

MST 383/683

Computational Assignment #3

Due Date: October 22, 2021

In this assignment your goal is to create a Matlab script that simulates an SIR disease on a network and compare the average dynamics of the network simulation to the ODE model. You should use the file SIS Averaging with Link Dynamics .m file provided on the course webpage as a basis for your code. Your Matlab script should do the following:

1. Use the following parameters $\beta = .1$, $\alpha = 1$, $T_{\max} = 10$, $n = 1000$ (number of temporal points), $S_0 = 990$, $I_0 = 10$ and $R_0 = 0$ (the recovered population, not the basic reproduction number), and $p = .05$ which is the probability of a node being connected to any other node.
2. Simulate the network SIR dynamics for $M = 100$ trials and average over the results to obtain the average dynamics for the S , I , R , and all of the edge dynamics.
3. Simulate the corresponding ODEs with these initial conditions.
4. Plot the S , I , R averages as well as the corresponding solutions to the ODE on one graph.
5. Plot the SS , SI , II averages as well as the corresponding solutions to the ODE on one graph.

You can use the standard moment closure approximation for the assignment.

Bonus: Create a second script that uses the moment closure that accounts for triangles. You will need to adapt the code to compute the clustering coefficient.