

BT5240 — Computational Systems Biology

Feb – May 2021
Assignment 2

March 3, 2021

Due Date: March 13, 2021 @ 17:00

Maximum marks: 60

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.

1 Problem 1

Consider a Watts–Strogatz network with 100 nodes and each node having 10 neighbours. Re-wire the network with $p = 0.7$, you will see that these networks change from the parent network. Calculate the average clustering coefficient and the characteristic path length of rewired network. Can these parameters obtained in any random network of same nodes and edges?

Hint: Generate 100 Erdős–Rényi random networks with identical number of nodes and edges. Compare the average clustering coefficient and characteristic pathlengths of random graphs and the rewired network.

2 Problem 2

Select a network from <http://networkrepository.com/> and report the following network analysis results

- A plot of the degree distribution (and comment)
- A plot of the average clustering coefficient as a function of the node degree (and comment)

- c The following statistics
 - i Average node degree
 - ii Average local clustering coefficient. Does this node show higher clustering coefficient than you would expect by chance, for this degree distribution?
 - iii Characteristic path length