Advanced Game Theory

David A. Siegel

Course information:
Course Number: POLSCI749S
Time: MW 1:25 - 2:40 pm
Place: Gross 111
Course website: Sakai

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Course Description

This is the second semester in the game theory sequence. The prerequisites are the first semester in deductive/analytical approaches and the department's math camp, or the equivalent of both. However, there will be a review of the material from the first semester of game theory, so don't worry if your game theory is rusty. The first few weeks also review/introduce many mathematical tools. And, of course, I will be happy to answer questions in class or help out of class.

The course has three primary aims. The first is a better understanding of the formal modeling literature. By the end of the course you should be ready to read and understand original modeling articles and have a good idea as to why authors made the choices they did, and what they gained or lost by making them. The second is an enhanced ability to write models of your own. Throughout the course you will be exposed to an array of different theoretical modeling choices, from sequential and simultaneous games to signaling and bargaining games to agency problems to behavioral models and computational methods, both to familiarize you with them and to indicate which may be of best use for a given problem. This will prepare you to write your own models in the future. The third is an appreciation of the context in which formal models are written. We'll discuss their assumptions, their presentation, and their intended messages.

Course Format

I believe the best way to learn modeling is by doing, and the class structure reflects this. I have partitioned the course into thirteen sections, each of which will take between $\frac{1}{2}$ class and $2\frac{1}{2}$ classes to get through. Problem sets of varying length will be distributed throughout the first nine sections. These problem sets will require a significant input of time, and represent the most important mechanism for developing mastery of the material. You will be provided with detailed solutions to the problem sets in the class in which they are due, and will be expected to carefully read through these and come to the following class with any questions.

To ensure that this important revision of your work happens, you will provide the first assessment of your own problem sets. The procedure will be as follows. After turning in a copy of your problem set and receiving the detailed solutions, you will have a week to figure out, with the help of the solutions, where you might have gone wrong, and why. You will then provide detailed comments on your paper that identify any incorrect points and explain how the problem should have been done, and why that is the case. You will not assign any grades, however. When you turn in your assessed problem set a week later I will grade both your original performance and your assessment. The goal is to ensure by the conclusion of this process that you understand fully the logic underlying the problems.

As a supplement to the required text I will post lecture notes to Sakai. I expect you to have made an attempt to read both text and notes before class. This will help you ask questions in class that will be of most use to you, and I encourage frequent interruptions in that regard. It is easy

to fall behind, and no question which helps prevent this is a bad one. I also recommend going over the text or the notes again after class, to cement your understanding.

At the conclusion of the class you will write a simple model of your own designed to address a question of substantive interest to you. The purpose of this model is not to produce an immediately publishable work of formal theory. It is instead to take some early steps in formalizing your thoughts, understand what this entails, and help you to discern your future interests in this area.

Readings

The required textbook for the course is McCarty, Nolan and Adam Meirowitz. 2014. *Political Game Theory: An Introduction*. New York: Cambridge University Press (**MM**). I will also post to Sakai related notes prior to most classes, usually several weeks beforehand. You are responsible for reading both text and notes carefully and coming to class with questions. I will provide additional notes detailing the examples we will go over in class after we go over them.

Course Requirements

- Participation (10%): I expect active participation in the form of questions during class.
- Problem Sets (70%): This is by far the most important part of the course. You are welcome to work together on these, but each person must write up the solutions on his or her own, either by hand (assuming your handwriting is legible) or by computer (preferably in LaTeX). You are strongly encouraged to make sure that you understand each thing you write down, and I encourage you to come talk to me if this is proving difficult. This is for your benefit, not mine; you will get much more out of the class this way. You will turn in a copy of each problem set on its due date, and keep the original for yourself. I will distribute solutions at this time. You will then have a week to provide the self-assessment discussed above on the original problem set (in a different color, if handwritten). At the end of this week you will turn in the assessed original to me. I will try to have this graded a week after you turn in the assessed one. You will be graded on both your original solutions and your assessment. Generous credit will be given for making a real attempt at a difficult problem and then working out later the full solution, even if the solution is not found at first, so don't worry if your initial answers are not flawless. No credit, however, will be given for a cursory first attempt, followed by a detailed assessment. *Do not put problem sets off to the last minute!* The earlier you start, the more help you can expect.
- Paper (20%): You are to produce by the last class a paper comprising an original model and its solution. This paper must contain a formal presentation of the model (no more than two pages), substantive justifications for all modeling assumptions and parameters (no more than three pages), a brief (no more than one paragraph) introduction detailing the question the model is intended to address, a brief (no more than three pages) discussion of insights derived from the model, and an appendix with a formal solution of the model. The model may be on any topic, as long as it uses methods discussed in class. It must be typewritten (again, preferably in LaTeX). *The goal of this assignment is to address a question formally, not to produce a complex model. Simple is completely fine; the focus is on the substantive side.*

Very Tentative Schedule:

Section 1: Why Formal Modeling? and Review of Game Theory I (1 week)

READING: None, but it might be helpful to read over your notes from Game Theory I prior to class.

Section 2: Individual Choice and Some Math (1 week)

READING: **MM** Ch 2,3.

Section 3: Group Choice and Proofs (1 week)

READING: **MM** Ch 4.

Section 4: Normal Form Games and Comparative Statics (2-3 weeks)

READING: **MM** Ch 5.

Section 5: Bayesian Games ($\frac{1}{2}$ week)

READING: **MM** Ch 6.

Section 6: Extensive Form Games (1-2 weeks)

READING: **MM** Ch 7.

Section 7: Dynamic Games of Incomplete Information (1-2 weeks)

READING: **MM** Ch 8.

Section 8: Repeated Games (1 week)

READING: **MM** Ch 9.

Section 9: Bargaining (1 week)

READING: **MM** Ch 10.

Section 10: Mechanism Design and Agency Theory ($\frac{1}{2}$ week)

READING: **MM** Ch 11.

Section 11: Markov Perfect Equilibrium ($\frac{1}{2}$ week)

READING: Acemoglu Lecture notes, pages 65-81 (on Course Website).

Section 12: Behavioral Models and Computational Methods ($\frac{1}{2}$ week)

READING:

Bendor, Jonathan, Daniel Diermeier, and Michael Ting. 2003. "A Behavioral Model of Turnout." *American Political Science Review* 97(2): 261–280.

Siegel, David A. 2009. "Social Networks and Collective Action." *American Journal of Political Science* 53(1): 122–138.

Section 13: Quantal Response Equilibrium and Global Games ($\frac{1}{2}$ week)

READING:

McKelvey, Richard D. and Thomas R. Palfrey. 1995. "Quantal Response Equilibria in Normal Form Games." *Games and Economic Behavior* 10: 6–38.

McKelvey, Richard D. and Thomas R. Palfrey. 1998. "Quantal Response Equilibria in Extensive Form Games." *Experimental Economics* 1: 9-41.

Morris, Stephen and Hyun Song Shin. 2001. "Global Games: Theory and Applications." Cowles Foundation Discussion Paper No. 1275R.