CSI 445/660 – Network Science – Fall 2015

CINET Assignment II

Date given: Oct. 29, 2015 **Due date:** Nov. 10, 2015

The purpose of this assignment is to familiarize students with the use of random graph generation facilities in CINET. The assignment has two parts.

Part I: Generate three random graphs each with 1000 nodes using the Erdős-Renyi (ER) model using edge probability values of 0.0009, 0.0015 and 0.004 respectively. For each of the three graphs, compute the following measures using CINET.

(a) The size of giant component (i.e., a largest connected component).

(b) The number of triangles.

(c) The number of bridges in the network.

Your submission for this part should be a table whose format is shown below.

Prob.	**#Nodes**	**#Edges**	**Giant comp. size**	**#Triangles**	**#Bridges**
0.0009	1000				
0.0015	1000				
0.004	1000				

Part II: Consider random graphs generated using the Erdős-Renyi (ER) model on 500 nodes. As we increase the edge probability, the number of edges in the generated graph increases. The goal of this exercise is to experiment with various probability values and find the *smallest* probability value at which the generated graph has a certain property. The two properties to be considered in this assignment are the following.

(a) The graph has a giant component with at least 400 nodes.

(b) The graph has no bridge edges.

For each of the two properties, you should try to make the required probability value *as small as you can*. The probability value that you report must be accurate to *three decimal places*.

For each of the two properties, in addition to the smallest probability value, your submission must also include a plot as described below. (Each plot must show *at least five* points.)

(a) For giant component, the plot should have the probability value along the X axis and the size of the giant component along the Y axis.

(b) For the number of bridges, the plot should have the probability value along the X axis and the number of bridges along the Y axis.

Note: For each graph property, you need to try various edge probability values and find the smallest value. You can do this systematically using a binary search on the probability values.

Things to Remember:

1. For both Part I and Part II, you must first use CINET to generate a random graph, download it to your computer and upload it again to CINET to compute the required measures.

2. You may be generating many random graphs. Use a systematic naming convention for the graphs so that you can easily identify which probability value was used in generating the graph.

3. When you upload the generated random graphs to CINET, please *don't* make them visible to all; make them visible just to yourself.