

BT 5240 — Computational Systems Biology

Jan–May 2020

Assignment 2

Network Biology

February 8, 2019

Due date: 24th February, 2020 @ 17:00

Maximum marks: 50

Instructions: Late assignments will not be accepted. If you need any assistance on computing, feel free to approach me. Evaluation will be based on the code(s), the answers and the methodology.

Academic Integrity: You are allowed to discuss the problems verbally with your friends, but copying or looking at codes (either from your friend or the Web) is not permitted. Transgressions are easy to find, and will be reported to the “Sub-committee for the Discipline and Welfare of Students” and will be dealt with very strictly. Mention any collaboration (discussions only!) in your solutions. Late submission penalties: 1 second – 24 h: 20%; 24–48 h: 40%; > 48h: 60% Early submission bonuses: > 24h: 10%, > 48h: 20%

Evaluation: Assignments will be evaluated by the TAs within one weeks of the due date. You can check out your marks and contest them, if needed, for at most one more week postevaluation, i.e. three weeks from the due date of the assignment.

Submission: Since this is a computational assignment, I would also like to look at your codes. Submit your assignment as one zip file by uploading it at <http://tinyurl.com/bt5240-submit>

Your zip file should be named something like BTyyBxxx.zip, based on your roll number. This zip file must contain a single neatly typeset PDF of your solutions (named BTyyBxxx.pdf) as well as the codes used for each of problems in a separate folder *codes*.

Problems

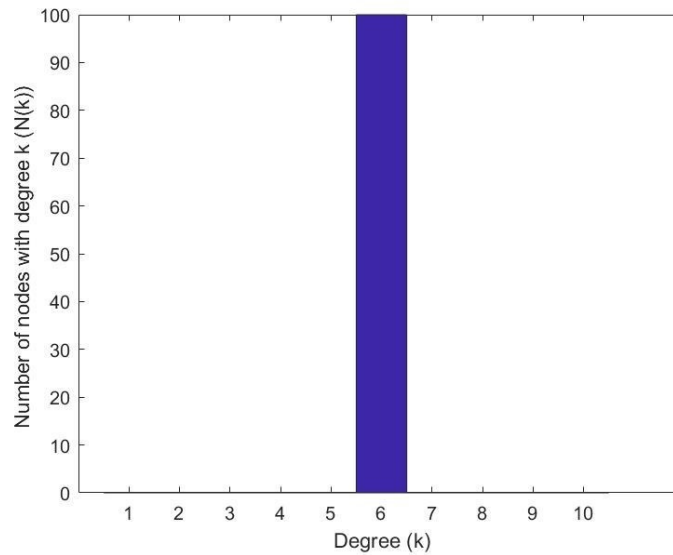
Problem 1

Choose a real network from <http://networkrepository.com/> and perform the following analysis:

- Compute assortativity
- Plot the degree distribution ($N(k)$ vs k)
- Plot the clustering coefficient distribution ($C(k)$ vs k)
- Comment if the network resembles a scale-free network or a small-world network

Problem 2

Write a function to construct a graph 'Network A' which has a similar degree distribution as the plot shown below:



Construct another graph 'Network B' by writing another function to rewire 'Network A' with a probability 'p' while preserving the total number of edges of the network.

Compute the following parameters for Networks A and B

- Diameter
- Characteristic path length
- Global clustering coefficient
- Plot the degree distribution