

1. List any two weak AI and strong AI.

Weak A.I

- i) Self-driving cars
- ii) Apple Siri

Strong A.I

- i) Solve the puzzle
- ii) make judgments.

2. Explain the properties of minmax algorithm

- It is complete
- It is optimal
- Time Complexity

3. Define any two disadvantages of Fuzzy logic

- Lack of precision
- Complexity in Designing Rules
- Computational overhead.

4. Define Clustering ? mention any two clustering algorithm

Clustering is a technique in machine learning and data mining that involves grouping a set of data points into clusters based on their similarities.

→ K-Means Clustering

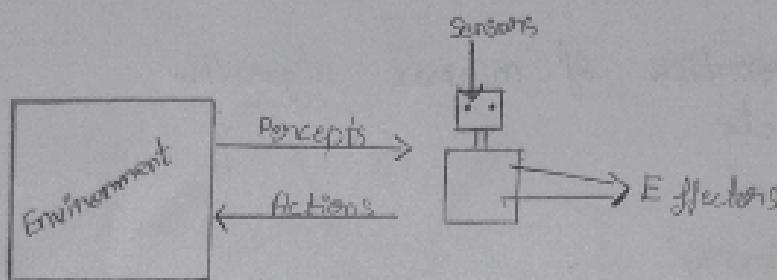
→ Hierarchical clustering

with example.

7. Explain agents and its environment with a neat diagram

⇒ An AI System is composed of an agent and its environment.
The agents act in their environment.

- Perceiving its environment through sensors.
- Acting upon that environment through actuators.
- Effectors are the devices which affect the environment.



8. Explain backward chaining with an example.

10. Explain any 5 applications of Computer vision.

- ⇒
- i) Facial Recognition: Identifying or verifying a person's identity using facial features.
 - ii) Autonomous Vehicles: Enabling self-driving cars to perceive and understand their surroundings.
 - iii) Medical Image Analysis: Analyzing medical images like X-Rays, MRIs, and CT scans for diagnosis.
 - iv) Object Detection and Recognition: Identifying and classifying objects with images or video streams.
 - v) Augmented Reality (AR): Blending digital information with real-world environments through visual inputs.

11. Explain left most & right most derivation. Construct parse tree with example.

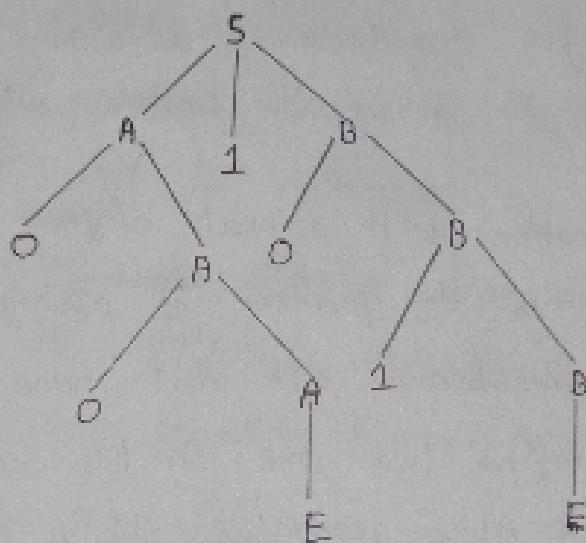
⇒ Left-most derivation:

In LMD at each step, the left-most non-terminal is replaced first

Right-Most Derivation.

In RMD at each step, the right-most non-terminal is replaced first

Parse Tree



12. Explain any five characteristics of Expert system.

⇒ i) Knowledge Base: It stores all the relevant facts, rules, and heuristics required to solve problems in a specific domain.

ii) Inference Engine: It is the brain of the expert system. It applies logical rules and reasoning to the knowledge base to derive new information/make decision.

iii) Inference Engine: It is the brain of the expert system. It applies logical rules and reasoning to the knowledge base to derive new information or make decisions.

iv) User Interface: The user interface allows non-experts to interact with the expert system. It collects input from the user, communicates with the inference

v) Explanation Facility: This feature provides reasoning and justifications for the system's decision or conclusions. Users can ask the system to explain why it reached.

Ques a) Explain 8-queens problem with a neat diagram.

Ans The 8-queens problem is the problem of placing eight queens on an 8×8 chessboard such that none of them attack one another (no two are in the same row, column, or diagonal). More generally, the n -queens problem places n queens on an $n \times n$ chessboard.

Solution characteristics:

- No two queens are on the same row.
- No two queens are on the same column.
- No two queens are on the same diagonal (both primary and secondary diagonals).

Example for 8-queens problem.

	a	b	c	d	e	f	g	h
1				Q				
2								Q
3		Q						
4							Q	
5	Q							
6			Q					
7	Q							
8				Q				

	a	b	c	d	e	f	g	h
1							Q	
2						Q		
3							Q	
4								Q
5					Q			
6								Q
7							Q	
8	Q							

b) List any 3 advantages of A* search.

→ Optimality: A* guarantees finding the optimal solution if the heuristic used is admissible.

→ Efficiency: A* is more efficient than other search algorithms like Dijkstra's algorithm. A* focuses on paths that seem promising & avoids exploring irrelevant paths.

→ Flexibility: The A* allows the use of various heuristics, which can be tailored for specific problem types. By choosing an appropriate heuristic.

ii) a) Define Unification in FOL. Write pseudocode of Unification.

→ Unification in First-Order-Logic is the process of finding a substitution that makes two logical expressions identical. It is a key operation in automated reasoning.

Pseudo code for Unification

```
function UNIFY(X,Y):  
    if X == Y: return {}  
    if is-var(X): return {X→Y} if not occurs-in {X,Y} else FAIL  
    if is-var(Y): return {Y→X}  
    return FAIL  
  
function UNIFY-LIST(L1,L2):  
    if L1 == [] & L2 == []: return {}  
    if L1 == [] or L2 == []: return FAIL  
    S1 = UNIFY(first(L1), first(L2))  
    S2 = UNIFY-LIST(apply(S1, rest(L1)), apply(S1, rest(L2)))  
    return merge(S1, S2)
```

b) What do you mean by chunking in NLP?

→ It refers to the process of identifying & segmenting phrases in a sentence, grouping words into meaningful "chunks" or phrases like noun phrase, verb phrase.

chunking processes:

→ Part - of Speech Tagging :

→ Rules or Patterns :

Q5. Explain Baye's Theorem in A.I.

Baye's Theorem is fundamental concept in probability theory and plays a crucial role in A.I.

Baye's Theorem is used to update beliefs or predictions about an event or hypothesis as new information becomes available.

Key Concepts :

→ Prior Probability ($P(H)$):

Represents the initial belief about the hypothesis before any new data is observed.

→ Likelihood ($P(E|H)$):

Reflects how probable the observed evidence is if the hypothesis is true.

→ Posterior Probability ($P(H|E)$):

This is the updated belief about the hypothesis after observing the new evidence.

→ Marginal Likelihood ($P(E)$):

This normalizes the result so that the sum of all possible posterior probabilities is 1.

b) L
→

b) What is uncertainty in A.I?

→ It refers to situations where the system does not have complete, reliable, or deterministic information about the environment or a problem. Uncertainty arises because of incomplete knowledge, noisy data etc.

b) a) Briefly explain machine learning life cycle.

→ It refers to the process followed in developing, deploying and maintaining machine learning models. It involves several stages that guide to creation of model.

Stages of ML life cycle

1. Problem Definition: Clearly define the problem you want to solve with machine learning.
2. Data Collection: Gather relevant data from various sources such as databases, APIs / sensors.
3. Data Preprocessing: Clean, format, & organize the collected data.
4. Model Selection: Choose appropriate machine learning algorithm based on the problem type.
5. Monitoring & Maintenance: Continuously monitor the model's performance after deployment to ensure it performs well.

b) List 3 disadvantages of Robotics.

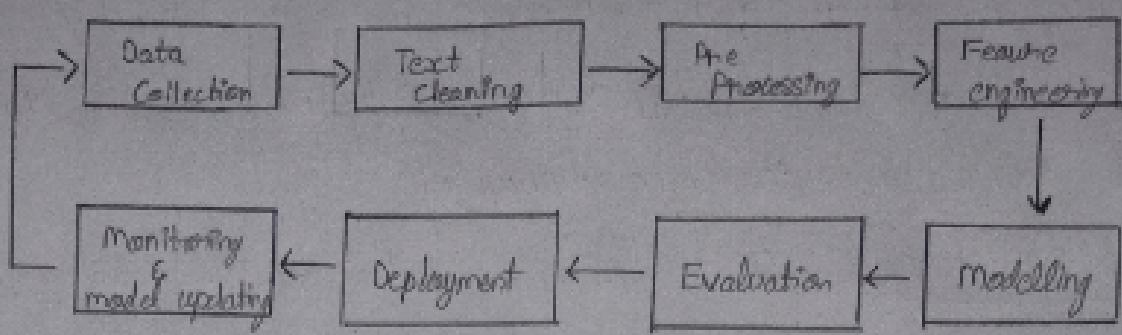
- Job Displacement: As robots become more capable, they can replace human workers in various industries, leading to job losses and economic disruption.
- High Initial Costs: Implementing robotic systems can require significant upfront investment in technology & training.
- Dependence on Technology: Increased reliance on robots can lead to vulnerabilities, such as system failures or cybersecurity threats.

18. a) Explain how to build NLP Pipeline with example.

- In comparison to general ML pipelines, NLP pipeline involves several steps to process & analyse text data.

Steps to build NLP pipeline

- Data Collection: Gather the text data you want to process.
- Data Preprocessing: Clean & prepare data.
- Feature Extraction: Convert text data into numerical representation that can be used in ML models
- Modelling: Choose and apply an NLP model.
- Evaluation: Assess the performance of the model using appropriate metrics
- Deployment: Implement the pipeline in a production environment for real-time processing.



b) Define Non-monotonic logic

→ It is a type of logic in which the introduction of few new info can invalidate previous conclusions. This contrasts with traditional logic, where adding more premises cannot reduce the set of conclusions.