Page No.
Date : / /

Introduction to Artificial Intelligence

1. Foundations of Artificial Intelligence

Artificial Intelligence (AI) is a branch of computer science that aims to create intelligent machines capable of performing tasks that typically require human intelligence.

The foundations of AI include :

- Logic : Enables machines to reason and solve problems.
- Knowledge Representation : Allows storing and organizing information for machines to understand.
- Search and Optimization : Helps in finding the best solutions from possible alternatives.
- Machine Learning : Enables systems to learn from data and improve performance.
- Natural Language Processing : Allows machines to understand and interact using human language.

2. History of Artificial Intelligence

The history of AI can be divided into the following phases :

- 1940s - 1950s : Early research and concepts. Alan Turing proposed the idea of machine intelligence.
- 1956 : John McCarthy coined the term "Artificial Intelligence" at the Dartmouth Conference.
- 1960s - 1970s : Development of expert systems and problem-solving programs.
- 1980s - 1990s : AI Winters due to limited computing power and unrealistic expectations.
- 2000s - Present : Rapid growth in machine learning, deep learning, and real-world AI applications.

Today, AI is used in various fields such as healthcare, education, finance, robotics, and more.

3. Limits of AI

- **Lack of Creativity** : AI can simulate creativity but cannot truly think or imagine like humans.
- **No Emotions or Consciousness** : AI does not have feelings, self-awareness, or real understanding.
- **Dependence on Data** : AI systems are only as good as the data they are trained on.
- **Limited Common Sense** : AI struggles with situations that require real-world common sense.
- **Cannot Make Moral Decisions** : AI lacks human values and cannot make ethical or moral judgments.

4. Ethics of AI

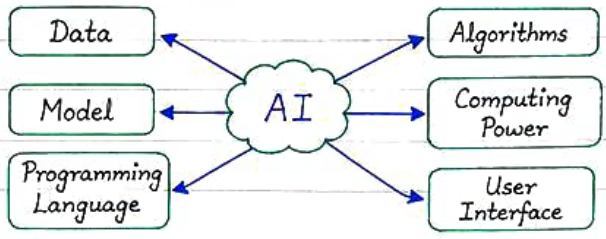
- **Privacy** : AI systems collect and use large amounts of data, raising privacy concerns.
- **Bias and Fairness** : AI can reflect or amplify biases present in training data.
- **Accountability** : It is important to know who is responsible for AI decisions and actions.
- **Transparency** : AI systems should be transparent and explainable to build trust.
- **Safety and Security** : AI should be designed to avoid harm and ensure safety.

5. Future of AI

- AI will automate more tasks and improve efficiency.
- It will play a major role in healthcare, education, transport, finance, and many other fields.
- AI and human collaboration will create new opportunities.
- Advancement in AI will lead to smarter, more adaptive and intelligent systems.
- Ethical and responsible development will be essential for a better future.

6. AI Components

1. **Data** : Raw facts and figures used to train AI systems.
2. **Algorithms** : Step-by-step instructions used to solve problems.
3. **Model** : The trained system that learns patterns from data.
4. **Computing Power** : Hardware and processors that run AI models.
5. **Programming Language** : Languages like Python, R, Java used to build AI systems.
6. **User Interface** : The platform through which users interact with AI.

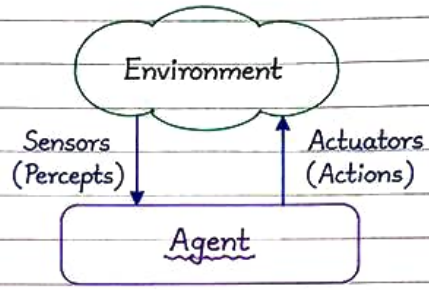


Intelligent Agents

Page No. : ____
Date : / /

1. Agents and Environments

- An agent is anything that can perceive its environment through sensors and act upon that environment through actuators.
- The environment is everything outside the agent that it can sense or affect.



2. Good Behavior : Concept of Rationality

- An agent is rational if it does the right thing.
- The right action is the one that maximizes the expected performance measure, given the percept sequence to date and the agent's built-in knowledge.
- Rationality is the foundation for designing intelligent agents.

3. Types of Agents

- Simple Reflex Agents : Act only on the current percept using condition-action rules.
- Model-Based Reflex Agents : Have internal state to handle partial obserability.
- Goal-Based Agents : Act to achieve specific goals.
- Utility-Based Agents : Act to maximize expected utility (happiness or performance).
- Learning Agents : Improve performance over time through experience.

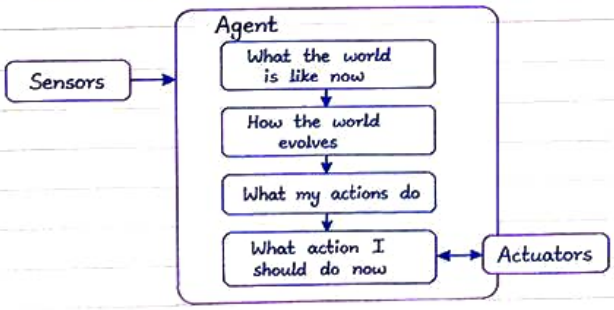
Type	Key Feature
Simple Reflex	Rule based on current percept
Model-Based Reflex	Uses internal state
Goal-Based	Goal achievement
Utility-Based	Maximize utility
Learning	Improve from experience

4. Nature of Environments

- Fully Observable vs. Partially Observable : Can the agent sense the full state ?
- Deterministic vs. Stochastic : Is the next state certain or uncertain ?
- Episodic vs. Sequential : Does the current action affect future decisions ?
- Static vs. Dynamic : Does the environment change while the agent is thinking ?
- Discrete vs. Continuous : Are percepts, actions, and time steps finite or infinite ?
- Single-Agent vs. Multi-Agent : Are there other agents in the environment ?

Environment Type	Description
Fully Observable	Agent has complete information
Partially Observable	Agent has incomplete information
Deterministic	Next state is certain
Stochastic	Next state is uncertain
Episodic	Decisions are independent
Sequential	Decisions affect future
Static	Environment does not change
Dynamic	Environment changes
Discrete	Finite values
Continuous	Infinite values
Single-Agent	Only one agent
Multi-Agent	Multiple agents

5. Structure of Agents



- An agent function maps percept sequences to actions.
- An agent program implements the agent function on an architecture.
- The architecture reads percepts from sensors and produces actions through actuators.
- The agent may have internal state (memory) to represent the world.