

Write a short note on:

a) Exhaustive and British Museum Search

Ans: **Exhaustive search** is simply a brute-force approach to combinatorial problems. It suggests generating each and every element of the problem domain, selecting those of them that satisfy all the constraints, and then finding a desired element (e.g., the one that optimizes some objective function). Note that although the idea of exhaustive search is quite straightforward, its implementation typically requires an algorithm for generating certain combinatorial objects. We delay a discussion of such algorithms until the next chapter and assume here that they exist.

British Museum Search: Generate and Test Search or British Museum Search is a heuristic search technique based on Depth First Search with Backtracking which guarantees to find a solution if done systematically and there exists a solution. In this technique, all the solutions are generated and tested for the best solution. It ensures that the best solution is checked against all possible generated solutions.

b) **Biological Neuron:**

Neurons are the building blocks of the nervous system. They receive and transmit signals to different parts of the body. This is carried out in both physical and electrical forms. There are several different types of neurons that facilitate the transmission of information.

The sensory neurons carry information from the sensory receptor cells present throughout the body to the brain. Whereas, the motor neurons transmit information from the brain to the muscles. The interneurons transmit information between different neurons in the body.

8. Discuss the following:

a) Hill Climbing Method:

Hill climbing is an optimization technique that is used to find a "local optimum" solution to a computational problem. It starts off with a solution that is very poor compared to the optimal solution and then iteratively improves from there. It does this by generating "neighbour" solutions which are relatively a step better than the current solution, picks the best and then repeats the process until it arrives at the most optimal solution because it can no longer find any improvements.

Variants:

- Simple — The first closest node or solution to be found is chosen.
- Steepest ascent — All available successor solutions are considered and then the closest one is selected.
- Stochastic — A neighbor solution is selected at random, and it is then decided whether or not to move on to that solution based on the amount of improvement over the current node.

Hill climbing is done iteratively — it goes through an entire procedure and the final solution is stored. If a different iteration finds a better final solution, the stored solution or state is replaced. This is also called shotgun hill climbing, as it simply tries out different paths until it hits the best one, just like how a shotgun is inaccurate but may still hit its target because of the wide spread of projectiles. This works very well in many cases because at it turns out, it is better to spend CPU resources exploring different paths than carefully optimizing from an initial condition.

7. Write a short note on the Introduction of Neural Networks

Neural networks, also known as artificial neural networks (ANNs) or simulated neural networks (SNNs), are a subset of machine learning and are at the heart of deep learning algorithms. Their name and structure are inspired by the human brain, mimicking the way that biological neurons signal to one another.

Artificial neural networks (ANNs) are comprised of a node layers, containing an input layer, one or more hidden layers, and an output layer. Each node, or artificial neuron, connects to another and has an associated weight and threshold. If the output of any individual node is above the specified threshold value, that node is activated, sending data to the next layer of the network. Otherwise, no data is passed along to the next layer of the network.

9. Explain the architectures of Neural Networks

Neural Networks are complex structures made of artificial neurons that can take in multiple inputs to produce a single output. This is the primary job of a Neural Network – to transform input into a meaningful output. Usually, a Neural Network consists of an input and output layer with one or multiple hidden layers within. It is also known as Artificial Neural Network or ANN. ANN architecture in Neural Network functions just like a human brain and is very important.

In a Neural Network, all the neurons influence each other, and hence, they are all connected. The network can acknowledge and observe every aspect of the dataset at hand and how the different parts of data may or may not relate to each other. This is

how Neural Networks are capable of finding extremely complex patterns in vast volumes of data.

10. Discuss informed and uninformed searches along with their different techniques

Definition of Informed search

The informed search technique utilizes the problem specific knowledge in order to give a clue to the solution of the problem. This type of search strategy actually prevents the algorithms from stumbling about the goal and the direction to the solution. Informed search can be advantageous in terms of the cost where the optimality is achieved at lower search costs.

Definition of Uninformed search

The uninformed search is different from informed search in the way that it just provides the problem definition but no further step to finding the solution to the problem. The primary objective of uninformed search is to differentiate between the target and non-target state, and it totally ignores the destination it is heading towards in the path until it discovers the goal and reports successor. This strategy is also known as a blind search.

Key Differences Between Informed and Uninformed Search

1. The former informed search technique uses knowledge in order to find the solution. On the other hand, the latter uninformed search technique does not use knowledge. In simpler terms there is no further information is provided about the solution.
2. The efficiency of the informed search is better than the uninformed search.
3. Uninformed search consumes more time and cost as it has no clue about the solution as compared to informed search.
4. Depth-first search, breadth-first search and lowest cost first search are the algorithms come under the category of the uninformed search. As against, informed search covers the algorithms such as heuristic depth-first, heuristic breadth-first search and A* search.