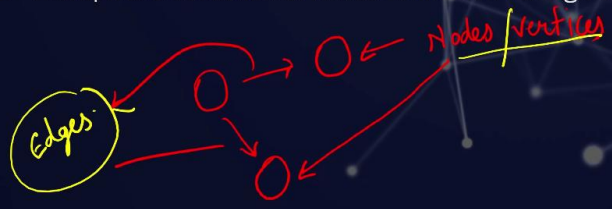
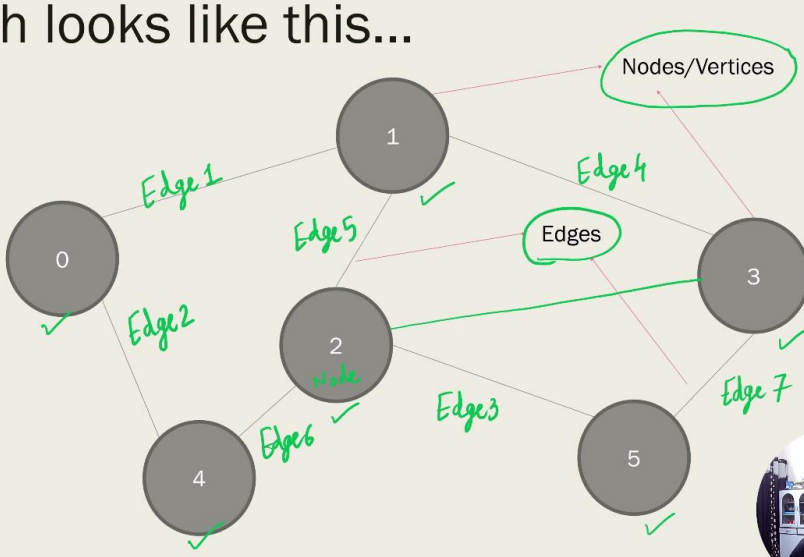
What is a Graph?

- Array/Linked lists & stacks → Linear Data Structures
- BST & AVL Trees → Non Linear Hierarchical Data Structure
- Graph is an example of Non Linear Data Structure
- A Graph is a collection of nodes connected through edges



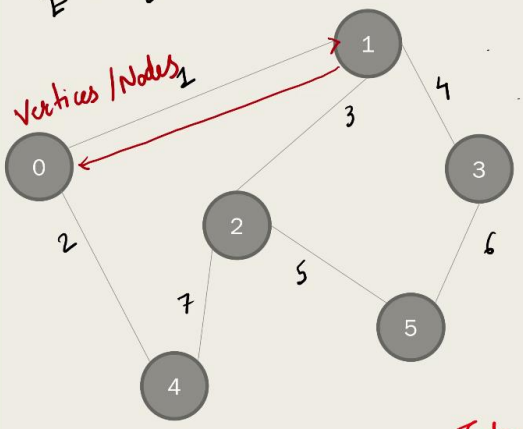
A Graph looks like this...



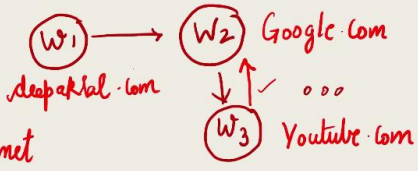
Formal Definition of a Graph

$V = \{0, 1, 2, 3, 4, 5\}$

$E = \{\{0,1\}, \{1,3\}, \{1,2\}, \{0,4\}, \{2,4\}, \{2,4\}, \{2,5\}, \{3,5\}, \{\}\}$



- A graph G= (V, E) is a collection of vertices and edges connecting these vertices
- Used to model Paths in a city, social networks, website backlinks, internal employee network, etc.
- A vertex or node is one fundamental unit/entity of which graphs are formed
- An edge is uniquely defined by its 2 endpoints
  - Directed Edge – One way connection
  - Undirected Edge – Two way connection
  - Directed Graph – All directed edges
  - Undirected Graph – All undirected edges



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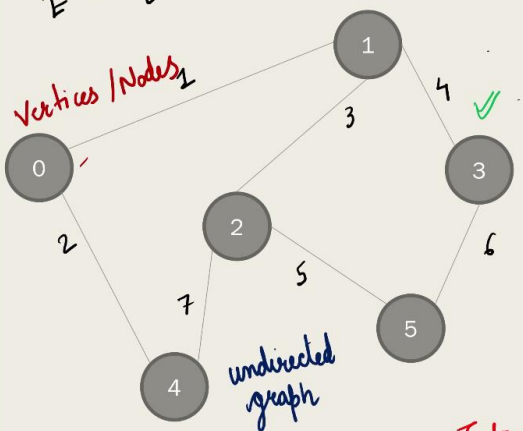

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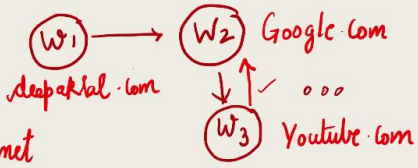
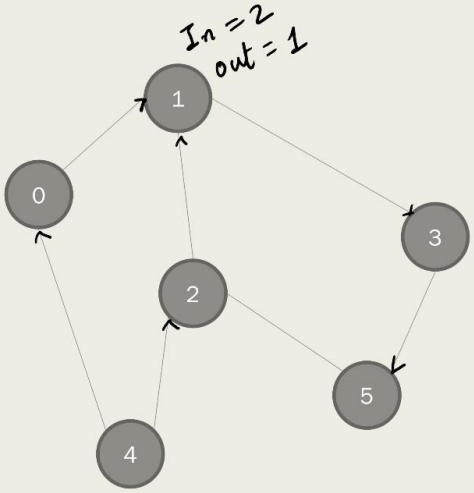


Indegree & Outdegree of a node



- Indegree = No of edges going out of the node
- Outdegree = No of edges coming into the node

Facebook – A Graph of Users

- Graphs are used to model relationships between nodes
- We can apply graph algorithms to suggest friends to people, calculate no of mutual friends etc.
- Other examples of graph include result of a web crawl for a website or for the entire world wide web, city routes etc.

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