Assignment 8
Submission deadline: Thursday Dec 08, 2016 by 8 PM
Submission format: upload document in Canvas

1. **(100 points) Network analysis using igraph and igraphdata.**

- Load the **karate** network in R, and describe the dataset in your own words, in 2-3 lines. Feel free to use help(karate).
- Is this a directed network? How many vertices and edges are there?
- Plot the network using the **circle** layout and the **graphopt** layout.
- What are the vertex attributes for this network? Plot the network using the **graphopt** layout and different vertex colors according to the vertex attribute **Faction**.
- Is it meaningful to calculate co-citation for this network? Why or why not?
- Calculate the geodesic distance between all pairs of nodes. Construct a heatmap showing geodesic distances between node pairs. Also construct a histogram of geodesic distances. What is the average geodesic distance in the network?
- Calculate i) degree centrality, ii) eigenvector centrality, iii) pagerank, iv) closeness centrality, and v) betweenness centrality for all nodes in the network. Construct four plots, with degree centrality in the x-axis, and the other four centrality measures in the y-axis. What is your interpretation of these plots?
- For each centrality measure, report the five most important vertices according to that measure. Using the vertex attribute **name**, identify these important vertices by name. Overall, which two vertices do you think are most important in the network?

Assignment instructions:

1. **Honor code:** The Virginia Tech honor pledge for assignments is as follows:
   "I have neither given nor received unauthorized assistance on this assignment."

   The pledge is to be written out on all graded assignments at the university and signed by the student. Type up your name to sign.

2. Submit your assignment as a document (word, pdf or similar) to Canvas, clearly marked with student's name and assignment number, eg. Sengupta_Srijan_HW8.pdf. Your submission should include R code and answers to problems.

3. Late assignments will not be accepted. Check Canvas regularly for assignments and submission dates.

4. You are free to discuss assignment problems with your classmates, but submitted work (answers and codes) **must** be your own work. Students are not allowed to copy computer codes or answers from each other, and must write their own codes and answers.