Graph

This document contains summary of some of the items discussed as part of the COMS 3110 Lectures. This document **does not replace the lecture materials**. This document may contain some topics that are not covered as part of the lecture; you will not be tested on those parts, they are made available to you for gaining further knowledge on topics/concepts that are related to class-lecture.

A graph is defined as a tuple $G = (V, E)$, where V is the set of vertices and E is the set of edges that connect pairs of vertices. An edge can be directed or undirected.

The two most common representations of graphs are

1. **Adjacency List:** Each vertex maintains a list of its adjacent vertices.
   Space Complexity: $O(|V| + |E|)$
   Applications: Sparse graphs, efficient neighbor traversal.

2. **Adjacency Matrix:** A 2D array where the (i, j) entry is 1 if there is an edge from vertex i to vertex j, and 0 otherwise.
   Space Complexity: $O(|V|^2)$
   Applications: Quick edge lookup