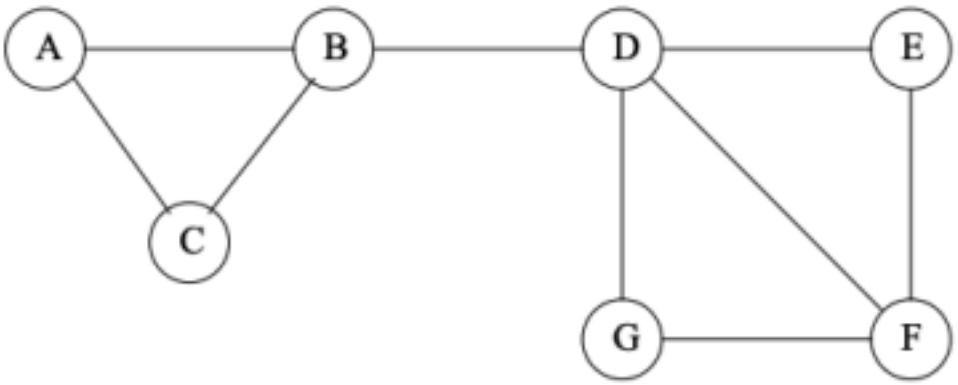
Graph Mining CSF426
Lab 2 (non-evaluative)
Time: 5 PM – 7 PM
Date: August 22, 2024
Instructor IC: Vinti Agarwal

Instructions: All questions need to be answered. Use jupyter notebook only to attempt the questions. No other IDE (VS code, Pycharm, Google collab allowed). For theoretical questions, you can type answers in the jupyter notebook itself.

Q1.

a) Create the undirected graph G (shown in figure below) using networkx package in python and display it. Print the nodes and edges of graph G.



b) Add a node ‘H’ to graph.
c) Add edges ‘HG’, ‘HD’, ‘HF’.
d) Compute adjacency matrix, adjacency list, and incidence matrix of G.
e) Calculate the memory consumption of each representation.
f) Print the degree of nodes “D” and “G”. Also, list the nodes in descending order of their degrees.
g) Compute the degree matrix for graph G.
h) Remove edge ‘BD’ and then print the number of connected components in graph G. Display the resultant graph.
i) Remove node ‘F’ and display the resultant graph.

Q2. It is possible to create a new graph G1, such that the edges of the graph G act as the nodes of graph G1? If yes, construct G1 from G and also specify the criteria of creating nodes and edges in G1.

Q3. Compute the eigenvalues and eigenvectors for the following matrices.

A1 = [1 0 4 0 4 0 3 5 − 3]

What would be eigenvalues of $A1^3$

A2 = [0 − 1 1 0]

How are eigenvalues of A2 different from that of A1. Why have we obtained such values for this matrix.

A3 = [1 2 8 0 5 − 3 0 0 − 3]

A4 = [4 0 0 2 7 0 3 5 − 1]

A5 = [4 0 0 0 4 0 0 0 4]

Can we compute the eigenvalues of A3 and A4 directly without any computation? How?

Also print the trace of all matrices.