**GRAPHS**

# Introduction

## Definition

- A graph is a set of **nodes (vertices)** connected by **edges**. Represents pairwise relationships between values. Components:

* Node/Vertex: Represents an individual entity.
* Edge: Represents the relationship between two nodes.

A diagram of a network

Description automatically generated

Slide : Graph

## Applications

- Social networks (e.g., Facebook for friendships).

- Recommendation engines (e.g., Amazon for product suggestions).

- Navigation systems (e.g., Google Maps for shortest paths).

- Others: Family trees, the World Wide Web, road networks, etc.

## Key Properties

- Graphs are a versatile data structure for modeling real-world connections.

- Linked lists and trees are specific types of graphs.

A diagram of a graph

Description automatically generated

Slide : Graph real world

# Type of graphs

## Directed & Undirected graph

|  |  |  |
| --- | --- | --- |
| Type | Description | Example |
| Directed Graph | Edges have direction (one-way). | Twitter (user follows). |
| Undirected Graph | Edges are bi-directional (two-way). | Facebook (friendship). |

A screenshot of a diagram

Description automatically generated

Slide : Directed & undirected

## Weighted vs. Unweighted Graphs

|  |  |  |
| --- | --- | --- |
| Type | Description | Example |
| Weighted Graph | Edges have weights (e.g., distance, cost). | Google Maps (shortest path). |
| Unweighted Graph | Edges do not carry additional information. | Basic networks. |

A graph chart with numbers and circles

Description automatically generated with medium confidence

Slide : Weighted & unweighted

|  |  |  |
| --- | --- | --- |
| Type | Description | Example |
| Cyclic Graph | Contains cycles (can return to the start). | Road networks. |
| Acyclic Graph | No cycles; cannot return to the start. | Trees. |

A screenshot of a graph

Description automatically generated