

MS&E 337 - Information Networks

Project Suggestions

You can work on your project in groups of up to three people, and it is largely up to you to define the topic and scope of the project. It is a good idea to double check the topic of your project with me after thanksgiving to give me a chance to offer early feedback. The basic types of project are the following:

- An experimental evaluation of an algorithm, model, or measure on an interesting dataset. There are several network data sets that you can work with (protein networks, Internet graph, weblogs, semantic web, etc.). You can also assemble your own data.
- A theoretical project that examines an algorithm, model, or measure in some topic related to the course. Try to derive some rigorous results.
- An extended, critical survey of a related topic, going into significant depth and offering a novel perspective on the area.

The projects for the course are due by the end of the quarter. If you are already conducting research in an area with content related to this course, then you may produce some non-trivial extension to your research and report on it for your project. Otherwise, you will have to choose a topic. Here are some suggestions:

1. Study the spread of computer viruses and worms. Propose and analyze realistic models for their propagation in a network. Study the effectiveness of various containment methods.
2. Do the same thing for human viruses (epidemics on human social networks).
3. Study the effectiveness of the spectral method for detecting web spam and collusion.
4. Biological Networks: An Algorithmic Study. Do the techniques of this class have applications in biological networks?
5. Study the role of incentives in the growth or evolution of the Internet and other scale-free communication networks. There are several references for this project including Bala and S. Goyal (00) and Jackson and Wolinsky (96)
6. Consider the following optimization problem: add k edges to a given a network to increase its eigenvalue gap as much as possible. There are several applications for such an algorithm in the context of peer-to-peer, mobile, and sensor networks.
7. Perform a literature review of other models for scale-free graphs, e.g. HOT (Highly Optimized Tolerance) model.
8. Write a program to generate power-law graphs in B-A model and the configuration model. Adjust the model to accept a varying clustering coefficient. Investigate the performance of some algorithms based on the varying clustering coefficient. Make sure that your program outputs important quantities like diameter of the graph, the degree sequence, etc.
9. Produce a simulation of a decentralized search on a structured or unstructured P2P networks. Your simulation should work for a few hundred thousand nodes.