What is Artificial Intelligence? - Man made intelligent machine

Introduction:

Artificial Intelligence is composed of two words **Artificial** and **Intelligence**,

Where Artificial defines ***"man-made*** and intelligence defines ***"thinking power",***

Hence AI means ***"a man-made thinking power."***

"It is a branch of computer science by which we can create intelligent machines which can **behave** like a human, **think** like humans, and **able to make decisions."**

Definition:

1. According to the father of Artificial Intelligence, John McCarthy, it is *"The science and engineering of making intelligent machines, especially intelligent computer programs".*

AI is accomplished by studying **how human brain thinks** and **how humans learn, decide**, and work while trying to **solve a problem,** and then using the outcomes of this study as a basis of developing intelligent software and systems.

2. Artificial Intelligence exists when a machine can have human based skills such as **learning, reasoning,** and **solving problems.**

Why AI:-

1. With the help of AI we can create such s/w or device which can solve real-world problems very easy with high accuracy such as **Health Issues, Marketing, and Traffic** Issues**.**

2. We can Create our Personal virtual assistance eg:- **Google Assistant**

3. We can create Robots which can work in an environment where survival of human can be trust.

Goals of AI

Following are the main goals of Artificial Intelligence:

1. Replicate human intelligence
2. Solve Knowledge-intensive tasks
3. An intelligent connection of perception and action
4. Building a machine which can perform tasks that requires human intelligence such as:
    - Proving a theorem
    - Playing chess
    - Plan some surgical operation
    - Driving a car in traffic
5. Creating some system which can exhibit intelligent behavior, learn new things by itself, demonstrate, explain, and can advise to its user.

What Contributes to AI?

Artificial Intelligence is not just a part of computer science even it's so vast and requires lots of other factors which can contribute to it.

To create the AI first we should know that how intelligence is composed, so the Intelligence is an intangible part of our brain which is a combination of **Reasoning, learning, perception, problem-solving, language understanding,**

1. **Reasoning:-** Judgment, Making Decision and Prediction

2. **Learning:** This is the Activity of Gaining Knowledge.

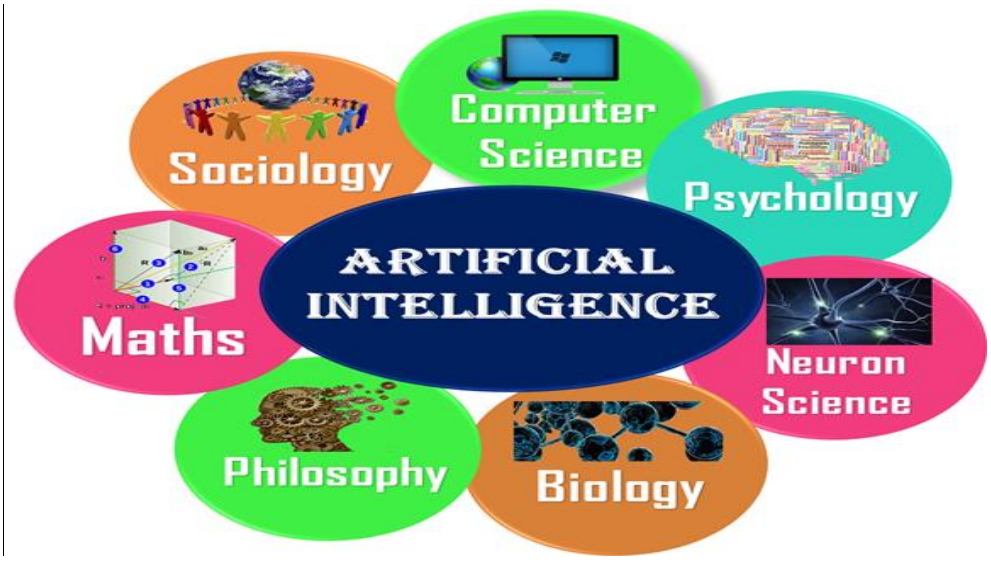
3. **Perception:** - This is Mechanism that put data acquire by sensor together in meaningful manner.

4. **Problem Solving:-** A process of working through details of problem to search the solution.

5. **Language understanding:-** Method to understand input made in the form of sentences in text or speech format.

To achieve the above factors for a machine or software Artificial Intelligence requires the following discipline:

- Mathematics
- Biology
- Psychology
- Sociology
- Computer Science
- Neurons Study
- Statistics



Advantages of Artificial Intelligence

Following are some main advantages of Artificial Intelligence:

- **High Accuracy with less errors:** AI machines or systems are prone to less errors and high accuracy as it takes decisions as per pre-experience or information.
- **High-Speed:** AI systems can be of very high-speed and fast-decision making, because of that AI systems can beat a chess champion in the Chess game.
- **High reliability:** AI machines are highly reliable and can perform the same action multiple times with high accuracy.
- **Useful for risky areas:** AI machines can be helpful in situations such as defusing a bomb, exploring the ocean floor, where to employ a human can be risky.
- **Digital Assistant:** AI can be very useful to provide digital assistant to the users such as AI technology is currently used by various E-commerce websites to show the products as per customer requirement.
- **Useful as a public utility:** AI can be very useful for public utilities such as a self-driving car which can make our journey safer and hassle-free, facial recognition for security purpose, Natural language processing to communicate with the human in human-language, etc.

Disadvantages of Artificial Intelligence

Every technology has some disadvantages, and thesame goes for Artificial intelligence. Being so advantageous technology still, it has some disadvantages which we need to keep in our mind while creating an AI system. Following are the disadvantages of AI:

- **High Cost:** The hardware and software requirement of AI is very costly as it requires lots of maintenance to meet current world requirements.
- **Can't think out of the box:** Even we are making smarter machines with AI, but still they cannot work out of the box, as the robot will only do that work for which they are trained, or programmed.
- **No feelings and emotions:** AI machines can be an outstanding performer, but still it does not have the feeling so it cannot make any kind of emotional attachment with human, and may sometime be harmful for users if the proper care is not taken.
- **Increase dependency on machines:** With the increment of technology, people are getting more dependent on devices and hence they are losing their mental capabilities.
- **No Original Creativity:** As humans are so creative and can imagine some new ideas but still AI machines cannot beat this power of human intelligence and cannot be creative and imaginative.

Application of AI

Artificial Intelligence has various applications in today's society. It is becoming essential for today's time because it can solve complex problems with an efficient way in multiple industries, such as Healthcare, entertainment, finance, education, etc. AI is making our daily life more comfortable and fast.

Following are some sectors which have the application of Artificial Intelligence:

1. AI in Astronomy

- Artificial Intelligence can be very useful to solve complex universe problems. AI technology can be helpful for understanding the universe such as how it works, origin, etc.

2. AI in Healthcare

- In the last, five to ten years, AI becoming more advantageous for the healthcare industry and going to have a significant impact on this industry.
- Healthcare Industries are applying AI to make a better and faster diagnosis than humans. AI can help doctors with diagnoses and can inform when patients are worsening so that medical help can reach to the patient before hospitalization.

3. AI in Gaming

- AI can be used for gaming purpose. The AI machines can play strategic games like chess, where the machine needs to think of a large number of possible places.

4. AI in Finance

- AI and finance industries are the best matches for each other. The finance industry is implementing automation, chatbot, adaptive intelligence, algorithm trading, and machine learning into financial processes.

5. AI in Data Security

- The security of data is crucial for every company and cyber-attacks are growing very rapidly in the digital world. AI can be used to make your data more safe and secure. Some examples such as AEG bot, AI2 Platform,are used to determine software bug and cyber-attacks in a better way.

6. AI in Social Media

- Social Media sites such as Facebook, Twitter, and Snapchat contain billions of user profiles, which need to be stored and managed in a very efficient way. AI can organize and manage massive amounts of data. AI can analyze lots of data to identify the latest trends, hashtag, and requirement of different users.

7. AI in Travel & Transport

- AI is becoming highly demanding for travel industries. AI is capable of doing various travel related works such as from making travel arrangement to suggesting the hotels, flights, and best

routes to the customers. Travel industries are using AI-powered chatbots which can make human-like interaction with customers for better and fast response.

8. AI in Automotive Industry

- Some Automotive industries are using AI to provide virtual assistant to their user for better performance. Such as Tesla has introduced TeslaBot, an intelligent virtual assistant.
- Various Industries are currently working for developing self-driven cars which can make your journey more safe and secure.

9. AI in Robotics:

- Artificial Intelligence has a remarkable role in Robotics. Usually, general robots are programmed such that they can perform some repetitive task, but with the help of AI, we can create intelligent robots which can perform tasks with their own experiences without pre-programmed.
- Humanoid Robots are best examples for AI in robotics, recently the intelligent Humanoid robot named as Erica and Sophia has been developed which can talk and behave like humans.

10. AI in Entertainment

- We are currently using some AI based applications in our daily life with some entertainment services such as Netflix or Amazon. With the help of ML/AI algorithms, these services show the recommendations for programs or shows.

11. AI in Agriculture

- Agriculture is an area which requires various resources, labor, money, and time for best result. Now a day's agriculture is becoming digital, and AI is emerging in this field. Agriculture is applying AI as agriculture robotics, solid and crop monitoring, predictive analysis. AI in agriculture can be very helpful for farmers.

12. AI in E-commerce

- AI is providing a competitive edge to the e-commerce industry, and it is becoming more demanding in the e-commerce business. AI is helping shoppers to discover associated products with recommended size, color, or even brand.

13. AI in education:

- AI can automate grading so that the tutor can have more time to teach. AI chatbot can communicate with students as a teaching assistant.
- AI in the future can be work as a personal virtual tutor for students, which will be accessible easily at any time and any place.

14. **Natural Language Processing** − It is possible to interact with the computer that understands natural language spoken by humans.

15 **Expert Systems** − There are some applications which integrate machine, software, and special information to impart reasoning and advising. They provide explanation and advice to the users.

Real Life Applications of Research Areas

There is a large array of applications where AI is serving common people in their day-to-day lives −

Sr.No.	Research Areas	Real Life Application
1	**Expert Systems** Examples − Flight-tracking systems, Clinical systems.	
2	**Natural Language Processing** Examples: Google Now feature, speech recognition, Automatic voice output.	
3	**Neural Networks** Examples − Pattern recognition systems such as face recognition, character recognition, handwriting recognition.	
4	**Robotics** Examples − Industrial robots for moving, spraying, painting, precision checking, drilling, cleaning, coating, carving, etc.	
5	**Fuzzy Logic Systems** Examples − Consumer electronics, automobiles, etc.	

AI Techniques: -

- AI techniques are method to solve various types of complex problems in different application areas.
- AI techniques are a method that exploits knowledge that should represent in such a way that

1. It should understand by people

2. Easily modified to correct

3. Can be used in many situations

To solve the problem artificial intelligence use the following techniques

(a) **Search:** There are some single-player games such as tile games, Sudoku, crossword, etc. The search algorithms help you to search for a particular position in such games.

(b)**Pattern recognition**:-this technique help to compare and make observation for eg: a vision program may try to match a pattern of eyes and a nose in a scenes in order to find a face.

(c)**Representation:** Knowledge representation in AI is not just about storing data in a database, it allows a machine to learn from that knowledge and behave intelligently like a human being.

(d)**Inference:-** This techniques helps to **create a new logic from old logic** or by evidence so generating the conclusions from **evidence and facts** is termed as inference.

(e)**Common sense knowledge and Reasoning**:- Knowledge Representation and Reasoning (**KR, KRR**) represents information from the real world for a computer to understand and then utilize this knowledge to solve **complex real-life problems** like communicating with human beings in natural language.

(f)**Learning From experience: - machine learning**

(g)**Planning:-** To generate a strategy for achieving the goal. The strategy is just a sequence of actions.

(h)**Heuristics: - heuristic** (find, discover") is a technique designed for solving a problem more quickly.

(i)**Genetic Programming:-** is a technique for getting program to solve a task

Agents in Artificial Intelligence

What is an Agent?

An agent can be **anything that sense (perceive)** its environment through sensors and act upon that environment through actuators.

An Agent runs in the cycle of **perceiving**, **thinking**, and **acting**. An agent can be:

- **Human-Agent:** A human agent has eyes, ears, and other organs which work for sensors and hand, legs, vocal tract work for actuators.
- **Robotic Agent:** A robotic agent can have cameras, infrared range finder, NLP for sensors and various motors for actuators.
- **Software Agent:** Software agent can have keystrokes, file contents as sensory input and act on those inputs and display output on the screen.

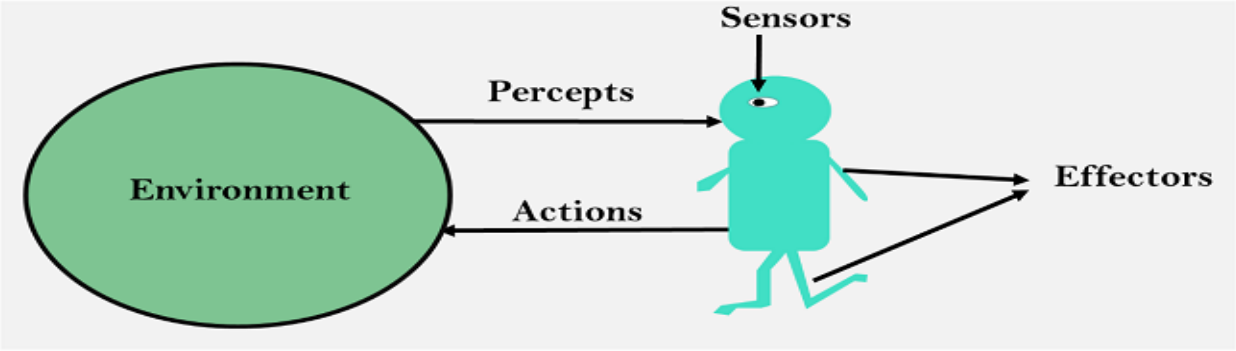
A **software agent** has encoded bit strings as its programs and actions.

We should first know about sensors, effectors, and actuators.

Sensor: Sensor is a device which detects the change in the environment and sends the information to other electronic devices. An agent observes its environment through sensors.

Actuators: Actuators are the component of machines that converts energy into motion. The actuators are only responsible for moving and controlling a system. An actuator can be an electric motor, gears, rails, etc.

Effectors: Effectors are the devices which affect the environment. Effectors can be legs, wheels, arms, fingers, wings, fins, and display screen.



Example: - Self Driving Car

Performance Measure	Environment	Actuators	Sensors
safe, fast, legal, comfortable trip, maximize profits	roads, other traffic, pedestrians, customers	steering, accelerator, brake, signal, horn, display	camera, sonar, speedometer, GPS, odometer, engine sensors, keyboard, accelerator

Vacuum-Cleaner

Percepts: location and contents, e.g., [A, dirty]

Actions: Left, Right, Suck