

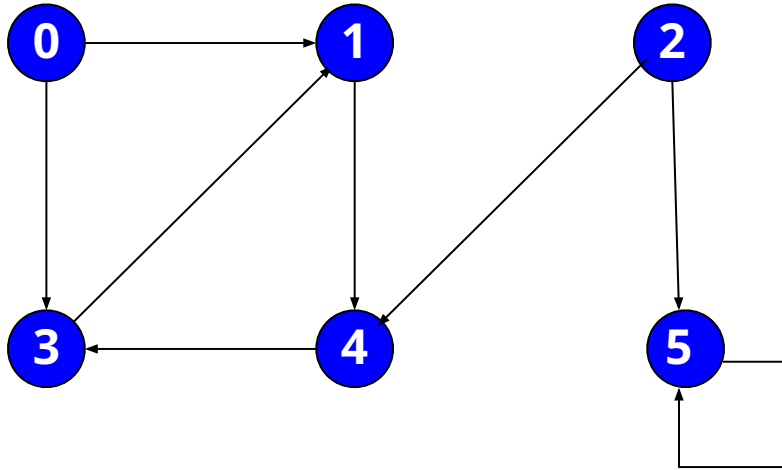
Data Structures

Adjacency List Graph Implementation

COMP128 Data Structures



Quick Review



How do you describe the following graph?

- Vertices?
- Edges?
- Is there a path from 0 to 2?
- Is there a path from 2 to 0?
- Are there any cycles?



Graph Implementation

We have the following two different approaches to implement a graph data structure:

- Adjacency List
- Adjacency Matrix

In each representation, we maintain a collection to store the vertices of a graph. However, the representations differ greatly in the way they organize the edges.



Using Adjacency List

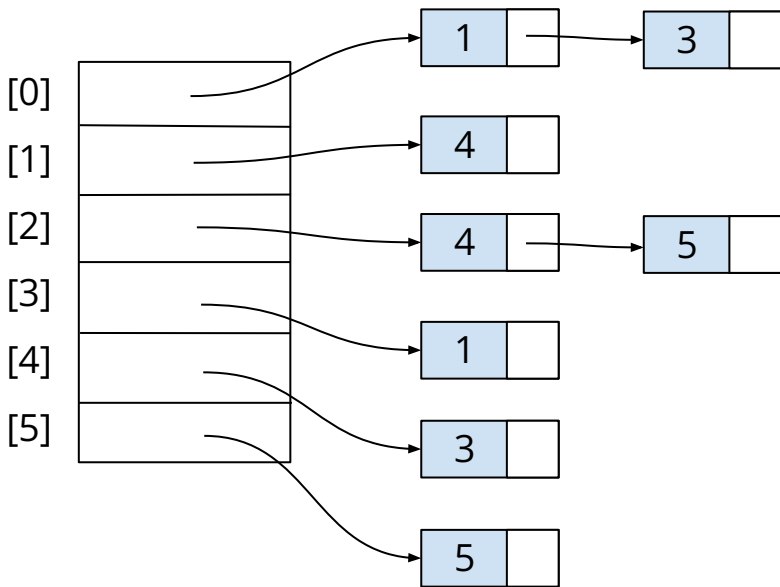
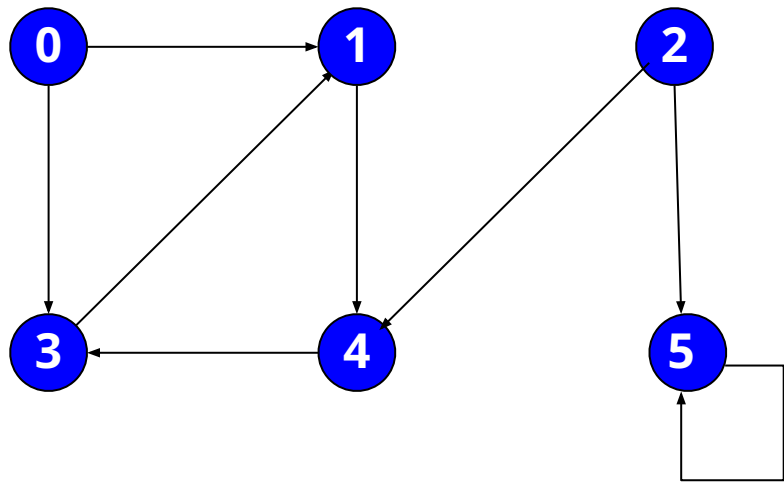
We maintain an unordered list of all edges, and for each vertex, a separate list containing those edges that are incident to the vertex.

This organization allows us to more efficiently find all edges incident to a given vertex.

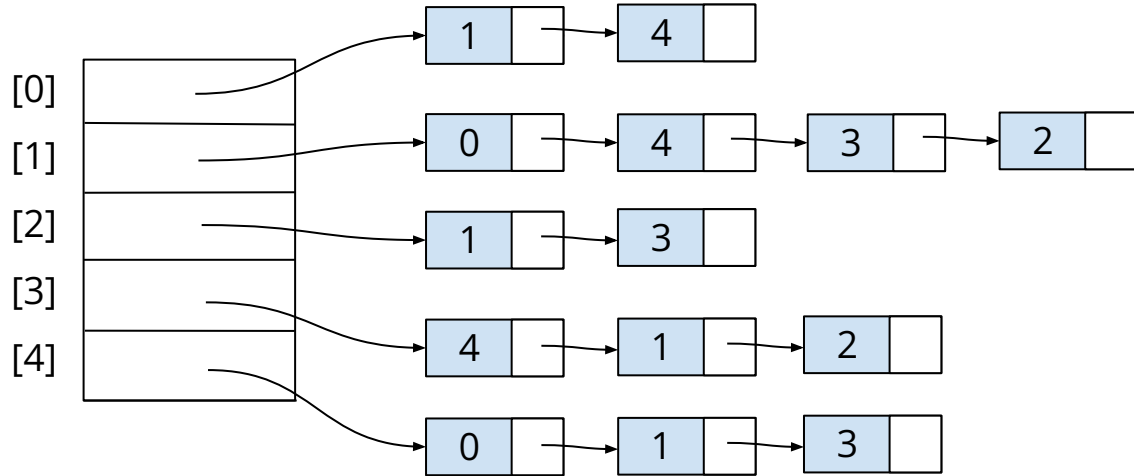
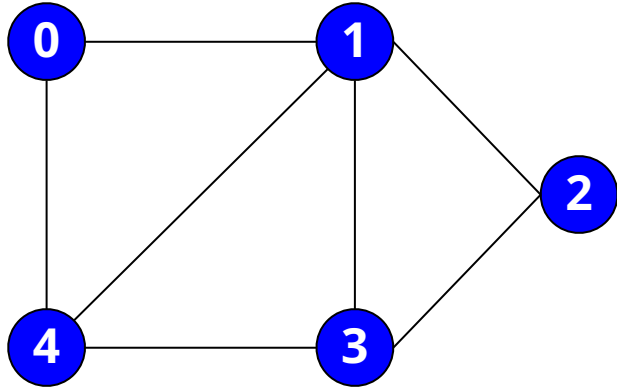


Using Adjacency List: Directed Graph

An adjacency list uses an array of lists, one for each vertex

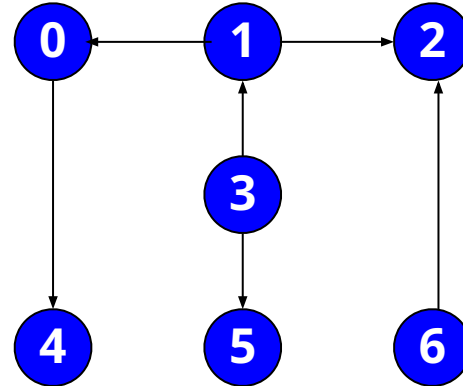
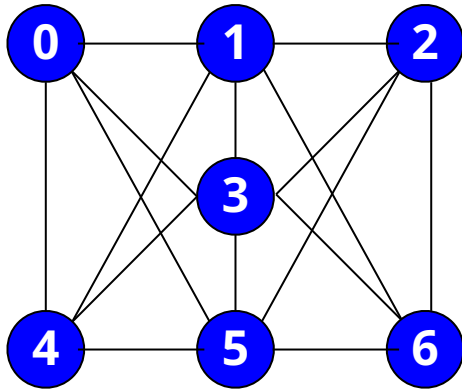


Using Adjacency List: Undirected Graph

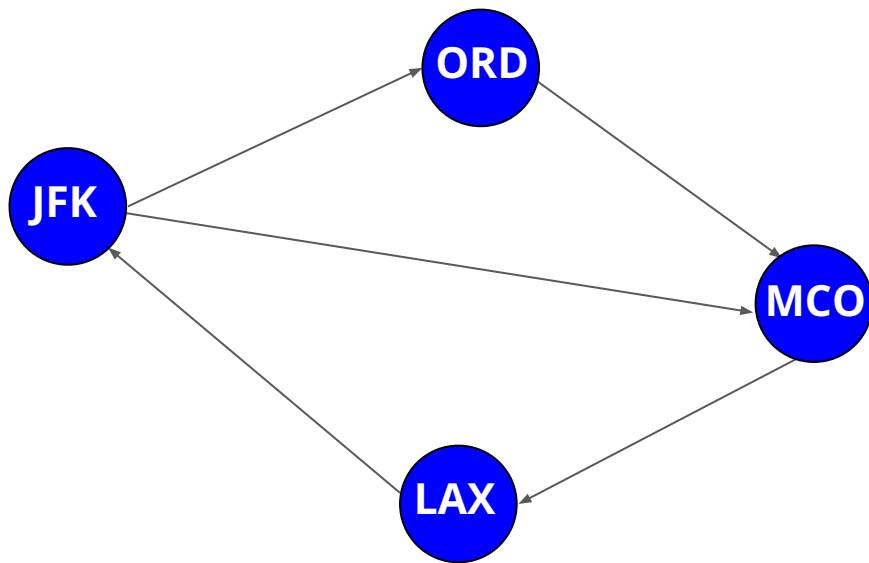


Quick Practice

Draw on a piece of paper, the adjacency list structure for the following graphs. Then check with the person next to you.



Using Adjacency List: Symbol Graph

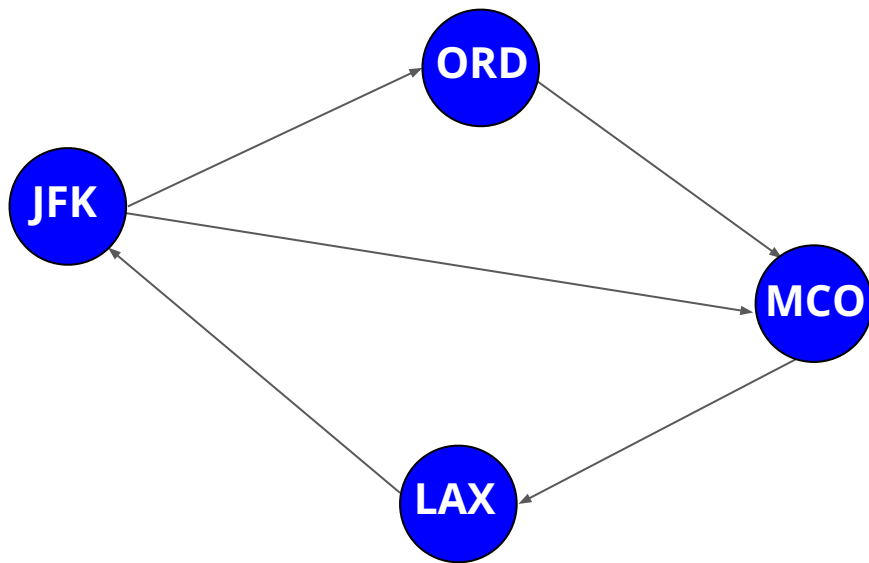


$V = \{\text{JFK}, \text{ORD}, \text{MCO}, \text{LAX}\}$

$E = \{\{\text{JFK}, \text{ORD}\}, \{\text{JFK}, \text{MCO}\},$
 $\{\text{LAX}, \text{JFK}\}, \{\text{ORD}, \text{MCO}\},$
 $\{\text{MCO}, \text{LAX}\}\}$



Using Adjacency List: Symbol Graph



$V = \{\text{JFK}, \text{ORD}, \text{MCO}, \text{LAX}\}$

$E = \{\{\text{JFK}, \text{ORD}\}, \{\text{JFK}, \text{MCO}\}, \{\text{LAX}, \text{JFK}\}, \{\text{ORD}, \text{MCO}\}, \{\text{MCO}, \text{LAX}\}\}$

Map <String, Integer>

JFK	0
ORD	1
LAX	2
MCO	3





In-class Activity

Adjacency List Graph Activity

