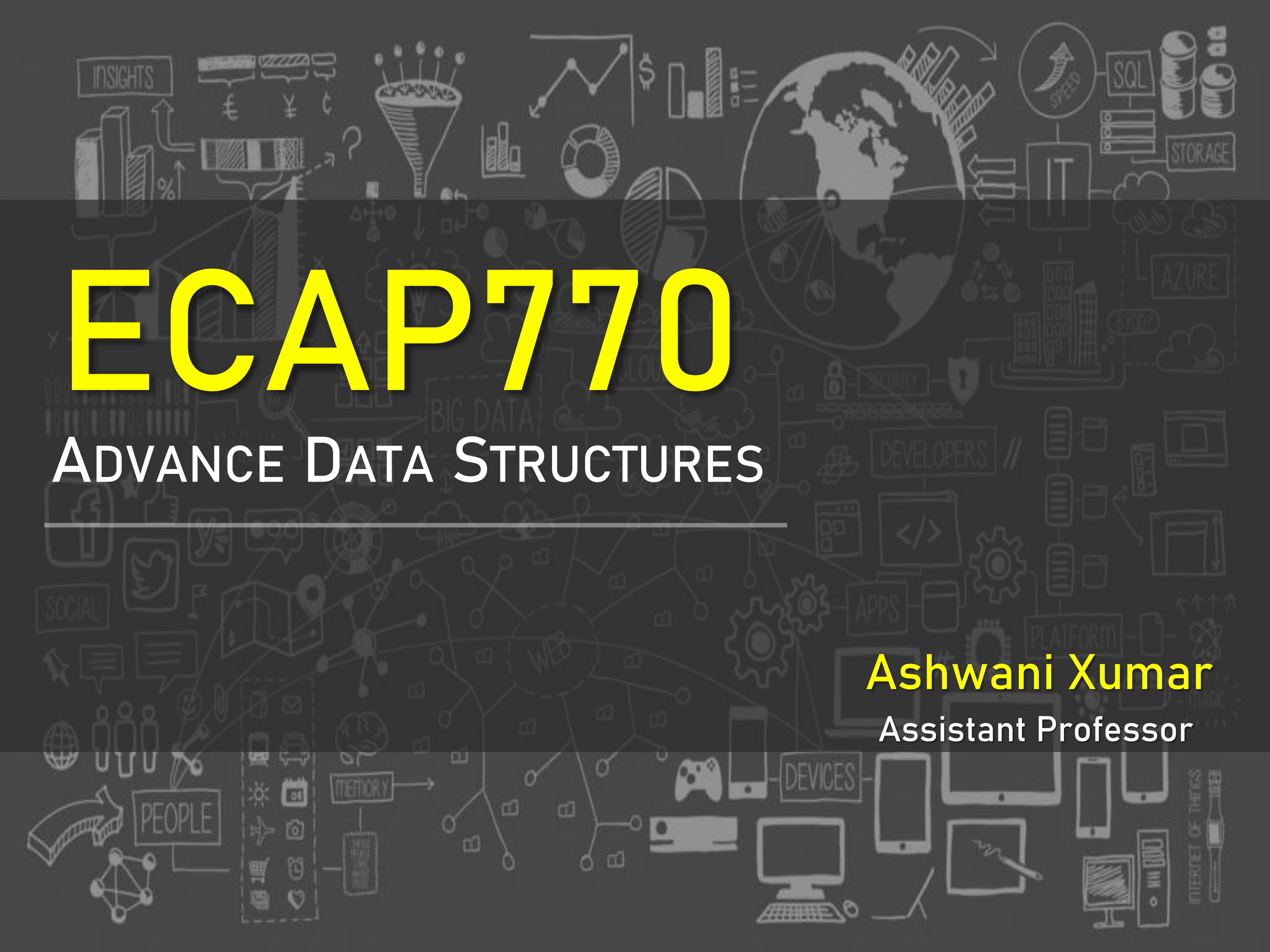

ECAP770

Advance Data Structures

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Learning Outcomes

After this lecture, you will be able to

- understand adjacency matrix

Graphs

- Graph is collection of vertices(nodes) (V) and edges(path) (E). It is non-linear data structure.

  G (V,E)

- It is a pictorial representation of a set of objects where objects are connected by links.

Graph Representation

- Graphs are commonly represent using following ways:
- Adjacency Matrix
- Adjacency List

Adjacency Matrix

- Two vertices is called adjacent or neighbour if it support at least one common edge.
- A finite graph can be represented in the form of a square matrix.
- Boolean value (0,1) of the matrix indicates if there is a direct path between two vertices.

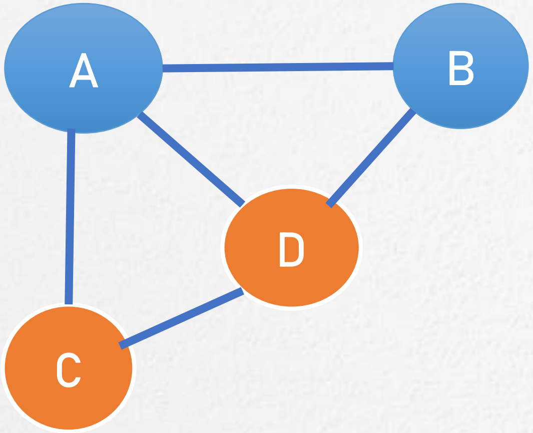
Adjacency Matrix

- It is also called 2D matrix that is used to map the association between the graph nodes.
- If a graph has n number of vertices, then the adjacency matrix of that graph is n x n, and each entry of the matrix represents the number of edges from one vertex to another.

Adjacency Matrix Representation

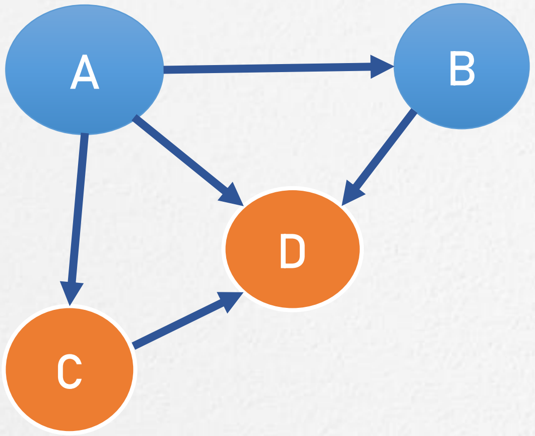
- If an Undirected Graph G consists of n vertices then the adjacency matrix of a graph is n x n matrix $A = [a_{ij}]$
- $a_{ij} = 1$ (if there is a path exists from V_i to V_j)
- $a_{ij} = 0$ (if there is no path exists from V_i to V_j)

Undirected Graph Representation



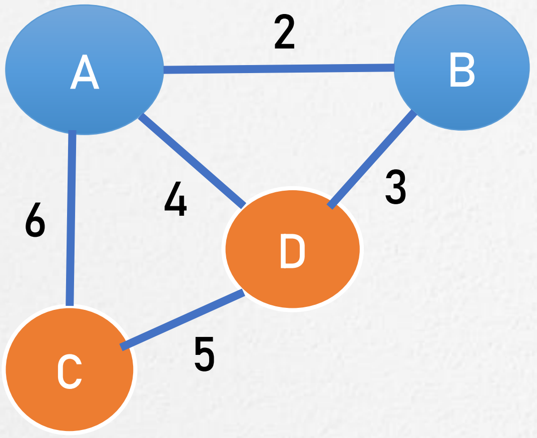
$$\begin{array}{c|cccc} & A & B & C & D \\ \hline A & 0 & 1 & 1 & 1 \\ B & 1 & 0 & 0 & 1 \\ C & 1 & 0 & 0 & 1 \\ D & 1 & 1 & 1 & 0 \end{array}$$

Directed Graph Representation



$$\begin{array}{c|cccc|} & A & B & C & D \\ A & 0 & 1 & 1 & 1 \\ B & 0 & 0 & 0 & 1 \\ C & 0 & 0 & 0 & 1 \\ D & 0 & 0 & 0 & 0 \end{array}$$

Undirected Weighted Graph



$$\begin{array}{cc} & \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{array}{c} A \\ B \\ C \\ D \end{array} & \begin{bmatrix} 0 & 2 & 6 & 4 \\ 2 & 0 & 0 & 3 \\ 6 & 0 & 0 & 5 \\ 4 & 3 & 5 & 0 \end{bmatrix} \end{array}$$

Applications: Adjacency Matrix

- Navigation tasks
- It is used to represent finite graphs
- Creating routing table in networks

That’s all for now…