

What is Artificial intelligence?

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think and act like humans. It involves the development of algorithms and computer programs that can perform tasks that typically require human intelligence such as visual perception, speech recognition, decision-making, and language translation. AI has the potential to revolutionize many industries and has a wide range of applications, from virtual personal assistants to self-driving cars.

Applications:

Uses of Artificial Intelligence :

Artificial Intelligence has many practical applications across various industries and domains, including:

1. **Healthcare:** AI is used for medical diagnosis, drug discovery, and predictive analysis of diseases.
2. **Finance:** AI helps in credit scoring, fraud detection, and financial forecasting.
3. **Retail:** AI is used for product recommendations, price optimization, and supply chain management.
4. **Manufacturing:** AI helps in quality control, predictive maintenance, and production optimization.
5. **Transportation:** AI is used for autonomous vehicles, traffic prediction, and route optimization.
6. **Customer service:** AI-powered chatbots are used for customer support, answering frequently asked questions, and handling simple requests.
7. **Security:** AI is used for facial recognition, intrusion detection, and cybersecurity threat analysis.
8. **Marketing:** AI is used for targeted advertising, customer segmentation, and sentiment analysis.
9. **Education:** AI is used for personalized learning, adaptive testing, and intelligent tutoring systems.

Advantages of AI:

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 AI:

Drawbacks of Artificial Intelligence :

1. **Bias and unfairness:** AI systems can perpetuate and amplify existing biases in data and decision-making.
2. **Lack of transparency and accountability:** Complex AI systems can be difficult to understand and interpret, making it challenging to determine how decisions are being made.
3. **Job displacement:** AI has the potential to automate many jobs, leading to job loss and a need for reskilling.
4. **Security and privacy risks:** AI systems can be vulnerable to hacking and other security threats, and may also pose privacy risks by collecting and using personal data.
5. **Ethical concerns:** AI raises important ethical questions about the use of technology for decision-making, including issues related to autonomy, accountability, and human dignity.

Problems of AI:

Issues of Artificial Intelligence :

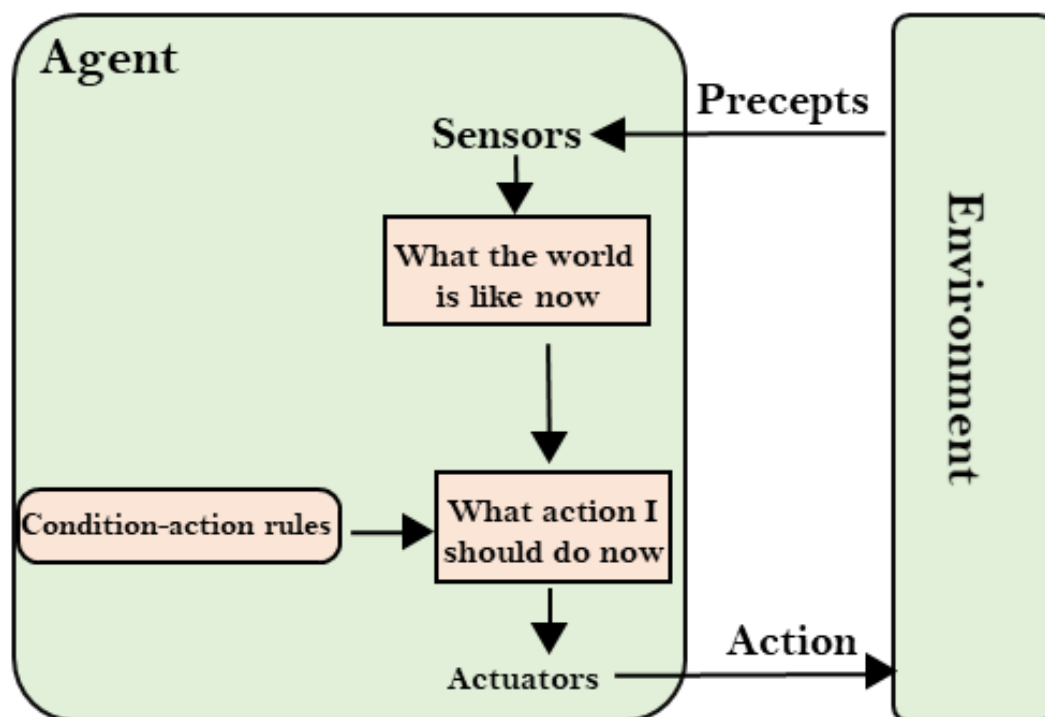
Artificial Intelligence has the potential to bring many benefits to society, but it also raises some important issues that need to be addressed, including:

1. **Bias and Discrimination:** AI systems can perpetuate and amplify human biases, leading to discriminatory outcomes.
2. **Job Displacement:** AI may automate jobs, leading to job loss and unemployment.
3. **Lack of Transparency:** AI systems can be difficult to understand and interpret, making it challenging to identify and address bias and errors.
4. **Privacy Concerns:** AI can collect and process vast amounts of personal data, leading to privacy concerns and the potential for abuse.
5. **Security Risks:** AI systems can be vulnerable to cyber attacks, making it important to ensure the security of AI systems.
6. **Ethical Considerations:** AI raises important ethical questions, such as the acceptable use of autonomous weapons, the right to autonomous decision making, and the responsibility of AI systems for their actions.
7. **Regulation:** There is a need for clear and effective regulation to ensure the responsible development and deployment of AI.

Types of Agents:

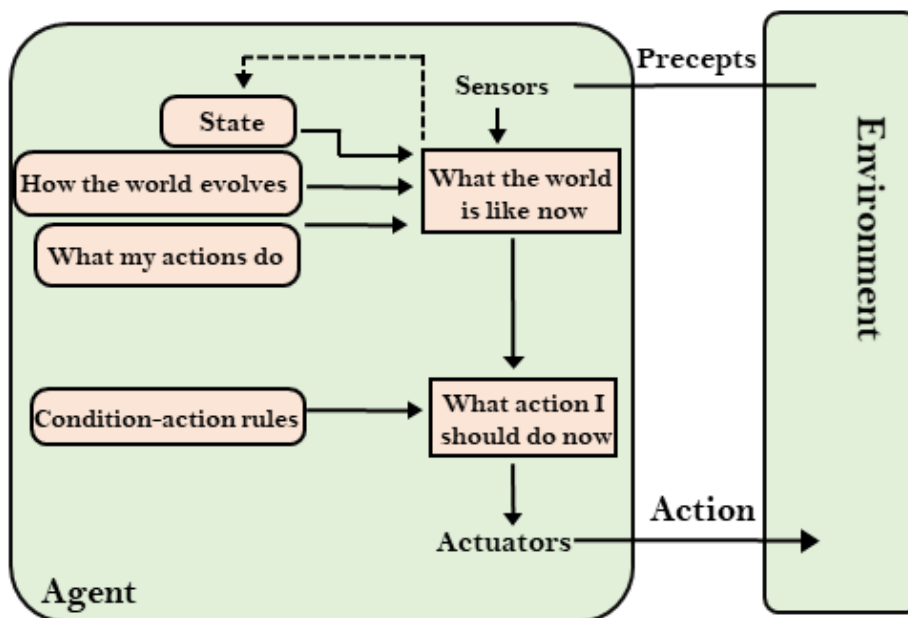
1. Simple Reflex agent:

- The Simple reflex agents are the simplest agents. These agents take decisions on the basis of the current percepts and ignore the rest of the percept history.
- These agents only succeed in the fully observable environment.
- The Simple reflex agent does not consider any part of percepts history during their decision and action process.
- The Simple reflex agent works on Condition-action rule, which means it maps the current state to action. Such as a Room Cleaner agent, it works only if there is dirt in the room.
- Problems for the simple reflex agent design approach:
 - They have very limited intelligence
 - They do not have knowledge of non-perceptual parts of the current state
 - Mostly too big to generate and to store.
 - Not adaptive to changes in the environment.



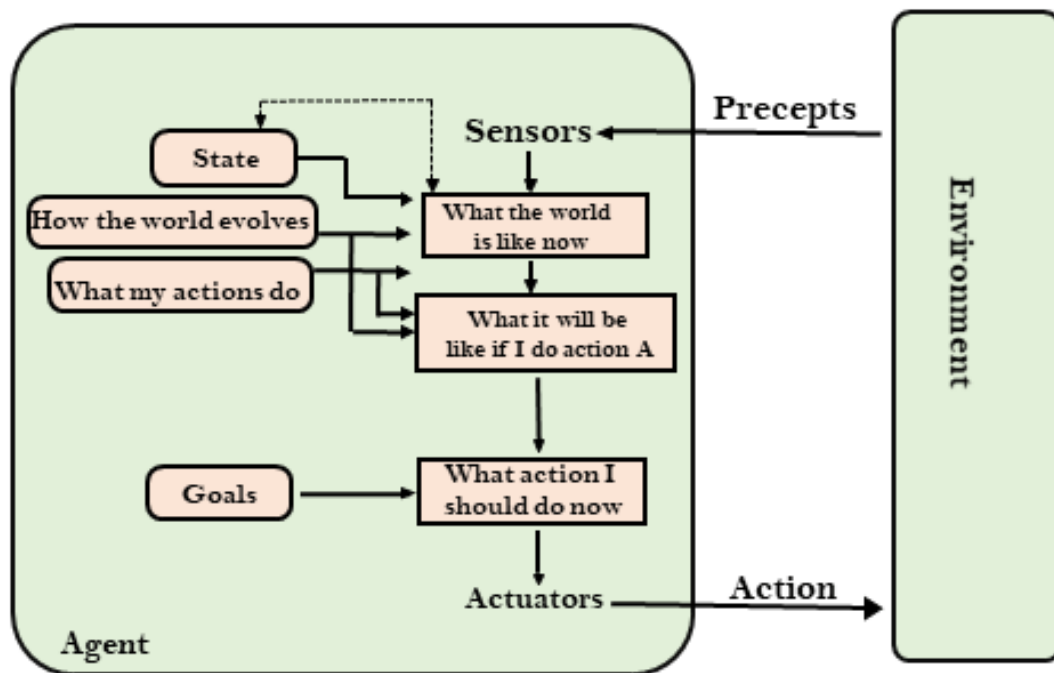
2. Model-based reflex agent

- The Model-based agent can work in a partially observable environment, and track the situation.
- A model-based agent has two important factors:
 - **Model:** It is knowledge about "how things happen in the world," so it is called a Model-based agent.
 - **Internal State:** It is a representation of the current state based on percept history.
- These agents have the model, "which is knowledge of the world" and based on the model they perform actions.
- Updating the agent state requires information about:
 - a. How the world evolves
 - b. How the agent's action affects the world.



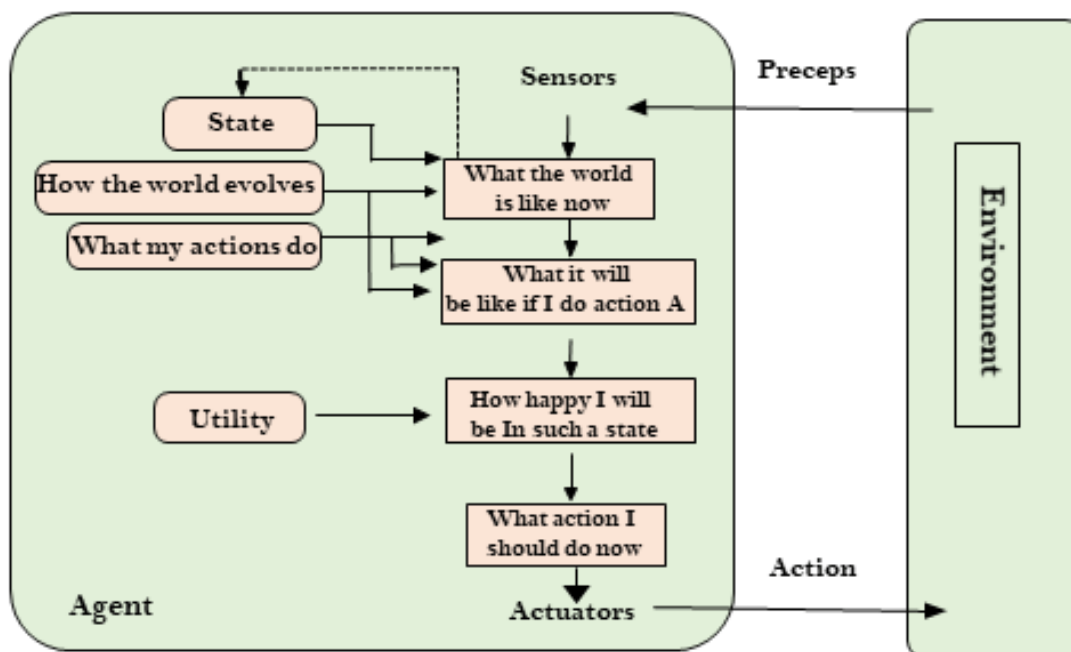
3. Goal-based agents

- The knowledge of the current state environment is not always sufficient to decide for an agent to what to do.
- The agent needs to know its goal which describes desirable situations.
- Goal-based agents expand the capabilities of the model-based agent by having the "goal" information.
- They choose an action, so that they can achieve the goal.
- These agents may have to consider a long sequence of possible actions before deciding whether the goal is achieved or not. Such considerations of different scenario are called searching and planning, which makes an agent proactive.



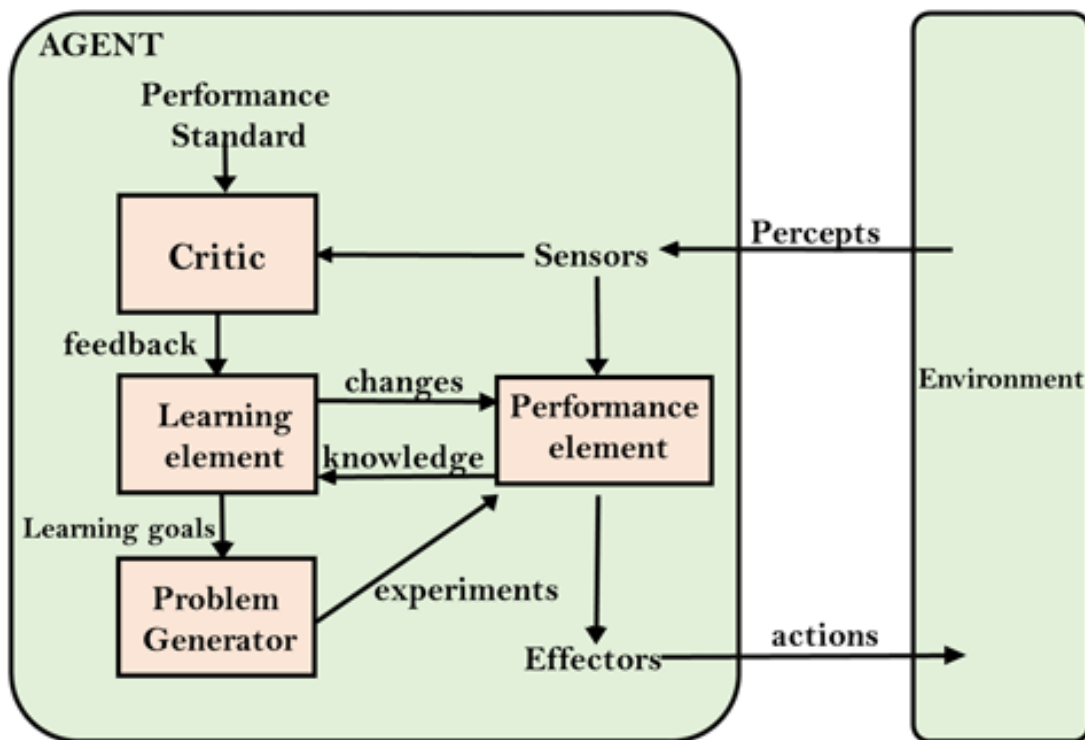
4. Utility-based agents

- These agents are similar to the goal-based agent but provide an extra component of utility measurement which makes them different by providing a measure of success at a given state.
- Utility-based agent act based not only goals but also the best way to achieve the goal.
- The Utility-based agent is useful when there are multiple possible alternatives, and an agent has to choose in order to perform the best action.
- The utility function maps each state to a real number to check how efficiently each action achieves the goals.



5. Learning Agents

- A learning agent in AI is the type of agent which can learn from its past experiences, or it has learning capabilities.
- It starts to act with basic knowledge and then able to act and adapt automatically through learning.
- A learning agent has mainly four conceptual components, which are:
 - a. **Learning element:** It is responsible for making improvements by learning from environment
 - b. **Critic:** Learning element takes feedback from critic which describes that how well the agent is doing with respect to a fixed performance standard.
 - c. **Performance element:** It is responsible for selecting external action
 - d. **Problem generator:** This component is responsible for suggesting actions that will lead to new and informative experiences.
- Hence, learning agents are able to learn, analyze performance, and look for new ways to improve the performance.



Agent Environment PEAS representation:

agents together. The PEAS system delivers the performance measure with respect to the environment, actuators, and sensors of the respective agent. Most of the highest performing agents are Rational Agents.

1. **Performance Measure:** Performance measure is the unit to define the success of an agent. Performance varies with agents based on their different precepts.
2. **Environment:** Environment is the surrounding of an agent at every instant. It keeps changing with time if the agent is set in motion. There are 5 major types of environments:
 - Fully Observable & Partially Observable
 - Episodic & Sequential
 - Static & Dynamic
 - Discrete & Continuous
 - Deterministic & Stochastic
3. **Actuator:** An actuator is a part of the agent that delivers the output of action to the environment.
4. **Sensor:** Sensors are the receptive parts of an agent that takes in the input for the agent.

Agent	Performance Measure	Environment	Actuator	Sensor
Hospital Management System	Patient's health, Admission process, Payment	Hospital, Doctors, Patients	Prescription, Diagnosis, Scan report	Symptoms, Patient's response
Automated Car Drive	The comfortable trip, Safety, Maximum Distance	Roads, Traffic, Vehicles	Steering wheel, Accelerator, Brake, Mirror	Camera, GPS, Odometer
Subject Tutoring	Maximize scores, Improvement is students	Classroom, Desk, Chair, Board, Staff, Students	Smart displays, Corrections	Eyes, Ears, Notebooks
Part-picking robot	Percentage of parts in correct bins	Conveyor belt with parts; bins	Jointed arms and hand	Camera, joint angle sensors

Solving problems by searching, Problem Formulation.

Components to formulate the associated problem:

- **Initial State:** This state requires an initial state for the problem which starts the AI agent towards a specified goal. In this state new methods also initialize problem domain solving by a specific class.
- **Action:** This stage of problem formulation works with function with a specific class taken from the initial state and all possible actions done in this stage.
- **Transition:** This stage of problem formulation integrates the actual action done by the previous action stage and collects the final stage to forward it to their next stage.
- **Goal test:** This stage determines that the specified goal achieved by the integrated transition model or not, whenever the goal achieves stop the action and forward into the next stage to determines the cost to achieve the goal.
- **Path costing:** This component of problem-solving numerical assigned what will be the cost to achieve the goal. It requires all hardware software and human working cost.