

A Study on Artificial Intelligence

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Abstract – Artificial Intelligence is concerned in developing machines or systems that can perform human tasks with precision. These systems are highly efficient and are capable of showing intelligent behavior. These systems learn from their experiences. AI is a rapidly developing area of computer science and Technology. AI has a huge scope in future, currently many researches are going on in the field of Robotics, Machine Learning, Neural Networks and Pattern Recognition. Expert Systems are an important part of Artificial Intelligence. Expert systems help the AI in making decisions based on intelligence. AI has the ability to reshape the future of innovations and it can also impact the Research and Development sector in a positive way. In this paper I am going to discuss about Artificial intelligence and its applications in industries along with a brief on expert systems. AI has already started making its way into the automobile industry with self-driving cars, navigation and many more by using pattern recognition.

Key Words: Artificial intelligence, Applications, Expert systems, Pattern Recognition.

1. INTRODUCTION

AI also known as Artificial intelligence is a branch of Computer Science it mainly focuses on creating machines that have the ability to think and solve problems. AI also has intelligence like humans which helps to think like them in situations to get a possible and likely outcome in a particular scenario. The fascination of human brain has led to a question Can machines think? This started the development of AI. John McCarthy the father of Artificial Intelligence said

“Every aspect of learning or any other feature of intelligence can in principle be so precisely described a machine can be made to stimulate it”. This is the main principle and idea behind Artificial Intelligence. AI is also a type of computer program which relies on a knowledge database it learns more from its tasks and it is self-developing. AI is connected through neural networks it can be also programmed to create music, create movies. Main goal of AI these days is to create a system which contains creativity, intelligence and randomness which a very difficult step and a challenge for the future. Industries have moved from just developing intelligent machines which provide solutions to creating machines which can think randomly and logically. AI can be categorized to two types:

- Strong AI
- Weak AI

Strong AI tends to think like a human and process like a human to think more creatively and achieve the best possible outcome whereas a weak AI only tends to achieve result like a human by processing its database before making a decision or a step towards the result.

Most of the Artificial Intelligence machines are based on expert systems. Expert systems are practically a knowledge database which gives support and information needed to the AI to make important decisions or to solve problems. AI is further divided into categories like machine learning, rnn, pater recognition, etc. object identification is also an important part of AI, in this the system is a fed a lot of information and objects to memorize which is further used to recognize when it is prompted this is used in facial scanning security systems it is also used in a popular system called ‘Face Id’ by Apple. AI is supposed to learn from day to day life to make itself better there are two types of AI based on learning

- Supervised learning
- Un supervised learning

In supervised learning the system is provided with a scenario and a result which leads to outcome. This relies on database.

In unsupervised learning the system is given a scenario without the result so the machine thinks and gives out a possible outcome. This relies on intelligence of the system in order to train it.

During the initial days of development of AI there were some important aspects of it they are as follows:

- Simulating complex functions of human brain.
- Natural language processing.
- Self development.
- Knowledge.
- Randomness and creativity.

While most of them have been successfully achieved randomness and creativity are yet to be completed. Research is ongoing in this area of development which will lead us to an AI system much more capable than a human brain.

Fields where Artificial intelligence is used are:

- Health care
- Automobile industry
- Agriculture
- Smartphones, etc.

1.1 Advantages of AI

As we know there are many advantages and disadvantages of AI. Some of its advantages are as follows:

- Artificial intelligence as any machine mainly reduces errors by working in a systematic way and they won't be affected by any hostile environment which results in more precision.
- As AI is a machine it can increase productivity by performing more work because it is not subjected to tiredness or fatigue like humans.
- AI machines can take over repetitive jobs which are monotonous in nature thereby expanding human creativity.
- AI is also very useful in field of health care.
- It also makes faster and accurate decisions
- AI can detect fraud easily and prevent any losses.
- It is also very interactive.
- Used in warfare to avoid human losses.
- Can adapt to any changes easily.
- They have improved interfaces which are slightly easy to handle.
- Converts information into knowledge easily.
- AI systems think logically.

As they can think logically without emotions, partiality they can make accurate and precise decisions. AI systems can be very useful in assessing people with difficulties of any sort. They are helpful in assessing surgeons perform radiosurgery. They don't need rest as they don't get tired which increases productivity which humans can't achieve as it is impossible.

1.2 Disadvantages of AI

There are some disadvantages of Artificial Intelligence they are as follows:

- AI systems are very expensive to develop.
- They are very expensive and highly complex to maintain.
- They require more data during machine learning to achieve more accuracy.
- The information sources we humans have is limited to a certain extent, so we cannot provide complete information to the AI system hence they cannot replicate human level of intelligence.
- Unemployment of humans.
- AI cannot be creative.
- Increase in costs.
- The programmers who have knowledge in AI are very few.
- Development process of AI systems is very slow when compared to other technologies.
- It is very hard a computer to achieve human like intelligence in all areas.
- Complex coding.
- They lack creativity and randomness.
- Mental health and mental capabilities of humans become too dependent on AI if used always.
- AI systems lack wisdom.
- Machines can be easily misused which is a threat to humanity and human life.

AI having human level of intelligence is questionable: ethically can we provide our intelligence to a machine with no emotions as intelligence to humans is considered a gift of nature.

1.3 Key statistics of AI

- Today 37% of all business organizations employ AI.
- Voice assistants which use AI are around 3 billion.
- AI industry might earn a total of \$118 billion every year by 2025.

- Amazon’s voice assistant alexa is powered by AI technology which has around 66,000 skills in its inventory.
- Self driven cars are safer than regular cars in the US.

Artificial intelligence has also impacted the job market in a huge way. There are around 133 million jobs which will be created by presence of Artificial Intelligence.

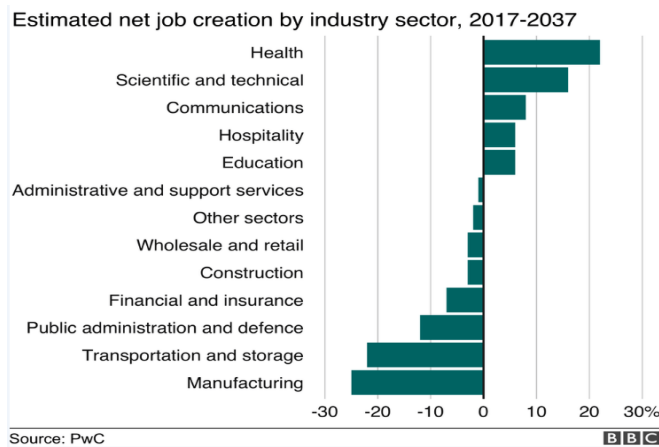


Chart: Jobs impacted by AI.

This shows the jobs that will be impacted by AI in percentage. AI will increase jobs in some fields whereas it might take away some jobs in certain fields.

1.3 Types of AI

There are 4 types of Artificial intelligence they are:

- Reactive AI
- Limited memory AI
- Theory of mind AI
- Self-aware AI

Reactive AI has no memory but responds to different stimuli. They do not have the capability to learn.

Limited Memory AI they contain memory but only to some extent. It can learn from previous experiences and improve its responses.

Theory of Mind AI this is a work in progress AI which researchers are currently developing like humans this contains emotions, wisdom, logic, etc. it understands the needs of user.

Self-aware AI it has human like intelligence and self-awareness. This type of AI is also currently in development stage.

1.4 Goals of AI:

There are two types of goals of AI they are:

- Scientific goal: used to understand about the mechanism of human intelligence.
- Engineering goal: building a tool or machine with human intelligence to solve real world problems.

Examples for engineering goals of AI:

- Reproduce human intelligence in machines or systems.
- Solving knowledge intensive tasks which require lot of information.
- Intelligent connection of perception and action.
- Speech and vision recognizing systems.
- Game playing systems.
- End of human mankind by Stephen Hawking.
- Life 3.0 by Max Tegmark.
- Silicon consciousness by Michio Kaku.

1.5 Applications of AI

AI is being used in many fields such as:

- **Games** – AI has been used in many games which involve a lot of thinking and strategies. Games such as chess, poker, etc. AI system can think many moves ahead where it can predict more than one possible outcome.
- **Financial sector** – Many banking organizations use AI to organize many account information. Used to invest in stocks and detect any changes.
- **Music** – sound processing, composition, etc.
- **Automobile** – automatic transmissions where cars can be automatically driven without a driver or any gear changes.
- **Hospitals** – AI is used in hospital by staff and surgeons in organizing bed schedules, detecting tumors, performing surgeries, organizing beds, etc.

- **Expert systems** – Where certain machines are used by combining practical knowledge and intelligence these machines provide advises to the users.
- **Natural language processing** – It is used in many voice assistants which makes it possible for a human to interact with a computer or a machine in normal language.
- **Intelligent robots** – Where robots are programmed to perform certain tasks given by humans. They have high intelligence and knowledge and they can also learn from their own mistakes which makes adapting to a new environment easier. They contain many sensors which detect heat, light, any bumps on the surface, etc. which are necessary for performing tasks and its survival in any kind of environment it is placed in.
- Misuse of this technology is a big threat.
- 99% of jobs might be eliminated in the future based on AI.
- It might create better environment between organizations and customers.
- There is a bigger question in AI development; do we have enough knowledge resources for it to replace human expertise and intelligence?
- AI might not have enough creativity to think like a human brain it will be more goal oriented so it can easily be used in destructive mode.
- If placed in wrong hands AI can be very dangerous to humanity in the future considering its abilities and knowledge base.
- Work load on humans will be minimized as AI can take over some jobs from us.

1.6 Real life uses of AI

- **OTT platforms:** AI is used to recommend the movies or any shows that a person might watch based on their previous watched shows.
- **Drones:** AI is applied in drones where they fly on their own by using sensors and cameras and they recognize paths or faces and have the ability to follow it on its own without giving any controls.
- **Self driving cars:** In the process of automation AI has been implemented in cars to drive on its own using many sensors it uses cameras to recognize the road and obstacles to drive itself. An example of this technology is tesla cars.
- **Natural language processing:** used in voice assistants where we can interact with a computer or a device in our own language, also used in speech recognition.
- **Robots:** These AI powered machines are found to be a helping hand to humans in healthcare sector in many areas.
- **Google:** Initially it was not an AI but due to its continuous development and updates it has become the world's largest AI.

1.7 Impact of AI

There is a bright and a dark future in this sector which is developing slowly but steadily.

- Transition to AI will be extremely hard and painful.
- It cannot completely takeover human as there are some jobs which only human can do.

As we see there are many beneficial impacts in development of AI and similarly there are many downsides to it. We should be very careful in this process of transition and in the future.

2. EXPERT SYSTEMS

Expert System is an application which is part of AI. It practically consists of a knowledge database which helps in solving complex problems and make complex decisions. Expert System mimics human decision making ability in Artificial Intelligence systems. It consists of high knowledge and expertise. Expert systems mainly represent if-then rules rather than giving a procedure code in AI. It is one of the best researches in AI field. It has been introduced by researchers at Stanford University.

2.1 Characteristics of Expert Systems

- **Expertise:** They contain more knowledge so decisions will be accurate and correct and the cost of accessing information is reduced.
- **Symbolic reasoning:** It is easier to validate information as Expert system uses symbols for representation.
- **Reliable:** They are very reliable to access any kind of information.
- **High performance systems.**
- **Easily understandable.**

2.2 Capabilities of Expert System

- Accurate advises
- Arriving at a certain solution
- Understanding
- Predicts different results
- Suggestions in alternate methods to solve a problem.
- Assisting humans in different situations
- Justifying the result

2.3 Components of an Expert System

There are basically three main components of an Expert System:

- Knowledge base
- Inference engine
- User interface

In **knowledge base** we usually have information, data, facts which are widely accepted around the globe by knowledge scholars and engineers. Knowledge base is required to exhibit decisions and solutions. We can also say that the success of an ES is mainly based on the kind of knowledge it acquires, the more and precise knowledge the better the ES

It also consists of past experiences from which it can improve and develop

Knowledge in an ES is mostly represented by IF-THEN-ELSE rules which are used to formalize the knowledge.

Inference engine makes use of certain procedures and rules based on the knowledge an ES has acquired to arrive at a correct and flawless solution for a given problem

User interface provides the interaction between user and the ES itself by which they can interact with the system. It is also helpful in explaining the steps followed by the system to arrive at a solution. It is similar to natural language processing. For a user to access an ES they need not be well equipped with knowledge in expert system. This makes it easier to understand the solutions and access them easier

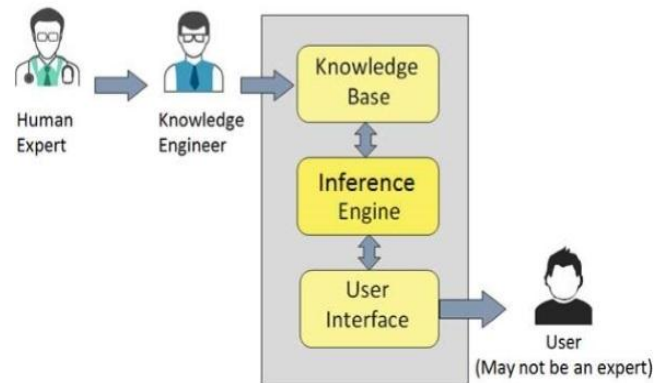


Fig-1: Components of Expert Systems

2.4 Limitations of Expert Systems

Like every technology ES also have certain limitations they are:

- Development costs are high.
- Difficult to maintain.
- Less people with expertise in ES.
- Requires more knowledge.

2.5 Benefits of Expert Systems

- Production cost is less.
- Easily available.
- Reliable.
- Reduce effort for individuals.
- High speed.
- Large source of information.
- Minimize training costs in industries.
- Works without emotions and fatigue.

2.6 Different types of Expert Systems

There are mainly five types of Expert Systems they are:

- Rule based expert system.
- Fuzzy expert system.
- Frame based expert .system
- Neural expert system.
- Neuro-fuzzy expert system.

2.7 Applications of Expert Systems

- Diagnosis systems to detect cause of a disease from given data, conduction of medical operations on humans.
- Finding out faults in any kind of device like computers, vehicles, etc.
- Planning and scheduling.
- Knowledge publishing.
- Loan analysis.
- Virus detection.
- Repair and maintenance.
- Marketing.

There are many applications of Expert systems and Artificial Intelligence.

2.8 Examples of Expert Systems

- MYCIN: it is an ES based on backward chaining it can identify certain bacteria which cause acute infections and it is also used to prescribe drug dosage based upon patient's weight.
- DENDRAL: used to predict molecular structure to perform chemical analysis.
- PXDES: it predicts the type and degree of lung cancer in patients.
- CaDet: it can identify cancer at early stages in patients.

3. CONCLUSION

Now, the time to think on the future of artificial intelligence and expert systems think that as to go with normal programming or adapt to artificial intelligence. AI has currently been a useful tool in the software industry. AI in its current short existence has led to many improvements in technology and has improved quality of life for humans. It has provided an impressive range of applications. At the same it has shown us the challenges that we may face in the future due to its development. AI has also provided many new areas of study to explore and develop for future generations. It has provided a new way of human thinking. The overall motivation behind this paper is to understand the developing technology which is necessary in order to cater the needs of growing population. But this concept requires a paradigm shift in human thinking which changes the way we think about modernization based on needs more than modifying existing techniques. The subject of AI is

really with full of surprises and new ideas this is an area of technology which is not completely yet developed but just the process of thought in machines is a huge leap forward in technology.

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BIOGRAPHIES



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