# Artificial Intelligence: Types, Methods, Accomplishments And Challenges

## Artificial Intelligence

Artificial Intelligence is also known as machine intelligence. It was first termed in the year 1956. It is intelligence demonstrated by machines, in contrast to the intelligence displayed by living organisms (humans and animals). It can also be defined as the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.

## Types Of AI:

Artificial intelligence is classified into three types or can be explained in three stages based upon the capacity to replicate human characteristics.

### 1. Artificial Narrow Intelligence/ Weak AI /Narrow AI ----- ANI

This is the first stage of AI where the present world has successfully reached to date. Weak AI doesn't only imitate human intelligence but it pretends human behavior based upon parameters and contexts. As these operate under narrow constraints and parameters they are also known as Narrow AI or Weak AI. It is designed to perform particular tasks and is also goal-oriented. It is intelligent at accomplishing the task assigned and it is programmed to do such as facial recognition, speech recognition/voice assistants, driving a car, etc.

### 2. Artificial General Intelligence / Strong AI / Deep AI ----- AGI

This is the second stage of the evolution of AI. AGI is also known as strong AI or deep AI. It is the concept where a machine with general intelligence can reciprocate human intelligence and human behaviors. In this stage, the machine can learn and apply its intelligence practically. AGI can think, understand, and act in a way that is indistinguishable from that of a human in any situation. To achieve this, the machines should be programmed with consciousness and a set of cognitive abilities. In this case, the efficiency to perform the assigned task is high.

### 3. Artificial Super Intelligence ----- ASI

ASI is the last stage of AI where machines can overtake the world. This is the most advanced stage where machines not only can understand both human behavior and human intelligence but they can become self-aware about the situations around and outclass human abilities. The concept of artificial superintelligence sees AI evolve to be so akin to human emotions and experiences, that it doesn't just understand them, it evokes emotions, needs, beliefs, and desires of its own. The impact of ASI will have on humanity, human survival, and way of life we lead and will be discussed later.

## Methods Of Artificial Intelligence

There are two competing methods for AI named Symbolic Approach and the Connectionist Approach. The symbolic Approach is also known as the 'Top-down Approach' and the Connectionist is also known as the 'Bottom-up Approach'. The bottom-up approach involves creating neural networks for the imitation of the human brain structure whereas the top-up approach seeks to imitate intelligence by analyzing the cognition independent of the human biological structure of the brain in terms of processing the symbols.

The differences between the two approaches can be explained by an example of a system with an optical scanner that recognizes the letters of an alphabet. The connectionist approach trains the scanner (Artificial Neural Network) by presenting the letters one by one whereas the Symbolic approach is something that involves the coding for the letter to be recognized based on the geometric descriptions.

Now let's discuss a few techniques of AI. The following are the most popular techniques of AI.

### 1) Heuristics:

Heuristics it means that whenever problems get too complex to find the guaranteed best possible solution using exact methods, Heuristics serves to employ a practical method for finding a solution that is not guaranteed to be optimal, but one that is sufficient for the immediate goals. There are two types of Heuristics: Generic Heuristics and Tailored Heuristics. Generic Heuristics are based on processes of nature.

### 2) Markov Decision Process (MDP):

A Markov Decision Process is a decision-making modeling framework where the output of the situation is either random or based on the decision-making inputs. The major goal is to indicate the action for the particular state. An MDP model consists of a set of possible states, set of possible actions, Transition probabilities, and rewards.

### 3) Natural Language Processing (NLP):

NLP is the language that is used by computers to understand the basic human languages for communication. The ultimate goal of NLP is to learn, read, decode, understand human languages, and also to translate it. The major application of NLP is Google Translate, Word Processors, Grammarly, etc.

### 4) Artificial Neural Networks (ANN):

ANN is an information processing paradigm that is inspired by the way the brains in humans (biological nervous system) process the information they see, learn. There are different types of ANNs i.e.; Feedback ANN and Feedforward ANN. These come under Machine Learning with is the subset of AI.

### 5) Evolutionary algorithm

In artificial intelligence (AI), an evolutionary algorithm (EA) is a branch of evolutionary computing, and a metaheuristic optimization algorithm focused on a general population. An EA utilizes biological evolution-inspired processes, such as replication, development, recombination, and selection. Candidate solutions to the question of optimization perform the part of individuals in a society, and the feature of health dictates the efficiency of the answers (see also a feature of losses). The population growth then takes place after the above operators repeatedly apply.

### 6) Deep learning

Deep learning is part of a larger class of machine learning approaches focused on representation-learning artificial neural networks. Training may be managed, semi-supervised, or unmonitored. Deep learning systems such as artificial neural networks, artificial-belief networks, recurrent neural networks, and coevolutionary neural networks have been extended to areas including machine vision, speech recognition, natural language processing, audio recognition, social network scanning, computer translation, bioinformatics, product design, medical image processing, object inspection, and board game algorithms have provided findings equal to and in certain instances beyond the success of human experts.

## Goals Of Artificial Intelligence

The overall goal of AI is to create machines and computers that behave effectively as humans. From the methods mentioned above the AI researchers are working to attempt to reach the following three goals:

- Strong AI: - Build machines that think
- Applied AI: - Advanced Information Processing
- Cognitive Simulation: - Test how the human mind works and create an independent artificial human.

The major goals of AI are discussed below:

### · To Create Expert Systems ? The systems which exhibit intelligent behavior, learn, demonstrate, explain, and advise its users.

In the year 1997, the exemplary expert systems are chess-playing programs by IBM Deep Blue, which defeated the world champion. The chess game is considered as the defined test for the AI robots because it is not only about analyzing the possible moves but also recognizing the patterns formed by humans and considering all possible moves and playing to defeat humans. Recognizing 'meaningful' chessboard positions and patterns in the board is sufficiently intelligent. This example goes to show that, despite expert systems' apparent disconnection from the modeling of human intelligence, we are generally more willing to consider an expert system a form of AI if its behavior appears more human-like.

Nevertheless, because the only requirement for an AI expert system is autonomous problem solving, which for small domains of information are very doable, expert systems have become considerably more widespread and successful than more generalized human intelligence schemes; assembly-line robots, for instance, are expert systems, as are machines which read

texts out loud for blind persons and programs which analyze trends in the stock market and make recommendations.

### · To Implement Human Intelligence in Machines ? Creating systems that understand, think, learn, and behave like humans.

As mentioned earlier the main goal of AI is to create a human-like robot that can think, learn, and respond to situations as humans do. But the major problem here is the continuous and deep research that is going on in the field of cognitive science where humans are studying their brains and mind's functionality. Although cognitive science is still dedicated in many ways to a dualism of mind and body, very few if any would still claim that the mind's function is unconnected to the structure of the brain. As a result of the research, human intelligence is now seen in two forms, Sub-conceptual neuron-based intelligence, and formal symbolic logical system.

So, it is very difficult to find the exact definition of the goals of Artificial Intelligence. Most of AI researchers consider their goal of AI as the replication of human intelligence, either explicitly by trying to uncover the rules of human cognition through a hypothetical artificial model, or implicitly by using human cognitive models as the models for an expert system. There is, therefore, quite a bit of overlap between the two goals of AI presented here.

## Accomplishments Of Artificial Intelligence

There are many projects of AI that were successful in accomplishing the tasks provided and the results were outstanding. From the initial stages of AI to date there was a lot of improvement in the ideas of the projects and the accuracy of the results. Let's discuss a few of the AI accomplishments from the past to date.

### 1) Writing Poetry:

Google's AI created poems based on the information provided by 11,000 unpublished books. Although, the poems and not well known but they are grammatically correct and make sense.

### 2) Defeating humans in games

Most of the AI machines beat world champions in chess and GO. Where chess is the calculation of the possible moves whereas Go has many possible moves where calculating is not possible. But in GO a machine beat a world champion. Even in the Atari Games, AI robots started to play better than humans.

In April 2015, an AI robot played a poker game with high professional players. The robot learned to play poker by itself and gave a hard time to the professional players. The most interesting part of this achievement is the robots managed to bluff well in the poker game.

### 3) Developing A Scientific Theory

Tufts University scientists programmed an AI bot that was capable of developing a new

scientific theory. Essentially, its theory analyzed data using a trial and error method and discovered how the regeneration process of a flatworm worked. This was, until then, a 120-year-old biological mystery.

### 4) Defeating Humans in IQ Tests

The major problem for most of humans is to remember the synonyms and analogies of a particular language. An AI Robot built by the University of Science and Technology in China with the help of Microsoft researches could outperform the average Human IQ in synonyms and analogies.

### 5) Detecting Lung Cancer

In the year 2018, more than 9.9 million people passed away by lung cancer. It is the most common type of cancer found and can be detected by X-Ray and CT scanning. In the next year, AI researchers and Scientists from Google and Northwestern Medicine, Chicago USA collaborated and started a project to create an AI to predict lung cancer. It was a successful AI project. It scanned more than 500 images in ten minutes.

### 6) PEGASUS

PEGASUS stands for Pre-Training with an extracted gap- sentences for abstractive Summarizations. Its technology is NLP and text recognition. Its major goal was to change/advise the shorter word in place of the big contents which deliver the same meaning.

Apart from the above-mentioned accomplishments, AI is taking over the world with its new achievements like Autonomous Driving Vehicles, Computer Class, Mathematical Theorem Proving, Scientific Classification, and many more and in the year 2019 with Facebook Detectron, DeepMind-Wavenet technology introduced a way to recover the original voice of Speech impair patients and SingularityNet- The first Platform for the Decentralized AI Economy, etc.

## Applications Of AI

Artificial Intelligence applications can be mainly classified into the following categories:

- Knowledge
- Planning
- Reasoning
- Communication
- Perception

AI can be applied in any field and each application has a specific limitation depending on the field requirements. The most popular fields where AI is playing a key role are Healthcare, Entertainment, Finance, Data Security, Manufacturing, Automotive Industry. Some examples of AI applications are:

- Speech Recognition ? Some AI machines are capable of hearing and understanding the

human language in terms of sentences and they know the meaning of that words used. It can handle different accents, slang words, noise in the background, change in human’s noise due to cold, etc.
- Handwriting Recognition ? The handwriting recognition software reads the text written on paper by a pen. It can recognize the shapes of the letters and convert it into editable text. It can recognize any language and this would be one of the best applications by reducing the need for translators.
- Intelligent Robots ?These robots are able to perform the tasks given by a human. They have sensors to detect physical data from the real world such as light, heat, temperature, movement, sound, bump, and pressure. They have efficient processors, multiple sensors, and huge memory, to exhibit intelligence. In addition, they are capable of learning from their mistakes and they can adapt to the new environment.

## Challenges Of Artificial Intelligence In Health Care

The most advanced area for AI is the medical field or health care where every minimal task performed by an AI robot has to be successful and should give a result with high accuracy. The most common application of AI in healthcare is the traditional machine learning for medicine i.e.; predicting the treatment protocols that are likely to succeed on a patient based on the attributes and contexts of the patient. The most complex form of AI in this field is the application of neural networks and is used to determine whether the patient attains a particular disease. 'Features' of the data set play a crucial role here. In the 1970s, Stanford developed an MYCIN which is used for diagnosing and blood-borne bacterial infections. But here the human diagnosticians were better than the AI robots.

In the case of health care, the AI robots replacing humans would be the best human invention because in the US on average the time spent by a nurse on regulation and administration is 25% of the work time. Some of the health care communities even implemented chatbots for interaction with the patients and testing their mental health and wellness. But, those chatbots experiment was almost a failure because the patients expressed their concerns about revealing confidential information. Apart from the confidentiality concern, there are many ethical implications for the use of AI in health care by raising issues like privacy, accountability, permission, and transparency. In the issues mentioned above the main issue that needs to be considered is transparency.

As a human, we make a lot of mistakes. Even professional doctors in the early stages of their careers make minute mistakes while treating a patient. So, undoubtedly AI systems will also make mistakes in diagnosis, analysis of the treatment for the patients which leads to the difficulty of establishing accountability. Many Deep learning algorithms that are used for the image analysis are impossible and hard to explain and most of the Machine learning systems in healthcare may also be subject to algorithmic bias, perhaps predicting the greater likelihood of disease based on gender or race when those are not causal factors. This is one of the more powerful and consequential technologies to impact human societies, so it will require continuous attention and thoughtful policy for many years.

## Future Of AI

In this technological world, there is always a discussion and debate about technology taking

over humans and the world. This also questions the existence of AI in the future. The main purpose of creating AI is to make human life luxurious and easier with the tasks performed by AI Robots. It is accepted that there are many advantages of AI but at the same time, there are disadvantages too. The main disadvantage of AI is unemployment for humans. With the introduction and successful implementation of AI many industries in the world will benefit from increased profitability and will still have good economic growth rates. In addition, AI is also aiming at innovative, human-centered approaches and measuring the applicability of robotic technology to various industries and companies in the entire world. So, AI will be the main reason for the revolutionized world in the decades to come. At a particular time, we will achieve AI which has both moral and ethical values. This might be a positive impact on the empowerment of humans, companies, and the world economy but at the same time it can be a debacle for the human race. In furthermore, AI will have all the advantages of colonizing the world without the help of human beings. Shortly, self-replicating AI could be made where human colonies beyond the earth will never have the potentials to fight in the free space with critical terms.

In addition to that, there are many scientists and researchers mentioning that the fear of AI Technology towards the human race is just a myth because machines always act as how humans want them to act. It all depends on how humans train AI robots to behave and how we program them. So, the effect of AI on humanity is still debatable.