Modelling and Analysis of Complex Networks

Exercise 3

Due: 13:00 on Oct. 11, 2024

The maximum score of this assignment is: **16 points**. Please submit the assignment in any readable data format (.txt, .doc, .pdf, .md ...) and submit the assignment before the deadline. If you have additional information concerning your answers, please also upload the document to the Moodle, or include the link to the document in your answers (e.g., link to your Github repository). Please indicate your team number in your submission.

Various graph models were discussed in the class. Please recall the features of these models and answer the following questions. The following questions can be answered with the help of Snap.py and NetworkX. You may also use other packages to deal with the problem. Please answer the following questions on both of the networks you have and submit your executable code. **(4 + 4 + 4 + 4 = 16 points)**

(a) Generate graphs based on Watts-Strogatz Model, and each of them should have the same number of nodes as Facebook-Ego. Please generate 9 graphs with three different values of $\bar{k}$ and p. Please plot the graph structures, degree distributions, and clustering coefficients as well.

(b) Generate scale-free graphs, and each of them should have the same number of nodes as Facebook-Ego. Please generate 3 graphs with three different values of γ. Please plot the graph structures, degree distributions, and clustering coefficients as well.

(c) Generate graphs based on Barabási-Albert Model, and each of them should have the same number of nodes as Facebook-Ego. Please generate 9 graphs with three different values of m_0 and m. Please plot the graph structures, degree distributions, and clustering coefficients as well.

(d) Please compare your Facebook-Ego network, Twitter-Ego network with the generated random graphs in (a), (b) and (c). Which random graph(s) approximates your networks at most? Why?