CS2023 - Inclass Lab

Week 10 – Graphs

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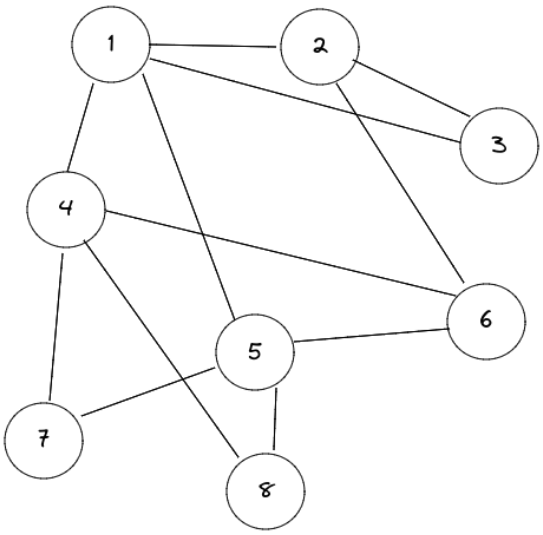


Figure 1: Graph for Section 1

Section 1 : Implementing Graph ADT

1. Write the adajaceny list representation for the graph in Fig1

   1 => [2, 3, 4, 5]

   2 => [1, 3, 6]

   3 => [1, 2]

   4 => [1, 6, 7, 8]

   5 => [1, 6, 7, 8]

   6 => [2, 4, 5]

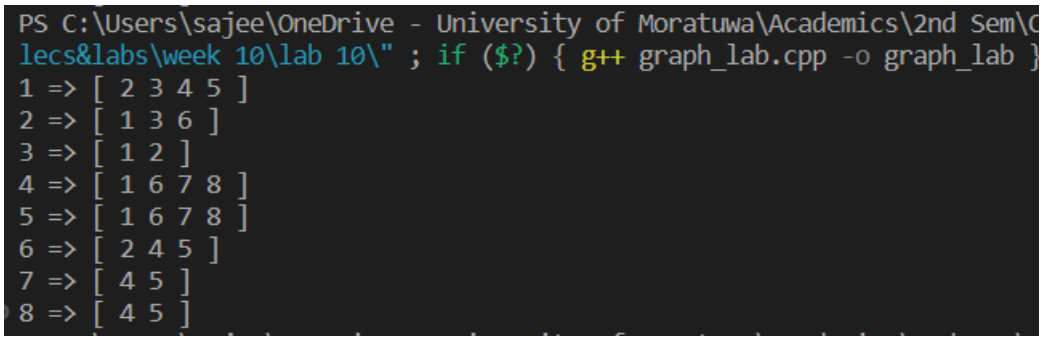
   7 => [4, 5]

   8 => [4, 5]

2. By using comments provided in the code, complete the following *Node (struct), addedge, print functions*
3. Create graph object and add the graph in Fig.1.

Source code has been uploaded to GitHub.

4. Print the adjacency list using the *print* function you implemented and take screenshot.



5. What is the change you will make in the *addedge* function so that Graph ADT could accept directed graphs.(Instead of accepting undirected graph, we need to accept directed graph). Write addedge altered function as your answer below.

```
void addedge(int u, int v, int directed = 0)
// 0 = undirected // 1 = directed
    {
       if(directed){
             // select node u and push v into u's neighbour
             nodes[u - 1].neighbours.push_back(v);

       } else {
             // select node u and push v into u's neighbour
             // select node v and push u into v's neighbour
             nodes[u - 1].neighbours.push_back(v);
             nodes[v - 1].neighbours.push_back(u);
       }
    }
```

Section 2 : Working out link prediction, no coding required

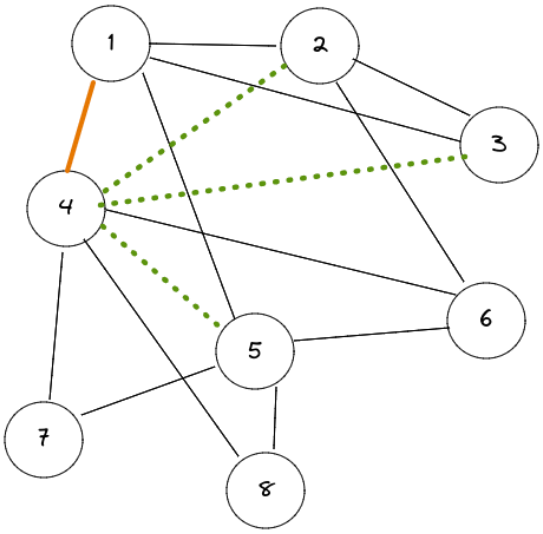


Figure 2: Graph for Section 2

To predict whether two nodes may have edge between them in the future, we must define a similarity score between the 2 nodes. Use the following similarity equation to calculate the similarity between 2 nodes,

$$Sim(a,b) = \frac{\text{\# of shared neighbours between a,b}}{\text{Total neighbours in a,b}} = \frac{a \cap b}{a \cup b}$$

Refer graph in Fig.2 to answer the question below.

Lets assume graph in Fig.2 is a social network graph of a social media platform, where nodes denote people and edges between them indicate that they are connected as friends. Node 1 and Node 4 just became friends, which of the neighbours of Node 1 will you suggest for Node 4 (in other word predict which neighbour of Node 1 can have a edge with Node 4). Utilize the similarity function provided to justify the answer.

Answer:

Let's take a look at Nodes 4, 2, 3, 5 and its' neighbours.
4 => [1, 6, 7, 8]
2 => [1, 3, 6]
3 => [1, 2]
5 => [1, 6, 7, 8]
now apply the similarity function to the nodes.
Sim(4,2) = 2/5
Sim(4,3) = 1/5
Sim(4/5) = 4/4
Hence from this similarity function we can say that nodes 4 and 5 are having a high similarity score between them. So, node 4 and 5 have a higher probability to have an edge between them in the near future.