CSC 499-06 Network Science, Fall 2014

Instructor: Dr. Natarajan Meghanathan

Project 3: Network Generation using CINET and Analysis/Visualization using Gephi

Due: December 2, 2014: 4 PM

In this project, you will generate networks according to the following **three models:**
(i) Random graph Erdos-Renyi model (ER)
(ii) Scale free network Barabasi Albert model (BA)
(iii) Small world network Watts Strogatz model (WS)

The network topology information (edges info) will be generated in CINET according to some parameters assigned to each of you for the three models. You will then create the .csv files for the node set and edge set from this edge info; load them to Gephi and analyze the following **network metrics** for each graph (generated for the parameters assigned to you) under each model.

(i) Degree distribution (degree vs. probability of finding node with the particular degree)
(ii) Average node degree
(iii) Average network diameter
(iv) Average path length
(v) Average clustering coefficient
(vi) Number of node communities
(vii) Number of connected components
(viii) An appropriate layout of the network depicting the different node communities and the PageRank values of the nodes (communities - node color; PageRank - node size)
(ix) An appropriate layout of the network depicting any two centrality metrics

Random Graph Erdos-Renyi Model

Generate graphs for each of the two probability values assigned to you and analyze them separately with respect to the above network metrics:

		Probability for a link	
Student Name	# Nodes, n	p_low	p_high
Bharath Gajjela	30	0.1	0.3
GM Khan	40	0.08	0.25
Joel V. Maddirala	50	0.06	0.2
Mina Zhou	60	0.05	0.15
Pratik Jannela	70	0.04	0.12
Ravi Ankamma	80	0.04	0.10
Susmita Atluri	90	0.03	0.08
Alain Rafiki	100	0.03	0.08

Scale-free Network Barabasi Albert model

Generate graphs for each of the two values for the number of edges added per node inclusion (m) and analyze them separately with respect to the above network metrics:

		# edges added per node inclusion	
Student Name	# Nodes, n	m_low	m_high
Bharath Gajjela	30	2	4
GM Khan	40	2	4
Joel V. Maddirala	50	2	4
Mina Zhou	60	2	4
Pratik Jannela	70	2	3
Ravi Ankamma	80	2	3
Susmita Atluri	90	2	3
Alain Rafiki	100	2	3

Small world network Watts Strogatz model

Generate graphs for each of the combinations of values for the number of nearest neighbors (K) and the probability of rewiring, and analyze them separately with respect to the above network metrics:

		# nearest neighbors (K) and Prob. of rewiring (p)	
Student Name	# Nodes, n	(K1, p1)	(K2, p2)
Bharath Gajjela	30	(4, 0.8)	(4, 0.05)
GM Khan	40	(4, 0.75)	(4, 0.1)
Joel V. Maddirala	50	(4, 0.7)	(4, 0.15)
Mina Zhou	60	(4, 0.65)	(4, 0.2)
Pratik Jannela	70	(6, 0.8)	(6, 0.05)
Ravi Ankamma	80	(6, 0.75)	(6, 0.1)
Susmita Atluri	90	(6, 0.7)	(6, 0.15)
Alain Rafiki	100	(6, 0.65)	(6, 0.2)

Submission:

Report and discussion: Compile a report for the network metrics evaluated for each of the six graphs. Include screenshots for all the figures and layouts.

Compare the results (including the variations in the network metrics) that you obtain for the different parameters assigned to you.

Video(s): Record video(s) demonstrating your generation of the network graphs under each of the models. If the demonstration runs for a longer time, you could record separate videos (one for each model) and upload them to Googledrive sent to my email address: natarajan.meghanathan@jsums.edu.