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Q1) Difference between uniform and informed searching method.

UNIFORM SEARCH

- 1) Utilizes additional knowledge about the problem domain.
- 2) Generally it's more efficient due to heuristic guidance.
- 3) It employs a heuristic function to estimate the cost to the goal.
- 4) Examples:- A^* search, Greedy Best-First Search, IDA*.
- 5) It can be optimal, depending on the heuristic used.
- 6) It is complete in finite search spaces if the heuristic is admissible.

INFORMED SEARCH

- 1) Operates solely on the problem structure without external knowledge.
- 2) It's less efficient as it explores the search space systematically without guidance.
- 3) No heuristic function; treats each node uniformly.
- 4) Examples:- Breadth-First Search, Depth-First Search, Uniform Cost Search.
- 5) It is typically optimal in finite, unweighted graphs.
- 6) It is complete in finite search spaces.

Q2) Define depth first search with proper example.

Depth First Search or DFS is a recursive algorithm to search all the vertices of a tree data structure or a graph. The depth-first search algorithm starts with the initial node of graph G and goes deeper until we find the goal node or the node with no children.

It is because of its recursive nature that the stack data structure can be used to implement the DFS algorithm.

ALGORITHM-

Step 1: SET STATUS = 1 (ready state) for each node in G .

Step 2: Push the starting node A on the stack and set its STATUS = 2 (waiting state)

Step 3: Repeat Steps 4 and 5 until the STACK is empty.

Step 4: Pop the top node N . Process it and set its STATUS = 3 (processed state).

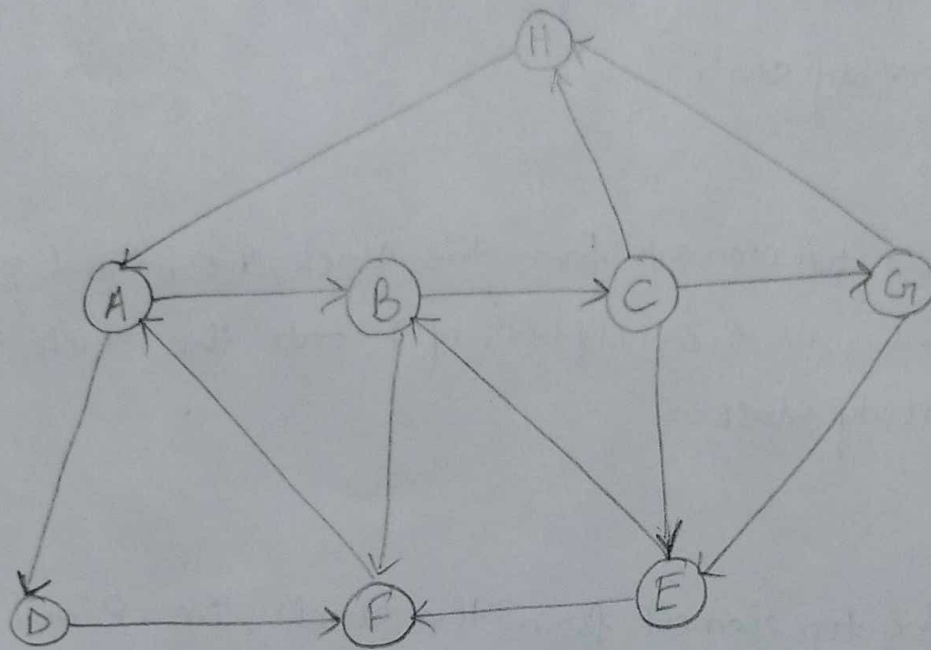
Step 5: Push on the stack all the neighbors of N that are in the ready state (whose STATUS = 1) and set their STATUS = 2 (waiting state)

[END OF LOOP]

Step 6: EXIT

Example of DFS algorithm -

Below there is a graph, a directed graph having 7 vertices -



Adjacency Lists -

A: B, D

B: C, F

C: E, G, H

G: E, H

E: B, F

F: A

D: F

H: A

Step 1: First, push H onto the stack. → STACK: H

Step 2: Pop the top element from the stack, i.e. H, and print it.
Now push all the neighbors of H onto the stack that they are in ready state.

Print: H] STACK: A

Step 3: Pop the top element from the stack, i.e. A, and print it. Now, push all the neighbors of A onto the stack that are in ready state.

Print: A

→ STACK: B, D

Step 4: Pop the top element from the stack, i.e. D and print it. Now push, all the neighbors of D onto the stack that are in ready state.

Print: D

STACK: B, F

Step 5: Pop the top element from the stack, i.e. F, and print it. Now push, all the neighbors of F onto the stack that are in ready state.

Print: F

STACK: B

Step 6: Pop the top element from the stack, i.e., B and print it. Now push all the neighbors of B onto the stack that are in ready state.

Print: B

STACK: C

Step 7: Pop the top element from the stack, i.e. C and print it. Now, push all the neighbors of C onto the stack that are in ready state.

Print: C

STACK: E, G

Step 8: Pop the top element from the stack, i.e. G and push all the neighbors of G onto the stack that are in ready state.

Print: G

STACK: E

Step 9: Pop the top element from the stack, i.e. E and push all the neighbors of E onto the stack that are in ready state.

Point: E

STACK:

Now, all the graph nodes have been traversed, and the stack is empty.

Q3) What is AI? Describe its advantages and characteristics.

Artificial Intelligence is a field of science concerned with building computers and machines that can reason, learn and act in a way that would normally require human intelligence or that involves data whose scale exceeds what humans can analyze.

It is a broad field that encompasses many different disciplines, including computer science, data analytics and statistics hardware and software engineering, and even philosophy and psychology. On an operational level for business use, AI is a set of technologies that are based primarily on machine learning and deep learning, used for data analytics, predictions and forecasting, object categorization, NLP, recommendations, intelligent data retrieval and more.

There are three main types of AI-

(i) Weak AI.

(ii) Strong AI.

(iii) Super AI.

Advantages of AI-

1. Reduction in Human Error: One of the most significant benefits of AI is that it can significantly reduce errors and increase accuracy and precision. The decisions taken

by AI, in every step are decided by information previously gathered and a certain set of algorithms. When programmed correctly, these errors can be reduced to null.

Example: Robotic surgery systems are an example of AI reducing human error.

2. Decision-Making: One of the noted pros of AI, it enhances decision-making by leveraging vast data to identify patterns and trends often invisible to humans. AI algorithms can analyze historical data and predict future outcomes, allowing businesses and individuals to make informed decisions quickly and accurately.

Example: In the healthcare industry, AI assists doctors in diagnosing diseases. For ex: AI algorithms can analyze medical images, such as X-rays or MRIs, to detect early signs of conditions like cancer.

Characteristics of AI -

1. Artificial Neural Networks: ANN is known as neural networks is based on the collection of connected nodes known as artificial neurons just like human brain cells. Each connection transmits a signal from one neuron to another neuron after processing it. With the help of some non-linear function, the output of each neuron generates a real number for a signal at a connection. The connections are also called edges. The further techniques that can be used in clustering are - P -quantization, low-rank factorization, compact convolutional filters and knowledge distillation.

2. Deep Learning: The modern world is stuffed with a lot of data and with the help of deep learning, the digital world is transforming into a beautiful place. It is a ML technique that automates computers to think just like humans. The architecture of this technique includes multiple hidden layers between the input and output layers as compared to ANN. In the deep learning framework, it performs automatic features after extraction along with classification learning. It has significantly improved the performance of many programs such as computer vision, image classification, speech recognition and others. Despite complex architecture or numerous hidden layers, the performance of the model can be improved with high-performance parallel computing CPUs.

For example: autonomous vehicles (self driving cars like Tesla on Autopilot mode), where deep learning helps in distinguishing between stop or green signal and make the decision to drive or not. Other examples are personalizing feeds on social media, image recognition, online text recognition and many more.