Graph

1. Directed
2. Undirected Graph

What is spanning tree?

* All vertices of a graph G must be present in Subgraph S.
* No. of edges must be V-1

A graph can have different spanning trees.

A complete graph has nn-2 spanning trees where n is number of vertices.

Degree of vertex:

1. Indegree: Number of incoming edges to a node
2. Outdegree: Number of outgoing edges to a node
3. Connected Graph
4. Disconnected Graph

S

1. Cyclic Graph:
2. Acyclic Graph:

**Tree** is connected Acyclic Graph. Of n nodes , Number of Edges n-1.

Directed Acyclic Graph(DAG):

Complete Graph:

A graph in which each vertex is connected to every other vertex by a direct edge.

Number of edges in complete Graph = nC2 = (n\*(n-1))/2

Weighted Graph:

32

43

12

**DFS (preorder, inorder, postorder) using stack** (push node/element one-by-one)

**BFS (level order) using queue** (push all adjacent elements in graph)

## **Prim’s Algorihtm:**

Prim's algorithm assumes that all vertices are connected. But in a directed graph, every node is not reachable from every other node. So, **Prim's algorithm fails due to this reason**. Prim’s algorithm use greedy approach to find the minimum spanning tree.

* We have to start from a source vertex(which could be anyone vertex)

## **Kruskal’s Algorithm:**

But **Kruskal's algorithm fails to detect the cycles in a directed graph** as there are cases when there is no cycle between the vertices but Kruskal's Algorithm assumes it to cycle and don't take consider some edges due to which Kruskal's Algorithm fails for directed graph

* We have to start from the minimum edge size.

## **Digkstra’s Algorithm:**

You are given a start and end vertex, you will find the ~~MST~~ **Shortest Path** b/w them.

**You can use Dijkstra's algorithm in both directed and undirected graphs**, because you simply add nodes into the **PriorityQueue** when you have an edge to travel to from your adjacency list.

**Depth First Search (DFS) is a systematic way of visiting the nodes of either a directed or an undirected graph**. As with breadth first search, DFS has a lot of applications in many problems in Graph Theory.

https://medium.com/about-data-structures/graphs-introduction-dfs-bfs-prims-algorithm-kruskals-algorithm-and-their-implementations-67e11bfecb56