Assignment 3: Community Detection

September 7, 2022

Submit your assignment in python 3.6 or above.

Data sets: (i) https://snap.stanford.edu/data/ego-Facebook.html
(ii) https://snap.stanford.edu/data/soc-sign-bitcoin-otc.html

Resources you can use for graph vizualization: https://networkx.org/, graphviz
etc. There are prebuilt implementations of some of the algorithms we require in
networkx etc., please do not use those. Use networkx and other libraries only
for vizualization.

Consider the data sets given above.

1. Run one iteration of the Spectral decomposition technique. Plot the sorted
   Fiedler vector, the associated adjacency matrix and the graph partition.

2. Come up with an automated algorithm to determine the right set of com-
   munities using the spectral decomposition method. What would be your
   stopping criterion.

3. Plot the associated adjacency matrix sorted by associated sorted sub graph
   Fiedler vectors. Vizualise and show the graph that you obtained.

4. Do the same for the Louvain algorithm. Show the communities you get
   after one iteration.

5. How would you pick the best decomposition of nodes into communities?

6. What was the running time of the Spectral decomposition algorithm versus
   the Louvain algorithm on the data sets you were given?

7. In your opinion which algorithm gave rise to better communities, why?

Submit you code as community-student-name.py. Write a report and submit
as community-student-name.pdf