Sri Sathya Sai College for Women Bhopal (M.P.)

Session: 2022-24

Graph Theory Presentation
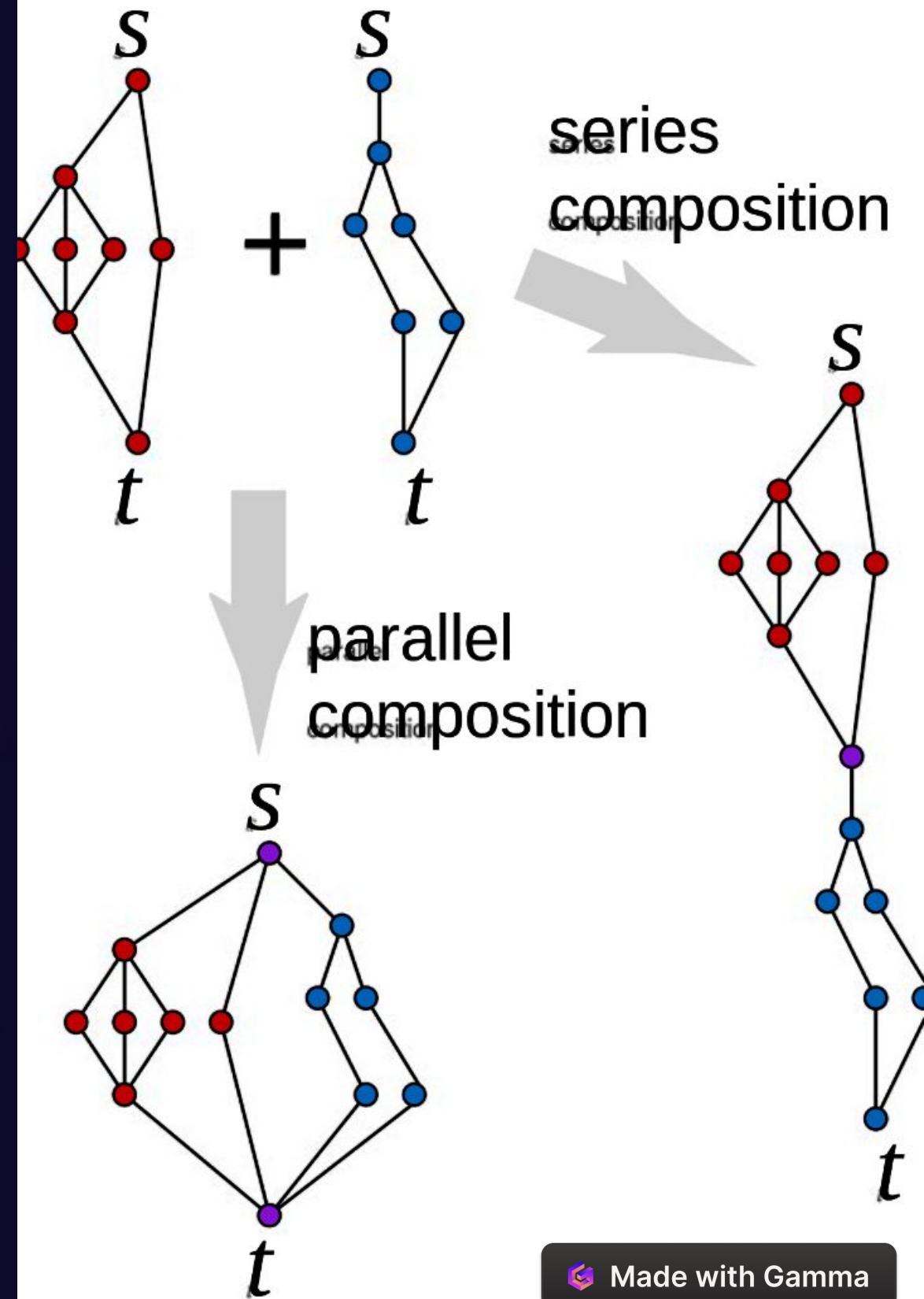
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[M.Sc. III Semester]

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Introduction to Graph Theory

Graph theory is a branch of mathematics that explores the relationships between nodes and edges. It has applications in various fields, including computer science, social networks, and transportation systems.

series composition

parallel composition

Basic Concepts in Graph Theory

1 Nodes and Edges

Graph theory involves the study of nodes (vertices) and edges (connections) that link them. Understanding these fundamental components is crucial to grasping graph theory concepts.

2 Connectednes s

Connectedness in graphs refers to the ability to reach any vertex in the graph from any other vertex through a series of edges. It's a key element in analyzing graph structures.
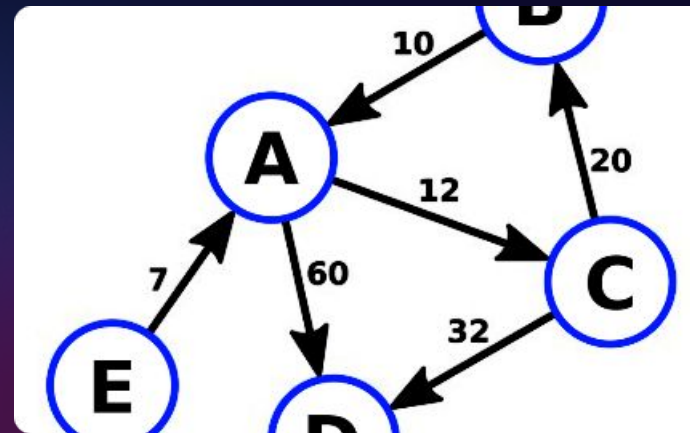
3 Paths and Cycles

Exploring paths (sequences of edges) and cycles (closed paths) provides insights into traversal and connectivity within graphs, forming the basis for various algorithms.
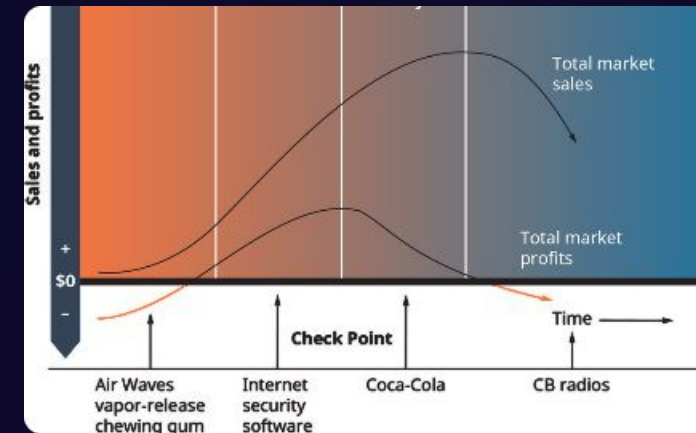
Types of
Graphs

Directed Graphs

Also known as digraphs, these graphs have directed edges—each edge has a specific direction, indicating a one-way relationship between nodes.

Weighted Graphs

These graphs have weights assigned to their edges, representing quantitative values such as distance, cost, or capacity, adding a layer of complexity to graph analysis.

Cyclic Graphs

A graph containing at least one cycle, a closed path where the starting and ending nodes are the same, providing insights into iterative processes and feedback loops.

Combination	Number of passengers	Club revenue (with no payment from student government)	
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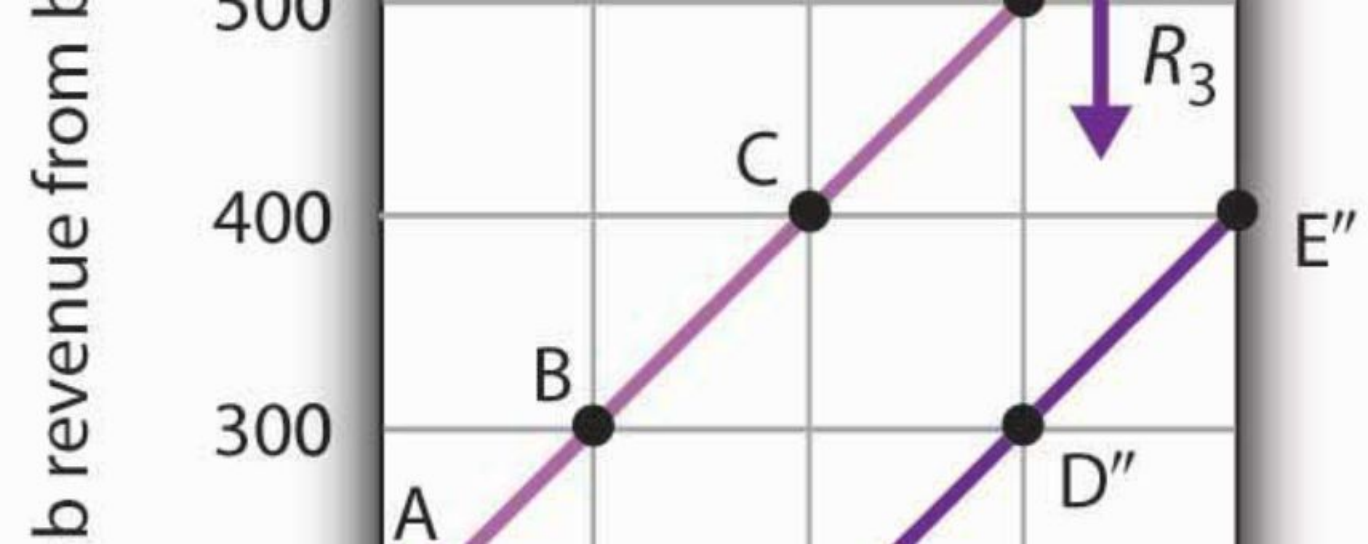
Graph

Adjacency Matrix
An adjacency matrix is a 2D array used to represent whether a particular edge is adjacent to a vertex in a graph, providing an efficient way to store graph data.

Adjacency List
Using arrays and linked lists, the adjacency list representation provides a flexible way to store graph data by recording the neighbor vertices of each vertex.

Object-Oriented Representation
Graphs can be represented using objects, with vertices as objects and the edges as references between these objects, offering a natural way to model graphs in software applications.

Applications of Graph Theory

Network Analysis

Graph theory plays a vital role in understanding network structures, behaviors, and optimizing network designs in telecommunications, social networks, and transportation systems.

Algorithm Design

Many efficient algorithms, such as Dijkstra's algorithm for finding the shortest path, are based on graph theory concepts, showcasing its significance in computer science and optimization problems.

Biological Modeling

Graph theory is used to model genetic, metabolic, and ecological networks, providing insights into biological systems' interconnectedness and complex relationships.

Thank You