

CSL7390 Social Network Analysis

Assignment 2

Note: Refrain from using pre-written code or solutions from the internet, including AI language models (like LLMs), to compose your queries. Ensure that your submissions are entirely your own work, and avoid copying or sharing code with your classmates. The evaluation process will include a plagiarism check.

Please submit one zip file (named as <roll no.>.zip), which will consist of two files 1) the full code in Python script (convert the notebook into Python file) and 2) A report that will explain the theory and output. Late submissions are allowed. However, the marks you obtain will be reduced by half as a penalty. You can use the networkx python library for the same.

Q1: Use the following data set as an undirected signed network.

<https://snap.stanford.edu/data/wiki-RfA.html>

This network contains signed links. Use the RES value from the dataset, 1 as a positive link and -1 as a negative link. (Do not use the lib function)

1. Count all the balanced cycles in the graph
2. Count all the unbalanced cycles in the graph.

Q2: Write functions to Generate a Random Graph with (i) N nodes and L edges and (ii) N and p parameters. (Do not use the lib function)

Q3. Generate a Random Graph (Using any algorithm) and a Scale-Free Graph (using Barabasi-Albert model) of different sizes ranging from N=100 to $10^5/10^6$ (based on your machine). Plot their degree distributions, both in usual scale and log-log scale. (Do not use lib function)

Q4. Convert a generated Random Graph with N nodes and L edges to Fuzzy Granular Social Networks using the fuzzy membership function:

$$\mu(v) = \begin{cases} 0, & \text{if } d(c,v) > r \\ 1/1+d(c,v), & \text{otherwise} \end{cases}$$

where $d(c,v)$ is the distance of node $v \in V$ to the center $c \in C$, and r is the radius of the granule. Use distance function as minimum hop distance and $r = D$ (diameter of the network).

References:

<https://www.sciencedirect.com/science/article/pii/S0020025515002388>