open.michigan

UNIVERSITY OF MICHIGAN

PROBLEM SET 2 – Week 2

1. Bipartite graphs (30pts)

Download the file actorsandmovies.net

- Open it in Pajek.
- This is a 2 mode network containing two classes of nodes, actors and movies. Create a 2-mode partition (Net>Partition>2-Mode). Now draw the network (Draw>Draw-Partition). The two classes of nodes should be colored differently. If labels are not shown, add them (Options>Mark Vertices Using>Labels). Apply your favorite layout algorithm. (*I*)
- Transfrom the network into a one-mode network (Net>Transform>2-Mode to 1-Mode>Rows). Draw the network (Draw>Draw). Qualitatively compare the structure of the 2-Mode to the 1-Mode network. Is there a loss of information?
- Show the weights on each edge using (Options>Lines>Mark Lines>with Values). What do the values represent?
- Compute the unweighted degree of each node (Net>Partitions>Degree>All). Next draw the network using (Draw>Draw-vector). How is the degree represented? Add the vector value to each vertex (it will be the degree/(max possible degree)) (Options>Mark Vertices Using>Vector Values). (*I*) Who are the most important actors using this measure?
- How does the boundary of the network (i.e. who is included) affect who is found to be most central? Load the file actorsandmoviesWithGere.net. It contains one extra actor, Richard Gere. Repeat the above procedure. In the 1-mode network of actors, is there a change in who is most central? What does this tell you about biases and boundaries in sample selection?
- Remove all edges between actors who have costarred in fewer than 3 movies (Net>Transform>Remove>Lines with value>Lower than). Which actors comprise the central core of this network?

2. Snowball Sampling (20 points)

Use the file Dining-table_partners.net to work with the following scenario. You are a prince who just met an enchanting young lady at a ball, but she left at the stroke of midnight and left a shoe behind. Now you'd like to find the shoe's owner. All you know about her is that she lives in this particular girls' dorm. The headmistress won't let you talk to the girls, so the only way you can find your princess is to covertly ask the one girl you know, Ella, to introduce you to her two favorite friends. Once you know her friends, you can ask them to introduce you to their two favorite friends, etc. This is a snowball sampling technique.

Highlight the vertices that you will reach using snowball sampling (Net > K-Neighbors > ...) (*I*).

Which girls will you not find using snowball sampling starting with Ella?

3. Your or my social network (50 points)

Import your data from FaceBook (see 'instructionsforfacebook.pdf'). This is the network of your (my) acquaintances and the connections between them, but you yourself (or I myself) are(am) excluded from the network.

- Do an energy layout of the network using the Draw>Draw-Partition-Vector command, using the degree partition and either closeness or betweenness as the vector (*I*). Who is the most central node in the network by degree, closeness and betweenness?
- Point out 3 vertices whose centrality scores differ (e.g. high betweenness but medium closeness) and explain from their position in the network why it happens.
- Identify a node with high betweenness that you could afford to remove without disconnecting other vertices from that component. Create a second network that excludes that person. Use Net>Transform>Remove>Selected Vertices .
- Recompute betweenness for everyone remaining in the network (*I*). Point out 2 particular vertices and their position in the network discuss why their betweenness centrality score did or did not change. Point out 1 vertex (if it exists) whose closeness centrality suffers as a result.
- Briefly discuss the ambiguities (& missing data) in this kind of data collection.
- Imagine you are a newcomer who wants to not only be friends with you, but occupy a central position in your network (I know, multiple personality is a bit hard to keep track of). You only have time to make 2 new acquaintances out of your network of friends. Which 2 would you choose to maximize your closeness centrality? Add yourself to the network by using the command Net>Transform>Add>Vertices and adding edges in the Draw window and compute your closeness. Which 2 vertices would you connect to to maximize your betweenness score (what is your betweenness?).