Dr. Ali Tafti
IDS 564: Social Media and Network Analysis, Spring 2016
Lab 6: Epidemics, and class readings EK, ch. 21

Regular Lab 6: Epidemics

Preparation: Please read chapter 21 of the EK book on epidemics. It is important to grasp how the SIR (Susceptibility, infection, and removal) model operates in the spread of diseases, ideas or fads in social networks.

Please use the data and build upon the R script provided. You should first try to run and explore the script in its current form. The function *simulate_sir()* executes a simulation of infection diffusion, with a given *igraph* network. For the regular lab, the function does not implement the removal and re-susceptibility part of the SIRS model. In other words, susceptible nodes can become infected and infect others, but they do not eventually become immune (Advanced Lab 6 will involve updating the SIRS simulation function to enable immunity).

You will need to update the function *simulate_sir()* in the script so that the vector *infected_t*, returned by the function within the list *time_stats*, gives a count of the number of nodes that are infected in each round. If it is done properly, you will see the result in the first plot of each of the three-plot sets after executing the function. (The advanced lab will involve updating the counts for removed and susceptible nodes.)

You will run multiple simulations for different forms of the Erdos-Renyi random graph, the Barabasi preferential attachment network, the Watts-Strogatz small-world network, and the primary school network (with weak edges removed) that you saw in Lab 3.

Please answer the quiz 6 questions. On this assignment section in Blackboard, please post your final R script with this assignment, and a PDF or Word document with any plots needed to determine your answers for Quiz 6. If no points are awarded for your attempt at quiz questions, we may consider the submitted documents to award some consolation points.

Note that this is an optional lab/quiz. If you choose to do it, the grade will be used in place of your lowest score on any previous quiz (i.e. and only if it is higher than at least one other previous quiz).

Important: Note that in each of the simulations, there is a natural amount of variation in results, because the first infected node (patient zero) is selected by random, and then transmissions are based on a probability parameter. Of course, if your simulations are built properly, you may find an occasional fluke in a simulation result. Thus, you'll need to run the simulations multiple times for each question (typically at least 10 times), and answer according to the ***typical*** results you find.

Please use your best judgment, consider all of the choices carefully, and choose what you believe is the *best* answer choice about the typical patterns you see in the simulations.