Syllabus for PS 232A: Formal Models in Political Science, Spring 2018

Instructor: Andrew Little, andrew.little@berkeley.edu. Office hours (Barrows 736) by appointment.

GSI: Andrew McCall, andrew.m@berkeley.edu Office Hours Wednesday 3-5 in Barrows GSI room.

Class: TuTh 11:00am-12:30pm, 791 Barrows.

Recitation: F 12:00pm-1:59pm, 791 Barrows.

This course introduces graduate students in political science (and related fields) to game theory, a tool for studying strategic interaction that is now used throughout the discipline. Students will learn the basic concepts of game theory and how to solve most of types of games used in applied political science work.

Goals For this Course and the Sequence

In addition to this course, the department offers a second formal theory course which covers more advanced material (232B) and "topics" courses (239) that focus on particular substantive applications. Students who want more advanced training should also consider taking math and theory classes in the Economics department.

Here is a personal view of what classes you should consider taking as a function of how you see formal theory fitting in to your research plans. A loose hierarchy of formal theory needs is the following:

1. "General consumer": able to understand less technical, classic papers, and at least follow the gist of more technical papers. Definitely take this class, 232B would be nice too.

2. "Serious consumer": not necessarily using models in your own work, but doing empirical (often experimental) work that closely engages with cutting-edge formal theory. Definitely take this class and 232B, 239 would be great when relevant to your interests.

3. "Light user": potentially overlapping with 2, but also doing some original modeling in your work. Definitely take this class and 232B, and some Economics classes would be wise if you have the time. Taking topics classes would also be helpful even if not directly overlapping with your interests.

4. "Heavy user": most work uses formal theory. Definitely take this class and 232B, and some of the Economics sequence is strongly recommended as well. Take the topics classes when possible unless it looks totally uninteresting given your substantive interests.

If you'd like to discuss your needs and plans in more detail feel free to set up a meeting to discuss some time.

A Note on Math

Game theory is a mathematical discipline. However, this is not a math class, and we will spend much more time going through concrete examples of how game theory has been applied to political science than proving general theorems. While some game-theoretic work uses quite advanced math, a fair amount of applied work requires only high school algebra, and most can be done with the addition of some basic probability and multivariate calculus. I will only assume knowledge of algebra, and any probability, calculus and other notation used will be taught/reviewed as we go along. *All students capable of gaining admission to a Berkeley Ph.D. program can fully succeed in this class regardless of prior technical preparation other than the required skills listed above.*

Math is hard and frustrating at times for everyone. I know that some of you may have not taken math in a long time or did not come to political science graduate school to take math(y) classes. A few suggestions if you are nervous about this aspect of the class:

- Stay on top of the readings, and consult multiple texts if you are having a hard time (more on this below)
- Start problem sets early, even if this just means scanning the problems to get your thoughts percolating
- Most importantly: DO NOT BE EMBARRASSED TO ASK YOUR COLLEAGUES OR ME FOR HELP. Again, EVERYONE struggles with some of this material, so there is no shame in admitting you are confused. Much of the material in the class is cumulative, so it is important to clear up any issues early lest you enter the spiral described here: `http://mathwithbaddrawings.com/2013/04/25/were-all-bad-at-math-1-i-feel-stupid-too/`

General Policies

Texts

There are countless introductory game theory textbooks, and even more opinions on the best individual or set of books to use for a class like this. These vary on their level of technicality, focus on political science, and clarity of writing. I think the one that best suits are purposes and hence will serve as the main text is:

- Steven Tadelis, “Game Theory: An Introduction”

A list of typos and corrections to the book (which are incorporated in my version of the book, but perhaps not if you get a used version) can be found here:

`http://assets.press.princeton.edu/releases/m10001.pdf`

When studying game theory (and other technical topics), it is often extremely useful to consult more than one source. For simplicity I will primarily work off Tadelis and won't require any additional text, but I strongly recommend you acquire at least one of these based on your needs.

Two other good books at a similar level as Tadelis:

- Robert Gibbons, “Game Theory for Applied Economists”
- Martin Osborne, “An Introduction to Game Theory”

If you are uncomfortable with the technical aspects of the course, you should try reading the corresponding section in this text before Osborne:

- Avinash Dixit, Susan Skeath, and David H. Reiley Jr., “Games of Strategy”

If you book must be written by Political Scientists, try:

- Nolan McCarty and Adam Meirowitz, “Political Game Theory”

For those who want a more detailed and technical treatment, a good (free!) choice is:

- Martin J. Osborne and Ariel Rubinstein, “A Course in Game Theory”

Two other popular sources among Game Theorists are

- Roger Myerson, "Game Theory”
- Drew Fudenberg and Jean Tirole, “Game Theory”

Another nice source are some videos by William Spaniel:

- `https://williamspaniel.com/on-youtube/`

The list could go on; ask me, others, or the internet if none seem to suit your needs.

Evaluation

- Class Participation: 10%. While this is mostly a lecture class, it should be relatively interactive: I expect to be interrupted a lot, and will often have the class break into groups to work on problems together. So, regular attendance and participation will be necessary to do well.
- Problem Sets: 40%. See below for details. Problem sets will be given out most weeks by Thursday evening at the latest. The problem sets are the following Wednesday evening (by 11:59pm)
- Final Exam: 30%. I usually give a 48 hour take-home exam starting the last day of class, though the exact format will be negotiable.
- Final Paper: 20%. The paper will akin to a proposal for a model that could be a part of a research paper (about 5 pages). Alternatively, if you incorporate a model into a seminar paper for another class that will count as well, provided you have permission from the other instructor.

Problem Sets and Collaboration

The plurality of your grade for the class will come from the nearly-weekly problem sets. Still, please do not forget that what you learn from doing the problem sets is far more important than your grades. To be blunt, rote copying of an answer from your colleagues or other sources is a waste of your time and the grader's time.

That said, I strongly encourage you to work together on the problem sets. Collaboration benefits both the receivers of help as well as the givers: being able to explain something to others is one of the best ways to truly master it. Three important guidelines for collaboration:

1. You should always spend some time trying to figure out the problems on your own before turning to others. This is both to keep a check on how well you understand the material, and because the initial stages of trying to crack a problem on your own are an important – if hard! – way on the path to understanding.
2. Your solution must be written in your own words. Again, copying is a waste of everyone's time.
3. If your solution to a problem comes from one of your colleagues – and this is more than fine as long as you follow guidelines 1 and 2 – acknowledge them in your write up. For example "Joe M provided the general approach to solving part a"

Schedule

Headers refer to approximately one class. The exact pace of the class is endogenous: comprehending what we do cover will be prioritized over getting through everything.

Introduction; Why do Game Theory; Preferences, Choice, and Utility

Background

Ben Orlin, "What it Feels Like to Be Bad at Math"

Clarke, Kevin A., and David M. Primo. 2007. "Modernizing Political Science: A Model-Based Approach." Perspectives on Politics 5, 4:741–753.

Little, Andrew and Thomas Pepinsky. 2016. "Simple and Formal Models in Comparative Politics," Chinese Political Science Review. Vol 1, No 3, 425–447.

Covered

My lecture notes on preferences, **or** Tadelis Chapter 1

Decision-making with uncertainty and time

Tadelis Chapter 2

What is a (normal form) game? What is a solution?

Tadelis Chapter 3

Pre-Nash solutions

Tadelis Chapter 4. Can skim 4.2 and later references to Iterated Deletion of Strictly Dominated Strategies.

Nash Equilibrium, Discrete Applications

Tadelis Chapter 5.1

Nash Equilibrium, Continuous Applications

Tadelis Chapter 5.2-5.3 (particularly 5.2.3, 5.2.5)

Mixed Strategies

Covered: Tadelis Chapter 6.1-6.2
Optional: Tadelis Chapter 6.3-6.4

Extensive Form Games

Tadelis Chapter 7

Solving Extensive Form Games

Tadelis Chapter 8.1-8.2

Examples of Extensive Games

Tadelis Chapter 8.3, 11.2
Applications
Rosenthal, Howard. "The Setter Model"

Multistage Games

Tadelis Chapter 9
applications
Powell, Robert. 1991. "Absolute and Relative Gains in International Relations Theory", APSR.

Infinitely Repeated Games 1

Tadelis Chapter 10.1-10.5

Infinitely Repeated Games 2, the Folk Theorem

Tadelis Chapter 10.6

Examples of Infinitely Repeated Games

Tadelis Chapter 11.3-11.4
Applications
Weingast, Barry. 1997. "The Political Foundations of Democracy and the Rule of Law"

Bayes Rule and Bayesian Games

Tadelis Chapter 12.1

Applications of Bayesian Games

Tadelis Chapter 12.2-12.4 (12.5 Optional)

Extensive Games of Incomplete Information; Beliefs

Tadelis Chapter 15.1

Perfect Bayesian(/Sequential) Equilibrium

Tadelis Chapter 15.2-15.4

Signaling and Screening

Tadelis Chapter 16

Cheap Talk

Tadelis Chapter 18