

Differentiate between search space and state space.

Feature	Search Space	State Space
Definition	Set of all possible states for a problem	Subset of search space containing only valid and reachable states
Purpose	Provides a comprehensive view of the solution space	Defines the boundaries within which the search algorithm operates
Example	In chess, the search space includes all possible board configurations.	In chess, the state space excludes configurations that violate the rules, like having pieces off the board.

What are the differences between forward chaining and backward chaining?

Forward Chaining	Backward Chaining
Forward chaining starts from known facts and applies production rules until it reaches the goal.	Backward chaining starts from the goal and works backward through production rules to find the required facts that support the goal.
Also known as data-driven reasoning	Also known as goal-driven reasoning.
It is a bottom-up approach.	It is a top-down approach.
It applies the Breadth-First Strategy.	It applies the Depth-First Strategy.
It operates in forward direction	It operates in backward direction

What basic functions or operations must a program perform in order to access knowledge?

1. **TELL:** This operation tells the knowledge base what it perceives from the environment.
2. **ASK:** This operation asks the knowledge base what action it should perform.
3. **Perform:** It performs the selected action.

List the advantages and disadvantages of Depth first search algorithm.

Advantages:

1. The memory requirement is Linear with respect to nodes.
2. Less time and space complexity than BFS.
3. Solution can be found without much exploration.

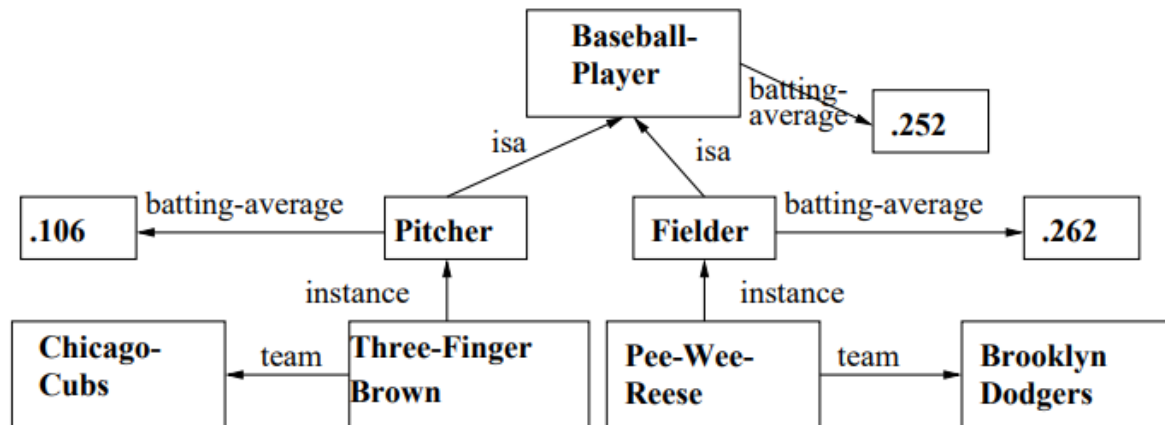
Disadvantages:

1. Solution is not guaranteed
2. It fails if cut-off depth is smaller than solution depth
3. In case of multiple solutions, minimal solution is not guaranteed

Explain intersectional search in semantic nets.

Intersection search refers to finding relationships between objects by spreading activation from each of two nodes and seeing where the activations met.

Question: “What is the relation between Chicago cubs and Brooklyn Dodgers?”



Answer: “They are both teams of baseball players.”

Define inheritable knowledge.

Inheritable knowledge refers to knowledge acquired by an AI system through learning and can be inherited by other AI systems. An AI system can inherit knowledge from other systems, allowing it to learn faster and avoid repeating mistakes that have already been made. Inheritable knowledge also allows for knowledge transfer across domains.

What is the purpose of decision trees?

Decision trees are used to solve classification problems and categorize objects depending on their learning features. They can also be used for regression problems or as a method to predict continuous outcomes from unforeseen data.

What are the various learning techniques? Explain.

1. **Supervised Machine Learning:** The main aim of the supervised learning technique is to map the input variable(x) with the output variable(y). Applications: Risk Assessment, Fraud Detection, Spam filtering, etc.
 - **Classification:** Classification algorithms predict the categories present in the dataset. Examples: Spam Detection, Email filtering, etc.
 - **Regression:** Regression algorithms are used to solve problems in which there is a linear relationship between input and output variables. Example: Weather prediction

2. **Unsupervised Machine Learning:** The main aim of the unsupervised learning algorithm is to group or categories the unsorted dataset according to the similarities, patterns, and differences. Applications: Network Analysis, Recommendation Systems, etc.
 - **Clustering:** It is a way to group the objects into a cluster such that the objects with the most similarities remain in one group. Example: grouping the customers by their purchasing behaviour.
 - **Association:** It is a way to find the dependency of one data item on another data item and map those variables accordingly so that it can generate maximum profit.
3. **Semi-Supervised Machine Learning:** The main aim of semi-supervised learning is to effectively use all the available data. It overcomes the drawbacks of supervised learning and unsupervised learning
4. **Reinforcement Learning:** Reinforcement learning works on a feedback-based process, in which an AI agent automatically explore its surrounding by hit & trial, learning from experiences, and improving its performance. Applications: Video games, Robotics, etc.