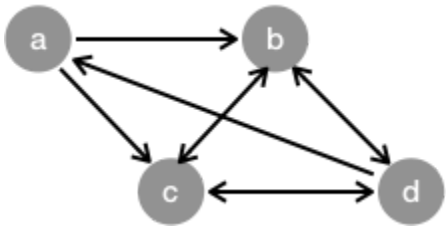
Problem 2. Basic graph diffusion (10 points).

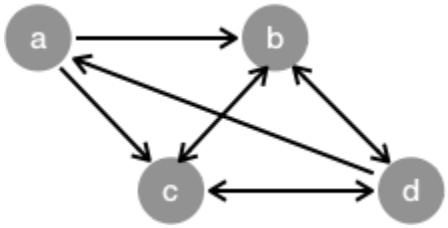
Write the adjacency matrix and transition matrix of the following graph.



Answer:

Problem 2. Graph diffusion (10 points).

Can the random walk on the following graph converge to a stationary distribution starting from a uniform distribution [0.25, 0,25, 0.25, 0.25]? If so, please write down the stationary distribution vector (round to 2 decimal places and write the distribution in the order of [a,b,c,d]). If not, please remove the minimum number of edges so that random walk can converge. We encourage you to solve this problem by writing a program. But code or pseudocode is not required. We will only grade this problem based on the solution.



Answer:

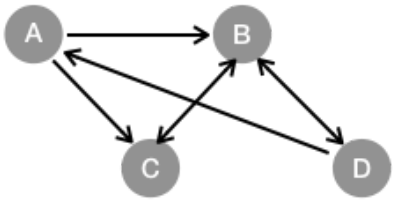
Problem 3. Network-based mutation profile clustering (10 points).

We have talked about how the network can help us cluster patients based on their mutation profile. We used a network to do the random walk with restart on the patient mutation matrix and then clustered these stationary distributions.

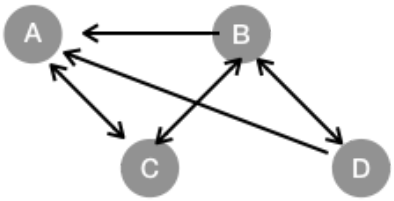
In real-world applications, we often have more than one network. If we have two different networks, how would you use both of them to do the clustering? Below is an example of the dataset. There are 5 patients, 4 genes. There are also two networks defined on the same set of genes. These two networks have different sets of edges. You don't need to do the actual clustering using two networks. A brief outline of the method would be enough.

	1	2	3	4	5
A	1	0	0	0	0
B	0	1	1	1	0
C	0	0	0	1	1
D	1	1	1	0	0

Mutation profile
of 5 patients on 4 genes



Network 1



Network 2

Answer: