CSC 485B/578B: Assignment 3

Due: 23:55 pm, July 3, 2014

Remarks

- Each question has two weights, with the first one for CSC 485B students and the second for CSC 578B students.
- You need to clearly write out the pseudo code to describe your algorithm design in a **pdf** file. Other format will not be accepted.
- You also need to submit your java source code to connex dropbox.

Question

Add a supernode to the anonymized personal Facebook network, described with *Personal-May8-Anonymous.gephi*, which could be downloaded from Connex → Resource, so that the supernode has a connection to any other node in the network. Treat this network as an undirected network.

Assume that you want to promote a product in the network and you have a budget to change x number of nodes in the network to adopt the product (e.g., by giving out the product for free). Assume that the threshold for diffusion is q across the whole network.

1. (50%, 50%) Design and implement a brute-force-search algorithm to test whether or not the budget is enough to cause a complete cascade. (Input of the algorithm: the values of x and q, output of the algorithm: a set of initial adopters if the budget is feasible, or no solution if the budget is impossible to cause a complet cascade). If $q = 0.2$, what is the minimum budget required for a complete cascade? If $q = 0.6$, what is the minimum budget required for a complete cascade?

2. (50%, 40%) It is clear that brute-force-search algorithm is not scalable. Design and implement a heuristic algorithm to provide an approximate solution to the above problem.

3. (0%, 10%) Run your heuristic algorithm multiple times. For each run, replace some of your heuristically-selected initial adopters with randomly selected nodes. Will this randomization improve the algorithm w.r.t. the chance of returning a correct answer?