II. ADVANTAGES

- One of the major advantages of artificial intelligence is that its decisions are based on facts rather than emotions. Even after our utmost efforts, it is a well-known fact that human decisions are always affected in a negative way by our emotions
- Unlike humans, machines with artificial intelligence do not need any sleep, thus overcoming the inherent disadvantage of tiredness in humans
- Easier spreading of knowledge. Once an artificial mind is trained for something, it can be very easily copied to the others reducing the time wasted in otherwise passing on knowledge to other humans through training

III. DISADVANTAGES

- Lack of creativity in responses
- Inability to explain the logic and reasoning behind a certain decision
- [2] Current development is at a stage where the AI cannot know when there is no solution to a particular problem
- Any malfunctioning can lead to the AI producing wrong solutions and since it cannot explain the reasoning behind its answer, blind reliance on AI can lead to problems
- Lack of common sense in reasoning can also cause major problems
- It can be used to cause mass scale destruction if given in the wrong hands

All this being said, one of the most concerning problem with the development of AI is that it will soon start substituting humans in every field thus causing a high rate of unemployment, which would lead to depression, crime and poverty. Also, there are some fields that require the human touch and there is a growing sense of belief that machines will quite possibly never be able to replace humans. The caring behavior of nurses in hospitals is one example of a job that humans feel machines will never be able to do justice to.

IV. CURRENT PROGRESS

Artificial Intelligence was created with the sole aim of mimicking or even outperforming human minds. Thus it is very important we question the fact whether it has actually been able to do so.

We cannot ignore the fact that AI is being used all around us especially in the fields of medicine, robotics, law, stock trading etc. It is being used in homes and big establishments

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Gaurav Keswani, Information Technology, VES Institute of Technology, Mumbai University, Mumbai, India.

such as military bases and the NASA space station. NASA has sent out artificially intelligent robots to planets so as to learn more about their habitat and atmosphere, with the intention of investigating if there is a possibility of humans living on these planets.

Expert systems have been used by Mercedes Benz and other auto manufacturers in the design of vehicle components, subway systems in Washington, D.C. use expert system software controllers to cause subway trains to stop within 3 inches of the right spot on the platform. These trains have motormen primarily to reassure passengers.

AI has filtered into general applications in these fields and has become so common that it is not referred to as Artificial Intelligence anymore. But does this mean that AI is better than the human mind or is ready to replace it completely?

Blind supporters of AI would point to the time when AI Deep Blue II defeated chess master Garry Kasparov to prove that Artificial Intelligence can in fact be smarter than humans. Though there is no doubt that the AI Deep Blue II won that game, it is still probably one of the dumbest software alive. The operators were programming the AI in every round depending on the opposition's last move. Also, the Deep Blue II had studied all of Kasparov's previous games while the latter wasn't given the same benefit. One can safely say that even though the Deep Blue II AI defeated Kasparov, it was never a fair fight to begin with.



Latest technologies like Xbox 360's Kinect and iPhone's Siri use algorithms based on Artificial Intelligence, but it is a well-known fact that these technologies are a long way from being perfect. Thus we can safely conclude that though Artificial Intelligence has made a lot of progress in the past few decades, it is not at a level where in one can confidently state that it is now ready to completely replace the human mind.

That being said, large-scale research is now being conducted into the field of proper simulation of the human brain. 'CCortex' is a project by Artificial Development Inc. and Swiss government's IBM sponsored Blue Brain Project, are two main ventures, whose goal is to simulate the human brain.

V. APPLICATIONS

Artificial Intelligence in the form of neural networks and expert systems has applications in almost all human activities. The combination of high precision and low computation time makes AI a cutting edge technology. Robot ES's are already taking over workshop level jobs in large industries, thus sidelining humans into a more supervisory role. Stock brokerage firms are now using Artificial Intelligence to analyze data, make analysis and buy or sell stocks without the interference of any human beings. Some of the applications of Artificial Intelligence are as follows-

A. Gaming Industry-

One of the most commonly known applications of AI in the gaming industry is its use in chess. Even though these machines are not as intelligent as humans, they use brute force algorithms and scan 100's of positions every second so as to determine the next move. As stated earlier, AI is also being used in Microsoft Xbox 360's Kinect for body motion detection. But it is still in its infancy and requires a lot more advancement for it to be used in day-to-day applications.

B. Heavy industries-

Artificial Intelligence robots have become very common in heavy industries and are employed in jobs that are otherwise considered dangerous for humans. These robots also increase the efficiency, as they do not need any break while working thus overcoming the inherent disadvantage of tiredness in humans.

C. Weather Forecasting-

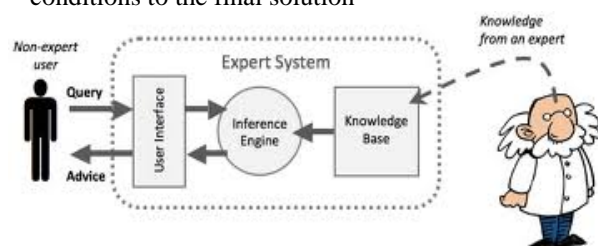
[3] Neural networks are nowadays being used for predicting weather conditions. Past data is provided to the neural network, which then analyses the data for patterns and predicts the future weather conditions.

D. Expert Systems-

Expert Systems are machines that are trained to have total expertise in specific areas of interest. They are developed to solve the problems in niche areas. These systems use statistical analysis and data mining to solve these problems by deducing the solutions through a logical flow of yes-no questions.

An expert system is made up of 3 parts-

- Knowledge base- It stores all the information, rules, data and relationships that are needed by the expert system to have total expertise in its area of interest
- Inference engine- It seeks information from the knowledge base on being presented with a query, analyses it and responds with a solution or recommendation in the way a human expert would
- Rule- It is a conditional statement that links the given conditions to the final solution



The working of these expert systems can be classified into the following categories-

- Forward chaining- this is a method of reasoning that starts with the facts and works towards a conclusion. It can be used to answer, "What is the situation?" type of questions. The problem here is that it generates a lot of superfluous information in the process due to the lack of knowledge about the conclusion. Thus it is best for analysis and interpretation.
- Backward chaining- this is a method of reasoning that starts with the conclusion and works backwards to prove it using supporting facts. It can be used in situations with hypothetical situations such as "a patient having type I diabetes". The expert system first finds the rules that match the situation and then uses them to verify the conclusion. Thus it is best for diagnosis.

[3] A common use of these Expert Systems is in the field of cyber defence. A computer expert can detect Cyber-attacks but it takes a lot of requirement gathering along with paper work and is thus time consuming. This may result in the attack causing severe damage by the time it is detected by this human expert. The use of an Expert System can solve this problem. Some of the possible queries of this system are as follows-

- Has a user tried to login to the system and failed 10, 100 or 1000 times? If yes, then the system is being probed by an intruder or script
- Is a particular user requesting for or accessing files that are outside his rights? If yes, then flag the user and restrict his access rights
- Has more than one user tried to login using the same password? If yes, then there has been a security compromise
- Have all users logged in to the system via the normal login form? If no, then trace the origin and log them off

By answering queries like these, expert systems using Artificial Intelligence can protect the system from cyber-attacks faster and more efficiently than human experts and are thus being used in intrusion detection systems.

Also, these expert systems are increasingly being used as automated online helpers or advisors. Artificial intelligence is used in automated online assistants, which are seen as avatars on a lot of web pages today. It uses natural language processing and helps to reduce the overall training and operation cost of firms. An example of this is an online restaurant advisor. The end-user usually sees an expert system through an interactive dialog, an example of which is as follows:

- Q. Do you know to which type of restaurant you want to go?
A. No
Q. Is there any kind of food you would particularly like?
A. Chinese
Q. Do you like spicy food?
A. No
Q. Do you usually drink wine with meals?
A. Yes
Q. When you drink wine, is it French wine?
A. Yes

We can see that the system asks a series of yes-no questions to the user so as to understand the user's requirements. It then looks into its own knowledge base, which contains everything it knows about the particular domain and comes to a conclusion using the inference engine. This conclusion or solution is then presented to the user through the user interface.

E. Aviation Industry-

Airline companies have started using expert systems to determine and analyse the weather conditions along with the mechanical status of the airplane. Once the AI completes its analysis and determines the best path, the airplane can be put on autopilot.

F. Heuristic classification-

A very common application of Artificial intelligence is in the field of heuristic classification. The AI is given several sources of information and has to make a decision to place it in one of the mentioned categories. [4] One example of this would be the AI being given a customer's name, record of previous payments along with other relevant history and then making a decision to grant the credit card or not. This involves the AI classifying the user into one of the following

categories- 'Grant credit card' or 'Don't grant credit card'. This leads to the reduction of a lot of manual work, which would otherwise be done by humans who not only take more time but also need to be provided with other benefits.

VI. FUTURE POTENTIAL OF AI

How useful will Artificial Intelligence be in the future? Can machines ever be as self-aware, thoughtful and intelligent as human beings? The answer to these questions is inter-related. The use of artificial intelligence will lead to production of machines and computers, which are much more advanced than what we have today. Speech recognition systems will reach much higher levels of performance and will be able to communicate with humans, using both text and voice, in unstructured English. There will be a great future some day for expert system applications in all aspects of health care, in both clinical and administrative areas, in improving patient care and in allocation of financial, social, and other resources. But when it comes to the question of Artificial Intelligence creating machines, which are more intelligent than human beings, no one seems to have the answer. Also, even if it is possible, the amount of time it will take cannot be predicted. What can be said with certainty is that machines having common sense will be developed, although it will pertain to specific niche areas only. It is also expected to have human brain features like learning from experience, cognition and perception. Whether human consciousness will be incorporated in these machines is still not known.

Robots in the future will be able to do everybody's work and will be faster and more efficient as compared to human beings in doing it. If one is ill, they can hire a robot nurse that will provide them with medicines at proper intervals. How much care and concern the robotic nurse will be able to show to the patient is still not known.

Thus we can safely say that Artificial Intelligence is still in its embryonic stage and its future depends only and only upon the scientists solving the mystery of the human brain. Till that is done, no one can make a conclusion of whether our future will be affected positively or negatively by Artificial Intelligence.

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Gaurav Keswani is currently pursuing B.E in Information Technology (Mumbai University) from V.E.S Institute of Technology, Mumbai, India. He is an active student member of societies like IEEE and Computer Society of India. He is currently working as the Jr. Web Editor at IEEE VESIT, the student Branch of IEEE (School Code- 33011). His interested research areas are artificial intelligence and social network analytics.