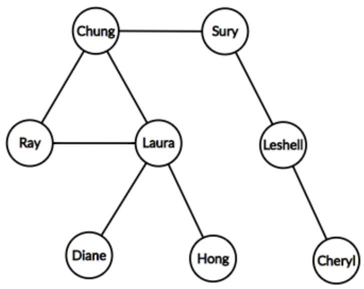
Quick Recap of Concepts (1)

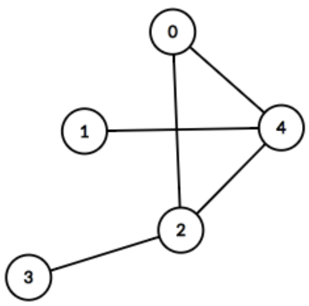
Definition. A graph is a set of vertices/nodes and a collection of edges that connect some pairs of vertices.
The edges in a graph can be *directed* or *undirected*. For this assignment we will focus on undirected graphs.



The vertices represent people and there is an edge between two people if they are classmates. The graph is undirected because if a person *P1* is classmate with a person *P2* then *P2* is classmate with *P1*. There is no need to specify the direction or order of the connection.

Graph Representation

The most commonly used representations of graphs are *Adjacency Matrix* and *Adjacency List*.



G1

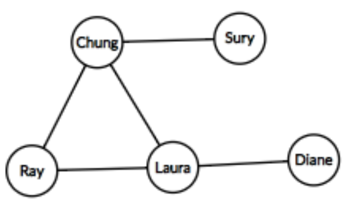
	0	1	2	3	4
0	0	0	1	0	1
1	0	0	0	0	1
2	1	0	0	1	1
3	0	0	1	0	0
4	1	1	1	0	0

Adjacency matrix representation of G1

0 → 2 | 4
1 → 4
2 → 0 | 3 | 4
3 → 2
4 → 0 | 1 | 2

Adjacency list representation of G1

The representation does not allow labeled vertices. We can extend the representation to achieve that. The representation of a ***labeled graph*** will stay the same and vertices will still be numbered. We will simply keep track of the label associated with each vertex. For example:



Graph G

0 → 1
1 → 0 | 2 | 3
2 → 1 | 3
3 → 1 | 2 | 4
4 → 3

Representation of G

Sury	0
Chung	1
Ray	2
Laura	3
Diane	4

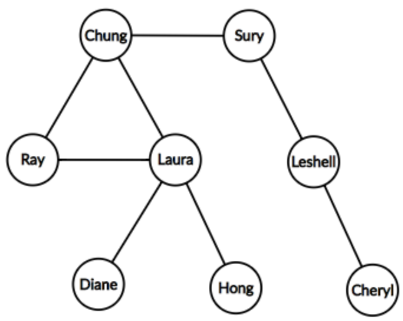
Label-Index mapping

Exercises

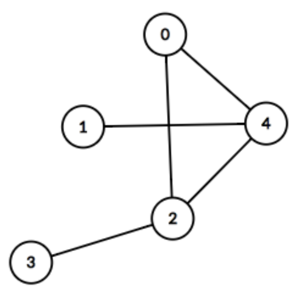
1) Diagram the undirected graph represented by the following adjacency list:

0	→	1	4			
1	→	0	4			
2	→	3	4			
3	→	2				
4	→	0	1	2	5

2) Show the *adjacency matrix* **and** the *adjacency list* corresponding to the following undirected graph. This is a *labeled graph*, so make sure to provide the label-index mapping as well.



3) Show the *adjacency matrix* **and** the *adjacency list* corresponding to the following undirected graph:



4) Given an ***adjacency-list*** representation of an undirected graph, how would you determine whether two given vertices *v1* and *v2* are (directly) connected? How long does that take (big-O notation)?

5) Repeat 4 for an ***adjacency-matrix***