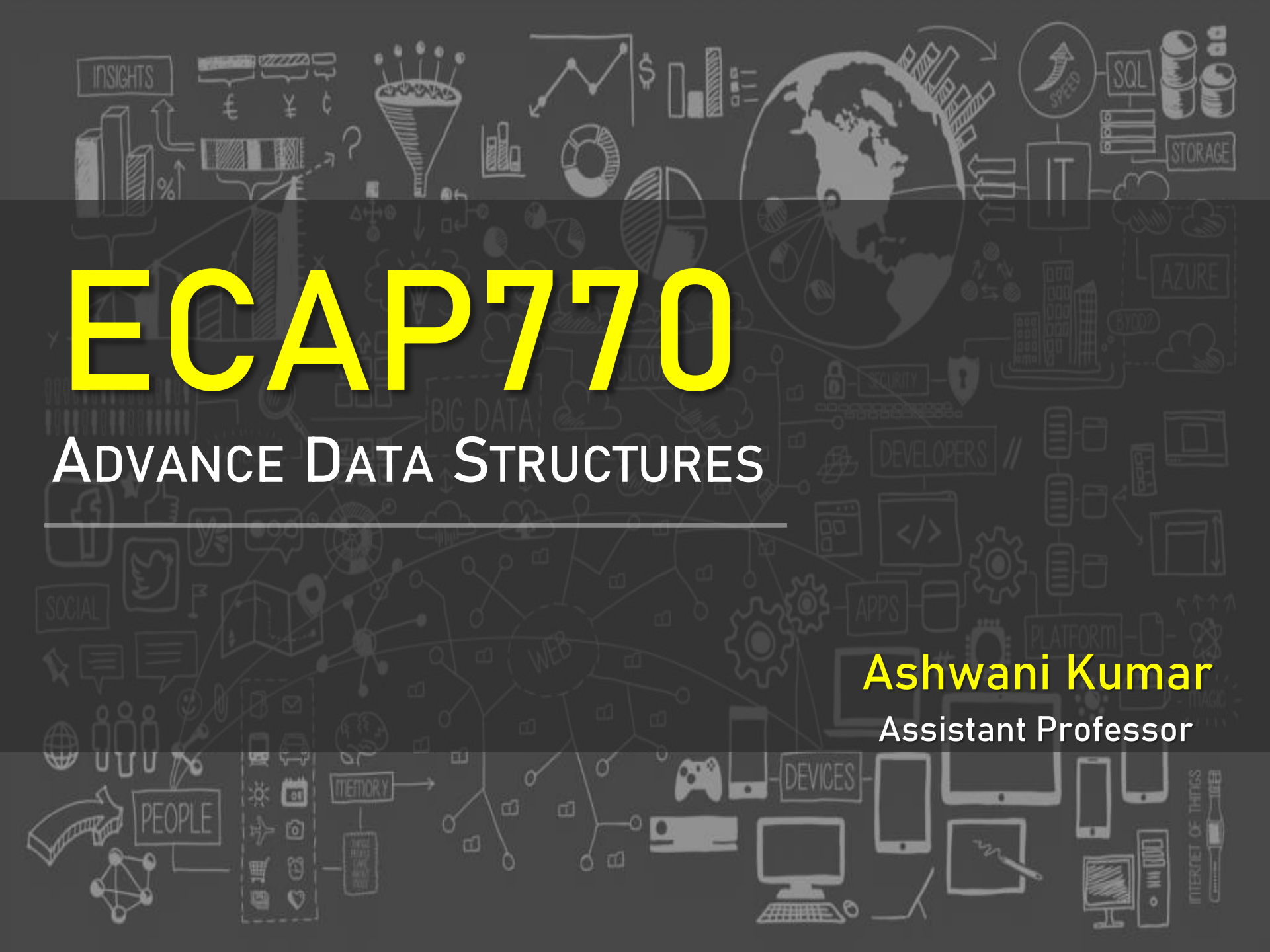

ECAP770

Advance Data Structures

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Learning Outcomes

After this lecture, you will be able to

- Understand breadth first search

Graph traversals

- In Graph traversal visiting every vertex and edge exactly once in a well-defined order.
- In graph algorithms, you must ensure that each vertex of the graph is visited exactly once.
- The order in which the vertices are visited may depend upon the algorithm or type of problem going to solve.

Graph Traversal Algorithm

- Breadth First Search (BFS)
- Depth First Search (DFS)

Breadth First Search

- Breadth first search is a graph traversal algorithm that starts traversing the graph from root node and explores all the neighbouring nodes. Then, it selects the nearest node and explore all the unexplored nodes.
- The algorithm follows the same process for each of the nearest node until it finds the goal.

Breadth First Search

- For using BFS algorithm user should know about data structure queue and its relevant operations like en-queue and de-queue

Algorithm: Breadth First Search

Step 1: SET STATUS = 1 (ready state)

for each node in G

Step 2: Enqueue the starting node A

and set its STATUS = 2

(waiting state)

Step 3: Repeat Steps 4 and 5 until

QUEUE is empty

Algorithm: Breadth First Search

Step 4: Dequeue a node N. Process it

and set its STATUS = 3

(processed state).

Step 5: Enqueue all the neighbours of

N that are in the ready state

(whose STATUS = 1) and set

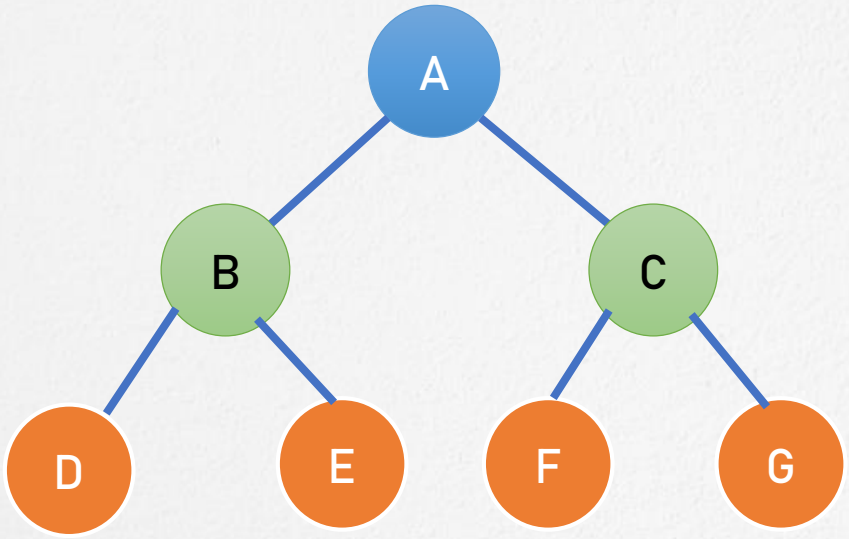
their STATUS = 2

(waiting state)

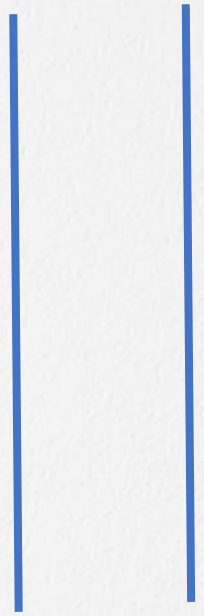
[END OF LOOP]

Step 6: EXIT

Example: Breadth First Search

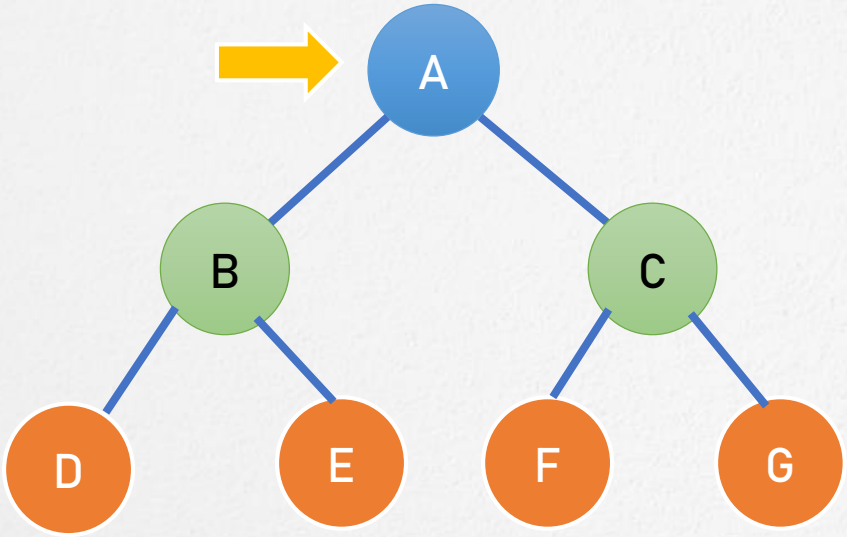


Queue



Output / visited :

Example: Breadth First Search



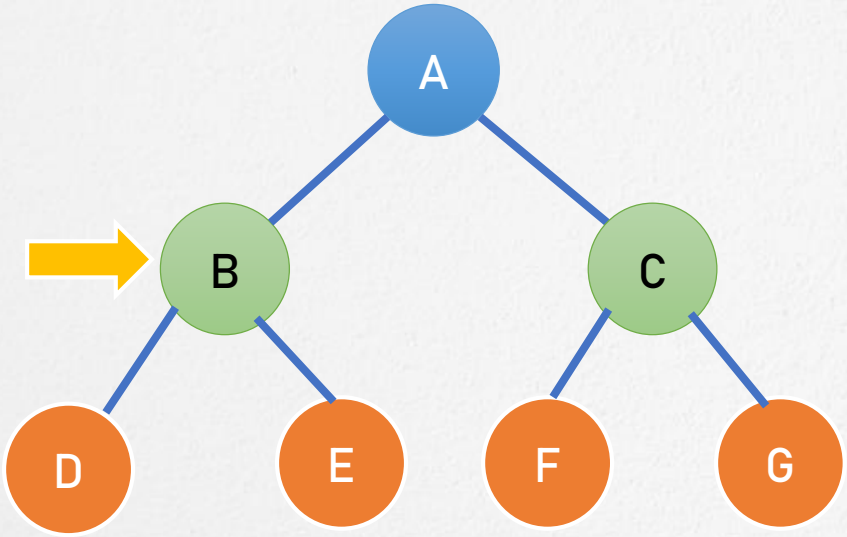
Queue

B
C

Output / visited : A B C

Fig. (A)

Example: Breadth First Search



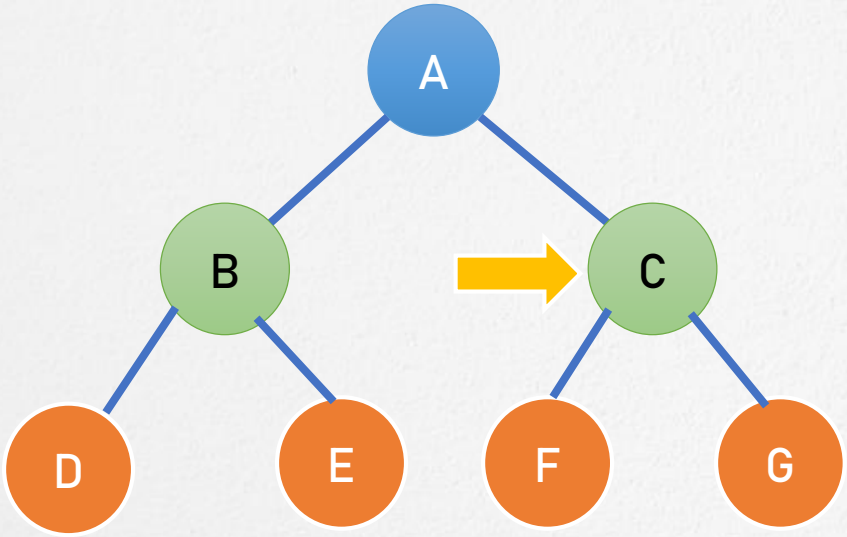
Queue

C
D
E

Output / visited : A B C D E

Fig. (B)

Example: Breadth First Search



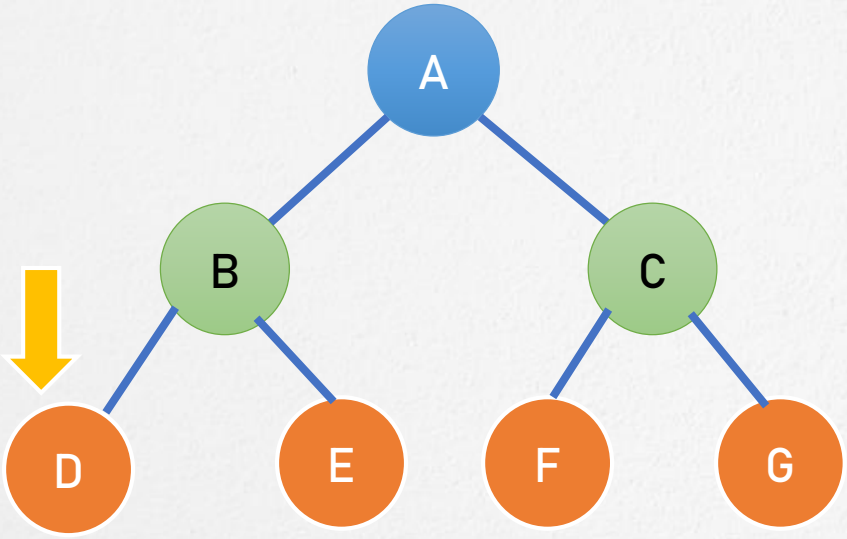
Queue

D
E
F
G

Output / visited : A B C D E F G

Fig. (C)

Example: Breadth First Search



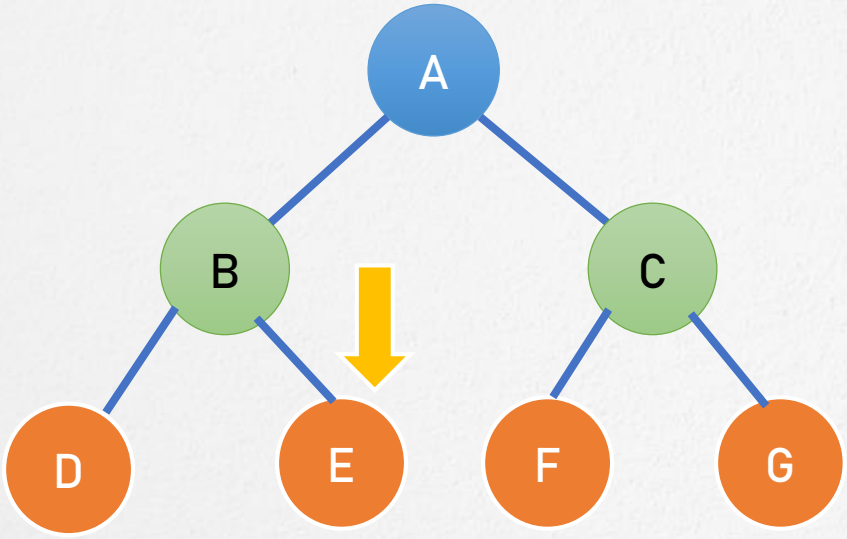
Queue

E
F
G

Output / visited : A B C D E F G

Fig. (D)

Example: Breadth First Search



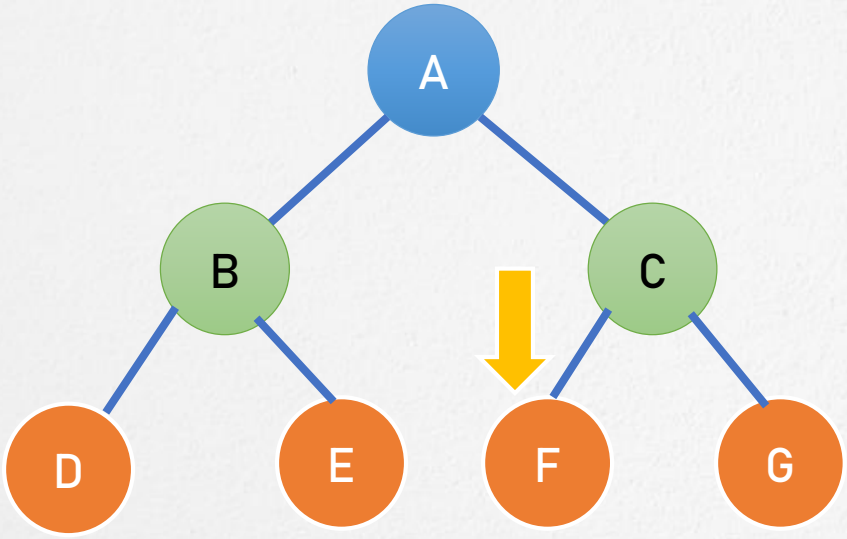
Queue

F
G

Output / visited : A B C D E F G

Fig. (E)

Example: Breadth First Search



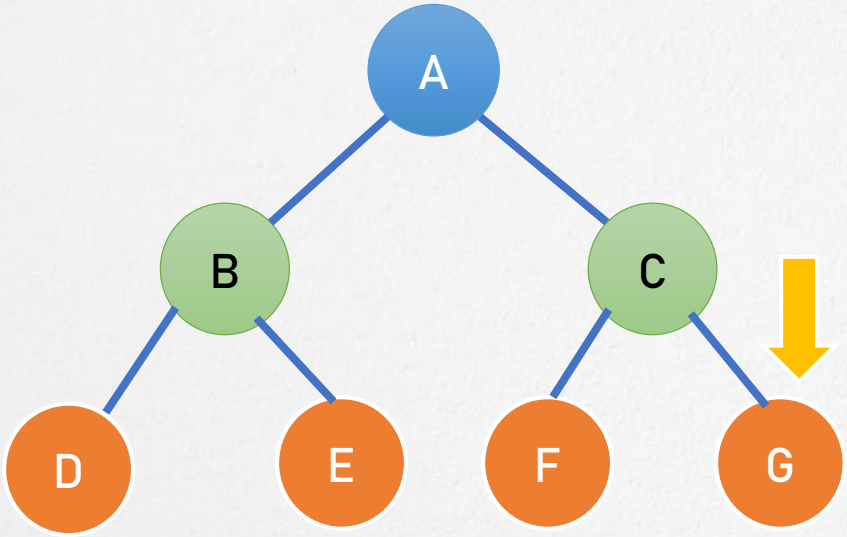
Queue

G

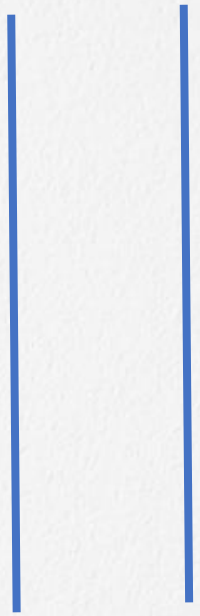
Output / visited : A B C D E F G

Fig. (F)

Example: Breadth First Search



Empty Queue



Output / visited : A B C D E F G

Fig. (G)

Algorithm Complexity

- The time complexity of the BFS algorithm is represented in the form of O(V + E), where V is the number of nodes and E is the number of edges.
- The space complexity of the algorithm is O(V).

BFS Applications

- Path finding algorithms
- To build index by search index
- Cycle detection in an undirected graph
- For GPS navigation
- In minimum spanning tree
- Social networking websites

That's all for now...