CS 491/591 Class Project

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Due: Thursday, May 5th

A significant part of this class is the class project. In this project, you will apply tools learned in this class to a problem in game theory or social computing. I expect this project to have both 1) an analytical component, where you make use of some of the mathematical tools covered in class and hws; and 2) an empirical component, where you do empirical tests which support or complement your analytical results. You are encouraged to do this project in groups of no more than three students.

The main deliverable for the class project is a paper no more than ten pages in length (not including bibliography and appendix). This paper should be structured as a standard research paper in that it should have an abstract (a paragraph or two), an introduction, a related work section, a body, and a conclusion and future work section. For project from teams with a graduate student, I expect the paper to contain at least one new and non-trivial idea.

Learning to write good papers is a life-long process. There are links to several good references for this process on my home page in the *Student Advice* section. I recommend discussing your project with other students both inside and outside of your group and getting other students to review a copy of your paper before you turn it in. I strongly recommend that you come by my office hours periodically to discuss your progress on the project.

1 Project Ideas

Following are some ideas for getting a topic for the class project:

For undergrads:

- Find a topic that interests you in the book that the book does not discuss in detail. Check out the references in the back of the book on

this topic and find a paper or two that discuss the topic in detail. Your project can be to 1) read, understand and synthesize these papers; and 2) devise experiments or simulations to test the ideas in the paper(s) and then run the experiments.

- In the Evolutionary Game Theory chapter, you could read the paper on the Phage6 virus, give the detailed game theoretic analysis for this virus and then run simulations to test the analytical results
- In the Network Routing chapter, you could read the paper by Roughgarden and Tardos that shows that the social cost of equilibrium traffic is at most 4/3 the optimal, and then run simulations to find networks for which equilibrium routing is close/far from the optimal.
- In the chapters on auctions, you can read any of the many papers on key word auctions, synthesize these results and then run experiments to determine the revenue of the auctioneer under various models

- If you are interested in a topic that is not covered in the book, but for which you can apply the tools we have learned in this class, then that is also fine. For example, you could do a game theoretic analysis of a simplified version of poker or some other game of chance. Alternatively, you could examine a system like Bittorrent from a game theoretic perspective.

- You could also try one of the ideas for grads mentioned below if you like, but please run it by me first.

For grads:

1. Use a problem related to your own research. Tools we have learned in this class are applicable to many areas of computer science. If you are doing research in security, imagine that the adversary is rational, with a known utility function (and perhaps a budget).

2. Make up an interesting question based on a topic in one of the papers we've talked about that interests you. Find additional papers on this topic in the bibliography of the textbook (citeseer and google scholar are good places to find a paper online if you have the title) to see if anyone has addressed this problem before.

3. Find problems in the "Conclusions and Future Work" section of papers we have discussed. Note these problems are frequently very challenging. If you want to look at one of these problems, you should first try to make it *easier* by looking at a restricted version of the problem.

4. Come talk to me. I have several problems that would be suitable for a class project.