

# Basic Graph Theory

## 1 Graphs

A graph is a mathematical structure consisting of a set of vertices and a set of edges connecting pairs of vertices. Graphs may be directed or undirected, weighted or unweighted.

## 2 Key Concepts

- **Degree:** Number of edges incident to a vertex.
- **Path:** A sequence of vertices connected by edges.
- **Cycle:** A path that begins and ends at the same vertex.

## 3 Common Algorithms

Graph traversal algorithms include depth-first search and breadth-first search. Shortest path algorithms include Dijkstra's and Bellman-Ford algorithms.

## 4 Applications

Graphs are used to model networks, transportation systems, social connections, and dependencies.