

Department of Computer Engineering

T.E. (Computer Sem VI)Assignment -1 Artificial Intelligence (CSC604)

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CO Addressed:-CSC604.1 -To conceptualize the basic ideas and techniques underlying the design of intelligent systems.

Assignment 1:

1. Explain the concept of rationality in the context of intelligent agents. How does rationality relate to the behavior of agents in their environments? Provide examples to illustrate your explanation.
2. Discuss the nature of environments in which intelligent agents operate. What are the key characteristics that define an environment, and how do they influence the design and behavior of agents? Provide examples of different types of environments and the challenges they present to agents.
3. Describe the structure of intelligent agents and the types of agents commonly used in artificial intelligence. What are the components of an agent, and how do they interact to achieve intelligent behavior? Provide examples of different types of agents and their applications in real-world scenarios.
4. Outline the process of problem-solving by searching, including the role of problem-solving agents and the formulation of problems. How do problem-solving agents analyze and approach problems, and what methods do they use to search for solutions? Illustrate your explanation with examples of problem-solving tasks and the strategies employed by agents to solve them.

Rubrics for the First Assignments:

Indicator	Average	Good	Excellent	Marks
Organization (2)	Readable with some missing points and structured (1)	Readable with improved points coverage and structured (1)	Very well written and fully structured	
Level of content(4)	All major topics are covered, the information is accurate (2)	Most major and some minor criteria are included. Information is accurate (3)	All major and minor criteria are covered and are accurate (4)	
Depth and breadth of discussion and representation(4)	Minor points/information maybe missing and representation is minimal (1)	Discussion focused on some points and covers them adequately (2)	Information is presented indepth and is accurate (4)	
Total				

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Signature of the Teacher

Rugved Wankhate
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Artificial Intelligence Assignment 1

(Q1)

- In the context of intelligent agents, rationality refers to the ability of an agent to make decisions that maximizes its expected utility or achieve its goals, given its knowledge and beliefs about the world.

Rationality does not necessarily imply perfect decision-making or omniscience but rather making the best possible decisions based on available information and goals.

Here are a few key points regarding rationality in intelligent agents:

- 1) Goal-Directed Behavior Rational agents are typically designed to achieve certain goals or objectives.
eg - A robotic vacuum cleaner's goal might be to clean a room efficiently.
- 2) Decision making under uncertainty: In rational agents must make decisions even in the face of uncertainty by considering probabilities and expected outcomes.
eg - A self-driving car must decide whether to slow down at an intersection based on its assessment of the likelihood of other vehicles running a red.

3) Adaptation to changing environments -

Environments can be dynamic. Rational agents need to adapt their behaviour to three changes to remain effective.

e.g. An intelligent thermostat adjusts the temperature settings in a house based on factors such as the time of day, occupancy patterns and outdoor weather conditions.

Q2)

- a) Data availability: The availability and quality of data significantly impact the performance and training of AI models. High quality, labelled data is essential for supervised learning tasks while unsupervised learning or reinforcement learning may require less structured data.
- (b) Feature space: The feature space defines the dimensions or variables within the data that the dimensions or variables within the data that the AI ML model can use to make predictions or decisions.
- (c) Complexity: The complexity of the problem and the underlying patterns within the data influence the choice of algo and the models architecture. Some problems may require deep learning techniques to handle complex relationships and, while others may be solvable with examples & models.
- (d) Noise and uncertainty: Real-world data often contains noise and uncertainty, which can affect the performance of AI ML models.
- (e) In a partially observable environment like a card game, agents must use memory and inference to make optimal decisions with incomplete information.
- (f) In stochastic environments like financial markets, agents must employ probabilistic models and risk management strategies to adjust to uncertain outcomes.

(3) Sequential environments such as navigating a maze require agents to plan ahead and consider the long term consequences of their actions

Q3)

→ The structure of intelligent agents in AI/ML typically consists of several components of that actions work together to perceive. The environment, make decisions components include.

1) Perception This component gathers info about the environment using sensors or data inputs. In the context of AI/ML perception involves preprocessing and feature extraction from raw data.

2) Knowledge base: The knowledge base stores relevant information about the environment, including past experiences, rules or models learned from data.

3) Reasoning / Inference engine - The reasoning or intelligence inference engine processes the info from the perception component and the knowledge base to make decisions offer solutions to problem

4) Decision Making: This component selects based on the info processed by the reasoning engine and the goals of the agent.

- 5) Activation / Actions : Actions are responsible for executing the actions chosen by the reasoning engine and are goals of decision-making component, influencing the environment based on the agent's decisions eg - of diff agents
- 6) Examples - i) Reactive agents : These agents make decisions based solely on the current state of the environment without maintaining an explicit internal state or history. eg - include simple rule-based systems for tasks, like playing or robotic navigation.
- ii) Learning agents : Learning agents improve their performance over time by learning from experience. They use techniques such as supervised learning, reinforcement learning etc.
- iii) Deliberate agents : Deliberate agents maintain an internal state representing their beliefs, goals and plans. They use their internal state to reason about the environment and make decisions.

- Q4) → Role of Problem solving Agents
- (a) Analysis of Problem : Problem-solving agents analyze the characteristics of a problem, such as date its initial state, possible actions and goal state.
- (b) Formulation of problems : Once the problem is analyzed, problem solving agents formulate it into a representation that can be understood and solved by computational methods.
- (c) Search for solution : Problem-solving agents represent the problem as a state space, where each state corresponds to a configuration of the environment and transitions. The states are defined by actions. They use search algorithms such as breadth-first search, depth-first search or A* search to explore the state space and find a path from the initial state to the goal state.