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Assignment No.-2

Q.2 Write down difference between Forward chaining & backward chaining.

Forward Chaining	Backward Chaining
(1) Forward chaining starts from known facts and applies inference rule to extract more data until it reaches to the goal.	Backward chaining starts from the goal & works backward through inference rules to find the required facts that support the goal.
(2) It is a bottom-up approach.	It is a top-down approach.
(3) Forward chaining applies a breadth-first-search strategy.	Backward chaining reasoning applies a depth-first search strategy.
(4) Forward chaining tests for all the available rules.	Backward chaining only tests for few required rules.
5) Forward chaining can generate an infinite number of possible conclusions.	Backward chaining generates a finite number of possible conclusions.

Q.3 Explain different Learning Methods in Machine Learning?

1. Supervised Learning :-

- Learning that takes place based on a class of examples is referred to as supervised learning.
- The supervised Learning method is comprised of a series of algorithms that build mathematical models of certain data sets that are capable of containing both inputs & the desired outputs for that particular machine.

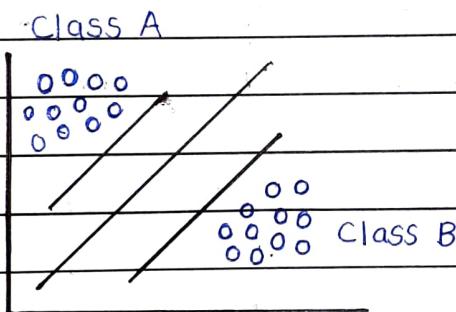


fig : Supervised learning.

2. Unsupervised Learning :-

- Unsupervised learning refers to learning from unlabeled data. It is based more on similarity & differences than on anything else.
- Unsupervised learning is a set of algorithms where the only information being uploaded is inputs.
- It is used to draw inferences from datasets consisting of input data without labelled responses.

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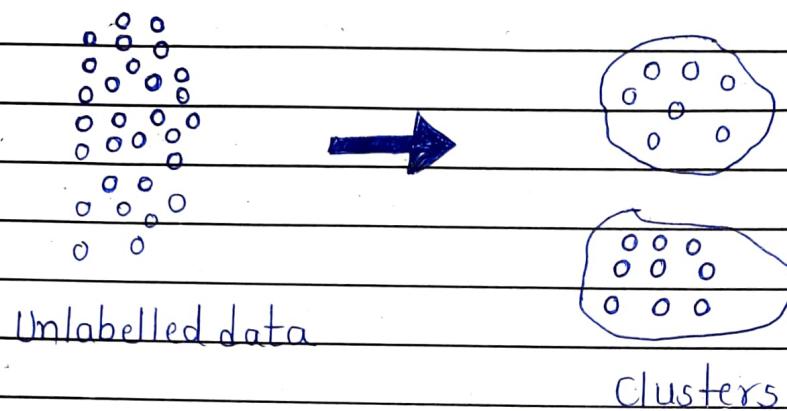


Fig :- Unsupervised learning.

3. Reinforcement Learning :-

- Reinforcement learning is a feedback-based Machine learning technique in which an agent learns to behave in an environment by performing the actions & seeing the results of actions.
- In Reinforcement learning, the agent learns automatically using feedbacks without any labelled data, unlike supervised learning.
- Since, there is no labelled data, so the agent is bound to learn by its experience only.
- The agent interacts with the environmental & explores it by itself.
- The primary goal of an agent in reinforcement learning is to improve the performance by getting the maximum positive rewards.
- How a 'Robotic dog' learns the movement of his arms is an example of Reinforcement learning.

Q.4 Discuss the evaluation of NLP with its advantages.

→ 1. Morphology :-

It is the analysis of individual words that consists of morphemes the smallest grammatical unit.

2. Syntax :-

Syntax is concerned with the rules. It includes legal formulation of the sentences to check the structures. For example, 'Hari' is good not to? The sentence structure is totally invalid here.

3. Semantic :-

During this phase, meaning check is carried out & the way in which the meaning is conveyed is analyzed.

4. Discourse Integration :-

In communication, or even in text formats, often the meaning of the current sentence is dependent on the one that is prior to it. Discourse Analysis deals with the identification of discourse structure.

5. Pragmatic :-

In this place the analysis of the response from the user with the reference to what actually the language meant to convey is handled.

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6. Prosody :- It is an analysis phase that handles rhythm. This is the most difficult analysis that plays an important role in the poetry or shlokus that follow a rhythm.

7. Phonology :-

This involves analysis of the different kinds of sounds that are combined. It is concerned with speech recognition. It is very much possible to have an analysis actually forming a fuzzy structure.

Advantages of NLP :-

1. Spelling & grammar checking.
2. Optical character recognition (OCR)
3. Screen readers for blind & partially sighted users
4. Document classification (filtering, routing)
5. Text Segmentation
6. Information retrieval
7. Document clustering
8. Question Answering
9. Machine translation
10. E-mail understanding.

Q.5

Represent the following statements in First order logic.

a. If a perfect square is divisible by a prime p, then it is also divisible by a square of p.

$$\rightarrow \forall x, y \text{ perfect_sq}(x) \wedge \text{prime}(y) \wedge \text{divides}(x, y)$$

b. Every perfect square is divisible by some prime.

$$\rightarrow \forall x \exists y \text{ perfect_sq}(x) \wedge \text{prime}(y) \wedge \text{divides}(x, y)$$

c. No person buys an expensive policy.

$$\rightarrow \forall x, y, z \text{ person}(x) \wedge \text{policy}(y) \wedge \text{Expensive}(y) = \neg \text{Buys}(x, y)$$

d. There is a barber who shaves all men in town who do not shave themselves.

$$\rightarrow \exists x \text{ Barber}(x) \wedge \forall y \text{ Man}(y) \wedge \neg \text{shaves}(y, y) \Rightarrow \text{shaves}(x, y)$$

e. Politicians can fool some of the people all of the time & they can fool all of the people some of the time, but they can't fool all of the people all of the time.

$$\rightarrow \forall x \text{ Politician}(x) \rightarrow (\exists y \forall t \text{ Person}(y) \wedge \text{Fools}(x, y, t)) \\ \wedge (\exists t \forall y \text{ Person}(y) \rightarrow \text{Fools}(x, y, t)) \wedge (\forall t \forall y \text{ Person}(y) \\ \text{Fools}(x, y, t))$$

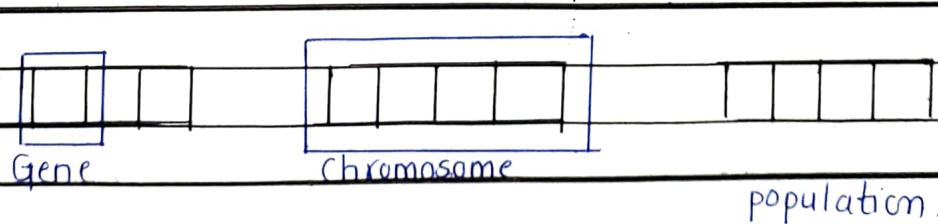
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Q.6 Write short Notes on the following :-

a) Genetic Algorithm :-

- Genetic Algorithms (GAs) are adaptive heuristic search algorithms that belong to the larger part of evolutionary algorithms.
- Genetic algorithms are based on the ideas of natural selection & genetics. These are intelligent exploitation of random search provided with historical data, to direct the search into the region of better performance in solution space.
- They are commonly used to generate high-quality solutions for optimization problems & search problems.
- Genetic Algorithms simulate the process of natural selection, which means those species who can adapt the changes in their environment are able to survive & reproduce & go to next generation.
- Each generation consists of a population of individuals & each individual represents a point in search space & possible solution.



b) Hill Climbing Algorithm :-

Definition :-

This algorithm is also called discrete optimization algorithm, uses a simple heuristic function viz. the amount of distance the node is from the goal. The ordering of choices is a heuristic measure of the remaining distance one has to traverse to reach the goal node.

Algorithm :-

Step 1 :- Put the initial node on a list START.

Step 2 :- If (START is empty) or (START = GOAL)
then terminate search.

Step 3 :- Remove the first node from START. Call
this as node a.

Step 4 : If (a = GOAL), then terminate search with
success.

Step 5 :- Else if node a has successors, generate
all of them. Find out how far they are
from the goal node. Sort them by the
remaining distance from the goal &
add them at the beginning of START.

Step 6 : Goto step 2

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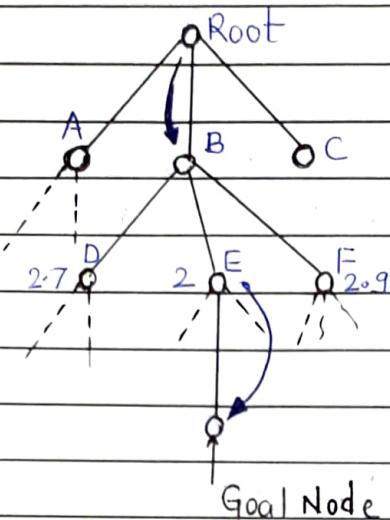


Fig :- Search tree for hill-Climbing procedure

3) Hierarchical Planning :-

- Hierarchical planning is also called as plan decomposition. Generally plans are organized in Hierarchical format.
Pop one level planner :-

If you are planning to take a trip, then first you have to decide the location. To decide the location we can search for various good locations from internet based on, whether conditions, travelling expenses etc. This is level one planning.

Hierarchy of Actions :-

In terms of major & minor or actions, hierarchy of actions can be decided. Minor activities would cover more precise activities to accomplish the major activities.

Major steps are given more importance. Once major

steps are decided we attempt to solve the minor detailed actions.

Planner :-

- 1) First identify a hierarchy of major conditions.
- 2) construct a plan in levels.
- 3) Patch major levels details
- 4) Finally demonstrate.

d) Robotics & its Applications :-

- Robotics is 'an interdisciplinary branch of computer science' & engineering. Robotics involves design, construction, operation & use of Robots. The goal of robotics is to design machines than can help & assist humans.

1. Security :-

Robotics companies are working on pairing robot guards with human security consultants.

2. Military Robots :-

Military robots are autonomous robots or remote controlled mobile robots designed for military applications from transport to search & rescue, & attack.

3. Space Exploration :-

Robots are great choice in space explorations because there are no chances for the

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loss of human life. So space institutions like NASA frequently use robots & autonomous vehicles to do things that humans cannot.

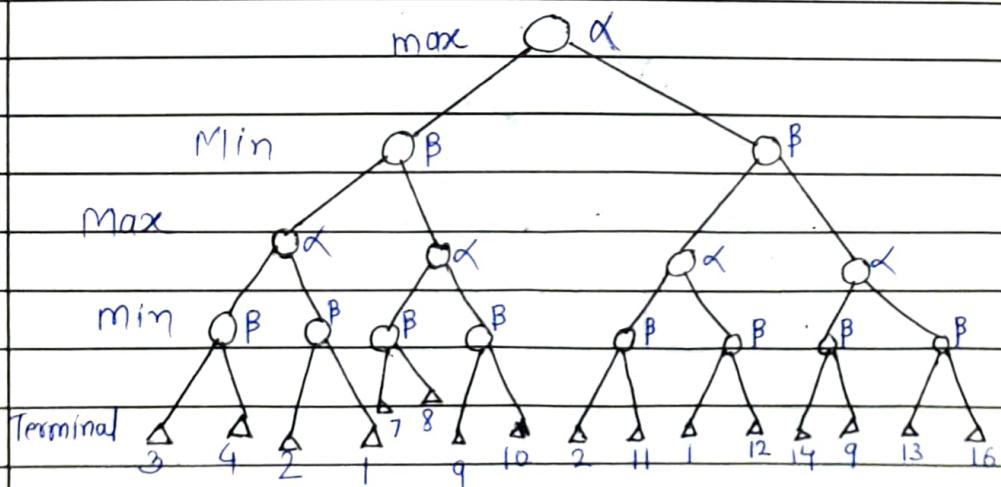
4. Agriculture :-

An example of robot that is used to remove weeds in farms is the Ecorobotix. It is powered by solar energy & can be used to target & spray weeds using a complex camera system.

5. Manufacturing :-

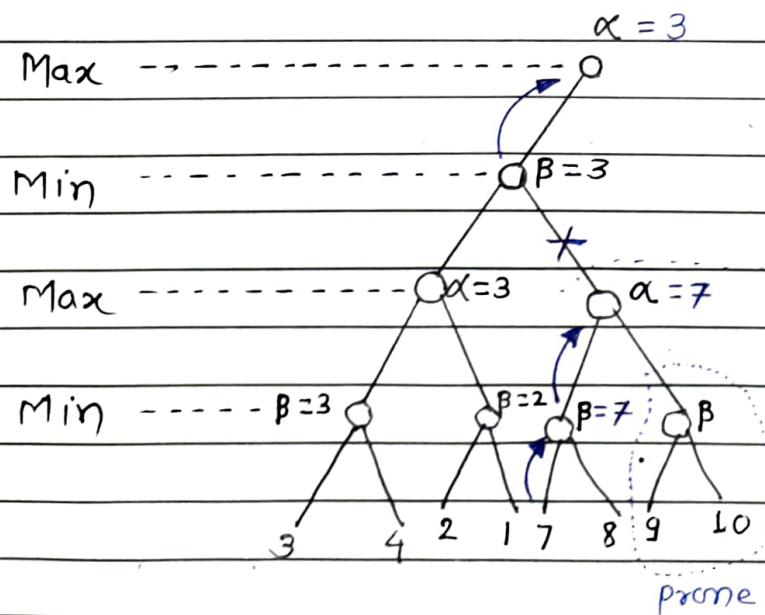
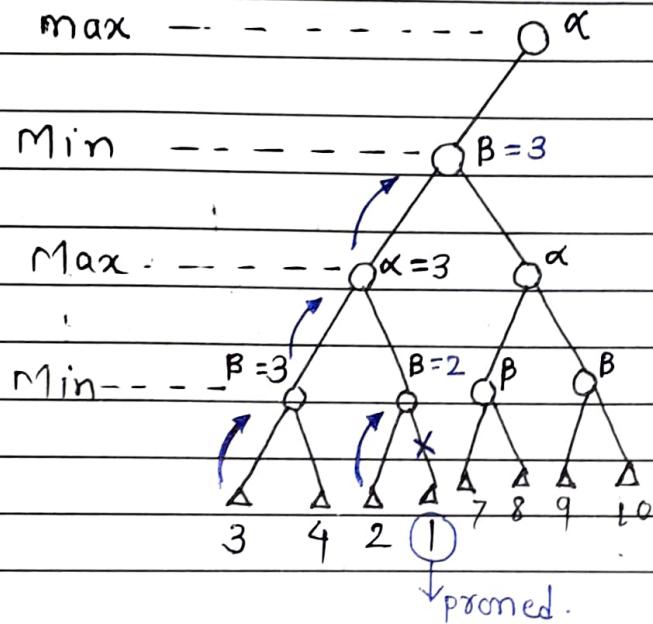
In this sector it is best choice to use Robots for manufacturing various dangerous & may be harmful to humans.

Q.1 Apply Alpha-Beta pruning on the following example.



→ Steps :-

α - max
 β - min



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