جامـــــعة المـــــستـقبـل
AL MUSTAQBAL UNIVERSITY

كلية العلـوم

قســـم علوم الذكاء الاصطناعي

المحاضرة الثانية

المادة: Searching and Sorting Algorithms
المرحلة: الثانية
اسم الاستاذ: م.م اية محمد حسين محمد علي

Graph

1.1 Introduction to Graph

Graph is a nonlinear data structure, it contains a set of points known as nodes (or vertices) and set of links known as edges (or Arcs) which connects the vertices.

A graph is defined as follows:

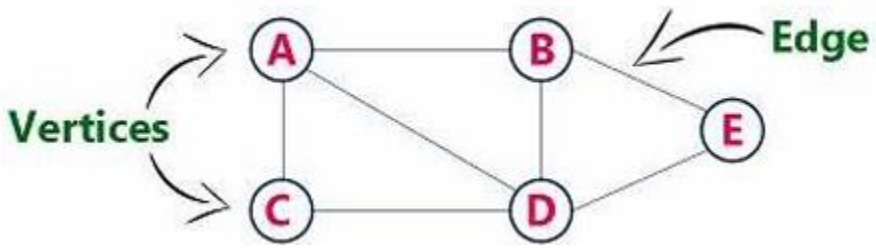
Graph: is a collection of vertices and arcs which connects vertices in the graph.
Graph: is a collection of nodes and edges which connects nodes in the graph.
Generally, a graph G is represented as G = (V , E), where V is set of vertices and E is set of edges.

Example :

The following is a graph with 5 vertices and 6 edges

This graph G can be defined as G = (V , E)

Where V = {A,B,C,D,E} and E = {(A,B),(A,C)(A,D),(B,D),(C,D),(B,E),(D, E)}.



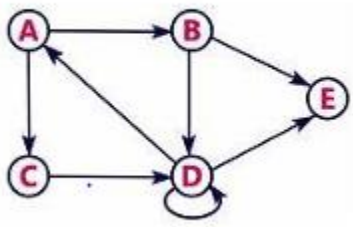
1.1.1 Graph Terminology

We use the following terms in graph data structure...

Vertex: A individual data element of a graph is called as Vertex. Vertex is also known as node. In above example graph, A, B, C, D & E are known as vertices.

Edge: An edge is a connecting link between two vertices. Edge is also known as Arc. An edge is represented as (startingVertex, endingVertex). For example, in above graph, the link between vertices A and B is represented as (A,B). In above example graph, there are 7 edges (i.e., (A,B), (A,C), (A,D), (B,D), (B,E), (C,D), (D,E)).

- Undirected Graph: A graph with only undirected edges is said to be undirected graph as in the above.
- Directed Graph: A graph with only directed edges is said to be directed graph as in the figure below:

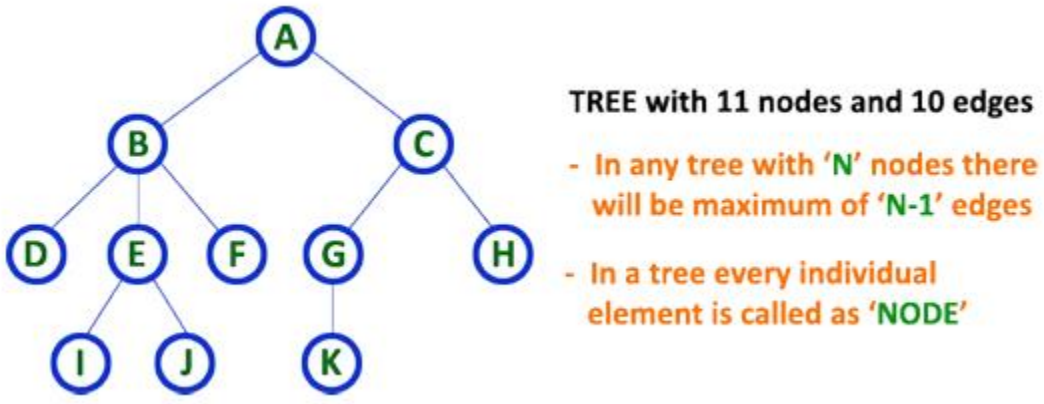


- Connected graph: A graph is called connected if every two of its vertices are connected.
- Disconnected graph: A graph that is called not connected if some of its vertices is disconnected.

1.2 Trees

A tree data structure can be defined as follows... A connected acyclic graph is called a tree. In other words, tree is a connected graph with no cycles . In a tree data structure, if we have N number of nodes then we can have a maximum of N-1 number of links.

Example:



Trees Used in Searching & Sorting

- Binary Tree
- Binary Search Tree (BST)
- AVL Tree
- Red-Black Tree
- Heap (for Heap Sort)
- B-Tree (databases)