



Data Structures and Algorithms Design

BITS Pilani
Hyderabad Campus

Febin.A.Vahab

CONTACT SESSION 6 -PLAN



Contact Sessions(#)	List of Topic Title	Text/Ref Book/external resource
6	Graphs - Terms and Definitions, Properties, Representations (Edge List, Adjacency list, Adjacency Matrix), Graph Traversals (Depth First and Breadth First Search)	T1: 6.1, 6.2, 6.3

Depth-First Search



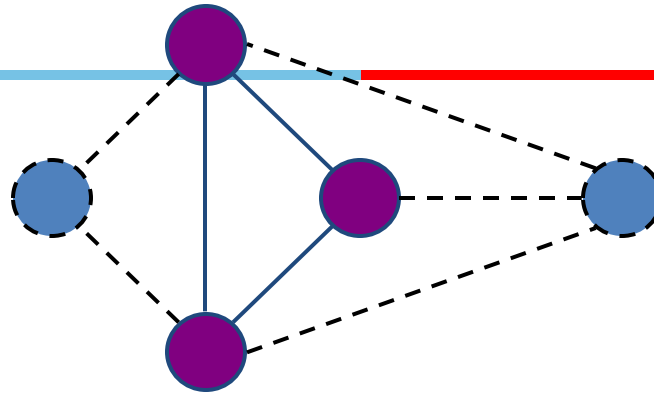
- Definitions
 - Subgraph
 - Connectivity
 - Spanning trees and forests
- Depth-first search
 - Algorithm
 - Example
 - Properties
 - Analysis
- Applications of DFS
 - Cycle finding
 - Path finding

SUBGRAPHS

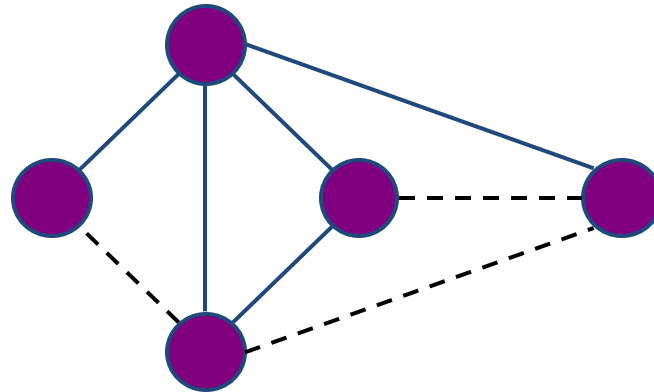


- Subgraphs
- A subgraph S of a graph G is a graph such that
 - The vertices of S are a subset of the vertices of G
 - The edges of S are a subset of the edges of G
- A spanning subgraph of G is a subgraph that contains all the vertices of G

SUBGRAPHS



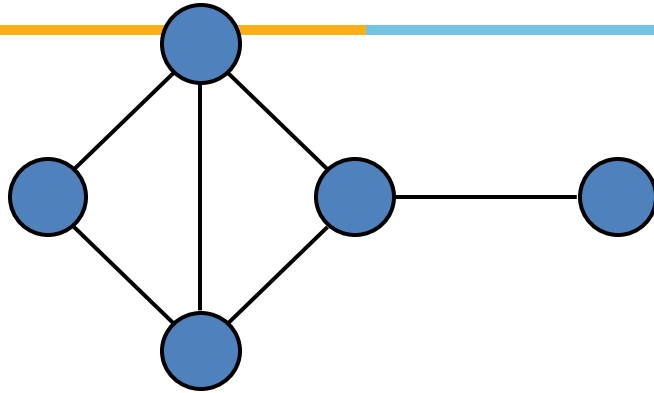
Subgraph



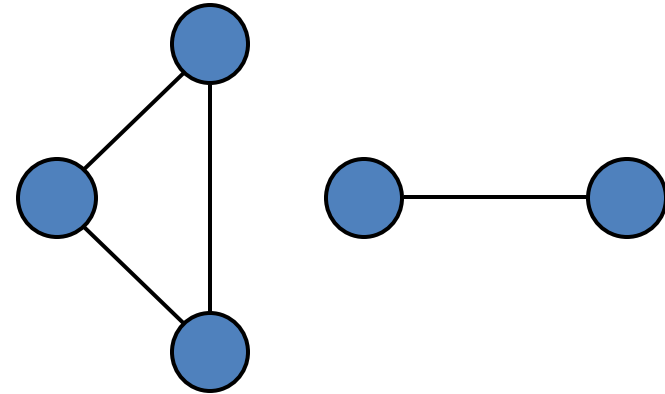
Spanning subgraph

- A graph is **connected** if there is a path between every pair of vertices
- A connected component of a graph G is a maximal connected subgraph of G
- A directed graph G is **strongly connected** if:
 - For any two vertices u and v :
 - There is a directed path $u \rightarrow v$, and
 - There is a directed path $v \rightarrow u$

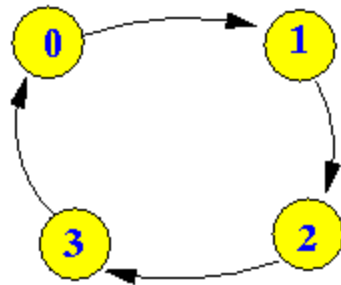
Connected graph



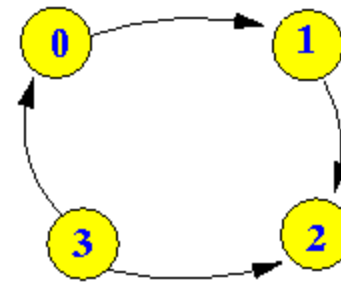
Connected graph



Non connected graph with two connected components



Strongly Connected

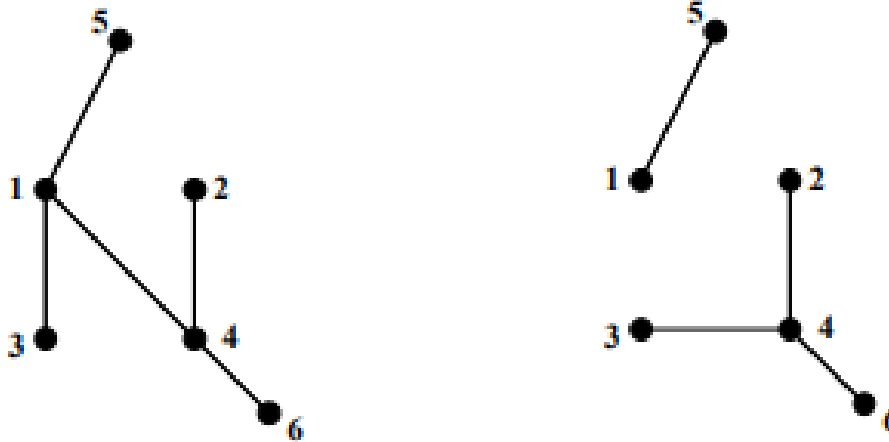


Not Strongly Connected

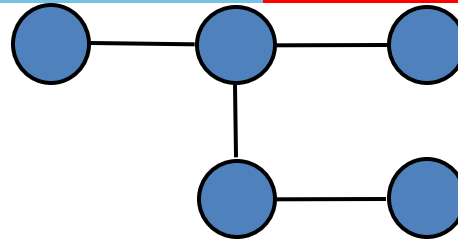
Trees and Forests



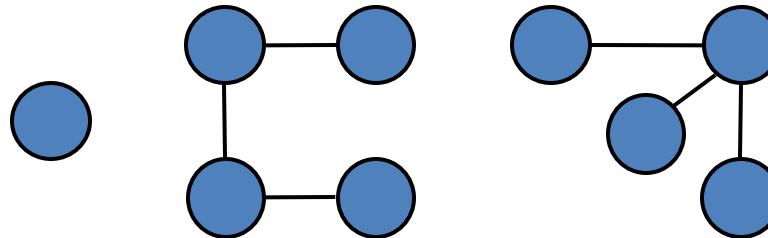
- A tree is a connected graph with no cycles.
- A forest is a graph with each connected component a tree



Trees and Forests



Tree



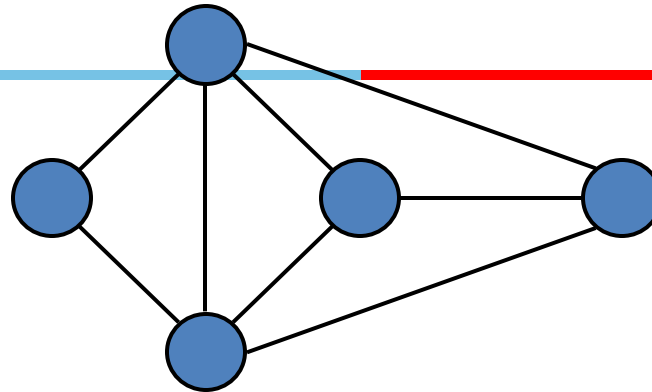
Forest

Spanning Trees

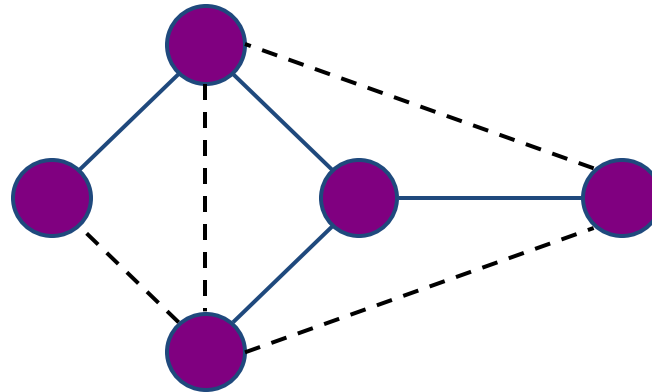


- A spanning tree of a connected graph is a spanning subgraph that is a tree:
- which includes all of the vertices of G , with minimum possible number of edges

Spanning Tree



Graph



Spanning tree

Subgraphs, trees-Example

- Perhaps the most talked about graph today is the Internet, which can be viewed as a graph whose vertices are computers and whose (undirected) edges are communication connections between pairs of computers on the Internet.
- The computers and the connections between them in a single domain, like <http://www.bits-pilani.ac.in/> , form a subgraph of the Internet. If this subgraph is connected, then two users on computers in this domain can send e-mail to one another without having their information packets ever leave their domain.
- Suppose the edges of this subgraph form a spanning tree. This implies that, even if a single connection goes down (for example, because someone pulls a communication cable out of the back of a computer in this domain), then this subgraph will no longer be connected.



THANK YOU!

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