1 Class Projects

The goal of the final project is to develop a deep understanding of an important research area, and, to the extent possible, to work on an open problem. You may also review an existing area of the literature, providing a careful and critical comparison of different approaches to computational mechanism design. You are strongly encouraged to build from the discussions in class, and to also remember that there are a few papers still to be covered.

Projects may be theoretical or experimental; theoretical projects must be individual, while experimental projects can be completed in pairs. A list of suggested topics for projects are provided here, but you are encouraged to propose a topic of your own for approval. Project proposals are due in class on Monday, April 17.

Your proposal will probably not need to be more than a couple of pages in length. Your goal should be to convince me that your ideas are well enough focused, and that you know what the first few steps will be. You should explicitly include the following sections in your proposal:

1. Provide a high-level description of your project.

2. Provide motivation for your proposed work (what will we know afterwards that we don’t know now, and why do we care?)

3. Place your work in the context of the papers that we have read in the course.

4. Let me know what things that Giro, Ben, and I can help with to get you started.

Ben and Giro will be meeting with you about a week before proposals are due to discuss your project ideas. Project presentations will be 4–6pm on Monday, May 1, and your final project report is due at noon Wednesday, May 17, to Arthur Cram, MD 133. Note that the presentations will be given well before the final due date; you need not have a near-final version of your project completed for presentation, but it should be beyond the preliminary stages.


2 Project Suggestions

Following are some suggestions, many of which were motivated by things that came up in class discussion, indexed by the class they’re most related to:

3/1 FP, non-convergence
- explore how manipulable FP really is
- implement and test proposed extensions to FP to see how convergent they are
- think about MD to make FP convergent

3/6 Nash Q-learning
- apply to a repeated game with extended state to include a little history, can it converge to trigger strategies?
- run Nash Q on a VCG style setting, does it converge?
- think about a model-based alternative to Nash Q
- is there something more like FP that can work in SGs?

3/8 Calibrated learning
- implement the calibrated learning algorithm (e.g. following discussion in Greenwald, Jafari and Marks)
  see how quickly it converges
- read the Hart & Mas-Collel paper, implement that and test
- test the manipulability of calibrated learning
- think about MD to allow CL to find "good" CE

3/13 Correlated Q-learning; Cyclic equilibria
- how to correlate play in correlated Q-learning?
- how to distribute choice of CE?
- speed up convergence in correlated Q-learning?
- explore possibility of manipulation

3/15 Rational learning; beliefs in repeated games
- empirical study of how beliefs impact utility in game play
- compute complexity of Kalai & Lehrer approach in small setting

3/20 Efficient learning equilibrium
- study ELE with discounting
- study ELE with agent beliefs
- study ELE subgame perfect
- study simpler ELE’s that use the folk theorem in different way
- empirical study of ELE

3/22 Nash memory
- try different search algorithms in place of GA
- apply techniques in both papers to different, perhaps smaller, well-motivated games (domains) [note: compute time of Phelps
is huge!]

4/3 Agenda of research in multi-agent learning
- write your own "on the agenda"
- instantiate authors’ ideas on teaching in an experimental setting
- try to relax one or more of the 5 assumptions in the "Learning against opponents..." paper
- examine other models of bounded memory
- explore the case of alternative metrics, such as no-regret