Political Science 476/589: Introduction to Game Theory
Winter 2021

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Class Time: 1:30-4:20pm
Office Hours: TTh 9:30-10:30a, by appt

Course Description

Overview. Game theoretic models have become a standard analytical tool in social science research, making it crucial for students to acquire at least a basic familiarity with these methods. This course provides an introduction to game theoretic modeling, focusing in particular on non-cooperative game theory and its applications in canonical and contemporary research.

This course will be a rigorous methodological introduction to the core concepts of non-cooperative game theory, emphasizing applications and modeling techniques relevant to applied research in political science and the social sciences more broadly. Students will be exposed to a variety of analytical frameworks and models including expected utility theory, normal and extensive form games, and games of complete and incomplete information. In addition, we will focus on applications of some of the workhorse game theoretic models in the social sciences including bargaining and signaling models, among others.

Although we will rarely use more than basic algebra and calculus, the material covered in the course is analytically demanding and may require students to brush up on mathematical techniques. That said, the challenge for applied game theorists and usefulness of the tools is in the understanding the logic behind models, *not* the math. This course assumes no prior experience with either formal modeling or mathematical coursework. We will begin the course with a review of all necessary mathematical tools and notation.

Learning Objectives. Students will be expected to demonstrate the ability to construct and solve simple static and dynamic game theoretic models of complete and incomplete information in their own research. They will develop an understanding of how game theoretic models can be employed as an analytical tool in their own mixed-method research designs. In addition, they will become intelligent consumers and critics of applied game theoretic research found in the major disciplinary journals of political science.

Structure of Remote Course. In my experience, the best way to learn this material is by doing. This learning technique is complicated in the remote setting we find ourselves. After talking with my peers from around the country teaching similar courses online, I have restructured the class following a "flipped classroom" approach. Each week, you will watch a pre-recorded lecture on your own time prior to that class meeting and we will work together through corresponding problem sets during our class sessions. It is critical you come prepared with pen and ample paper to work through problems in real time! I expect active participation and believe you will find this an efficient and productive way to learn the material. Following each class, you will then type up your problem sets, answer any written questions, and submit them online before the following class.

Required Readings and Materials. There is one required textbook for the course, available in PDF form on the course Canvas page, at the campus bookstore, and through a variety of online retailers in both hard copy and electronic versions:

Tadelis, Steven. 2013. *Game Theory: An Introduction.* Princeton: Princeton University Press. (link)

Course Assessment and Expectations

Components of Final Grade.

1. Problem Sets (40%). Students will submit eight problem sets throughout the quarter. All problem sets are to be submitted on Canvas prior to the start of class the day they are due. Your answers must be typeset in LATEX, though you may submit scanned copies of any additional notes to show your work. All written work should be prepared independently.

2. Participation (20%). Students are expected to be active participants during class sessions. I will call on students at random and expect not necessarily that you always have the right answer, but that you are actively engaging with the material and able to explain where you are stuck. (In many cases, this actually more useful for the class than having the right answer!)

3. Midterm Exam (10%). This class will have a midterm exam covering the material from Weeks 1-6. It is a closed book, take home exam you will be given a week to complete, though it should take no longer than 4 hours. The questions on the exam will be similar to those on the problem sets. The exam will be available on Canvas at 4:20pm on February 17, 2021, and must be submitted on Canvas by February 24, 2021, at 1:30pm.

4. Final Portfolio (30%). At the end of the quarter, students are expected to submit corrected and annotated problem sets from throughout the quarter together (10%) with one of the following short papers (20%):

   (a) A research proposal that explains how and why you will incorporate a modeling technique we have employed this quarter.

   (b) A critique of an academic article with a formal model that assesses its usefulness and appropriateness of the application. If you choose this option, you must get approval from me for the article/book by February 25, 2021. I am also happy to help with recommendations in your areas of interest.

Expectations for 476 & 576. This course is being offered as a joint course with advanced undergraduate students and graduate students. While the learning objectives remain the same, students enrolled in the course for graduate credit will complete longer problem sets that extend the material covered in the textbook to applications in contemporary research. Each week will cover a specific class of models with readings and problems in the textbook for this course (Tadelis 2013). All students will complete both the reading and selected textbook problems associated with those concepts and techniques.

In addition, students enrolled in the course for graduate credit will read and prepare solutions for a model from a published paper that applies the concepts and techniques from the textbook. In doing so, the expectation is graduate students are not only mastering the concepts to be consumers of these models, but also building the skills to write a model in their own research. While undergraduate students enrolled in POL S 476 are of course welcome to work through these papers and submit solutions, it is not required. Instead, I ask these students read the introductory sections of these articles that motivate the research at hand as well as the basic model set-up, but stop short of working through the equilibria themselves to derive solutions and analytic results.

Course Policies

Typesetting Submitted Work. All problem sets must be typeset using LATEX. While I encourage students to use this (forced) opportunity to get comfortable with a TEX editor, you may also use a graphical interface like LyX if you prefer. I will provide a brief introduction and sample code/templates on the first day of class.

Late Penalty. Late problem sets **will not be accepted** if you do not get permission from me ahead of time to turn it in past the assigned due date and time. The reason for this is that we will as a class immediately present and review solutions to the problem sets at the start of the class in which they are due. Midterm and final exams that are not turned in on time will receive a 10% penalty for each hour (or part thereof) they are late.

Academic Misconduct. Academic misconduct is a serious offense at the University of Washington. All cases of suspected academic misconduct will be referred to the Arts and Sciences Committee on Academic Conduct. University policies and guidelines regarding cheating and plagiarism can be found here: UW Academic Responsibility Guidelines. If you are uncertain what constitutes plagiarism, please ask the instructor and/or refer to the University of Washington Student Conduct Code (WAC 478-120-024).

Student Accommodations. Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course.

Religious Accomodations. Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Faculty Syllabus Guidelines and Resources. Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form available here.

Winter 2021 Course Outline

• required reading (all)   ◦ 476 optional/skim readings   ⊙ due date

Week 1: Course Introduction & Applied Formal Models in the Social Sciences

Wednesday, January 6, 2021.   Zoom @ 1:30 PST

Some resources I will be drawing on in our first meeting...

> Little, Andrew T. and Thomas B. Pepinsky. 2016. "Simple and Formal Models in Comparative Politics."
> *Chinese Political Science Review* 1: 425-447
>
> Myerson, Roger B. 1992. "On the Value of Game Theory in Social Science." *Rationality and Society*
> 4: 62-73.
>
> Powell, Robert. 1999. "The Role of Formal Models." In *The Shadow of Power*. Princeton: Princeton
> University Press. ⇒ pp. 23-38.
>
> Morton, Rebecca B. 2004. "Political Science's Dilemma." In *Methods and Models: A Guide to the
> Empirical Analysis of Formal Models in Political Science.* Cambridge: Cambridge University Press.
>
> Ashworth, Scott, Christopher R. Berry, and Ethan Bueno de Mesquita. 2015. "All Else Equal in Theory
> and Data (Big or Small)." *PS: Political Science & Politics* 48: 89-94.

Week 2: Math Refresher, Expected Utility Theory, and How to Read a Formal Model

Wednesday, January 13, 2021   Zoom @ 1:30 PST

- Moore & Siegel (2013): Chapters 3, 5-6, 8
- Morrow, James D. 1994. "Utility Theory." In *Game Theory for Political Scientists.* Princeton: Princeton
  University Press.
- Tadelis, Steven. 2013. *Game Theory: An Introduction*. Princeton: Princeton University Press. ⇒
  Chapters 1 - 2.2.3 (pages 3-10, 14-21)
- Notes on "How to Read a Formal Theory Paper"

Week 3: Normal Form Games

Wednesday, January 20, 2021   Zoom @ 1:30 PST

- ⊙ Problem Set 1 Due
- • Tadelis, Steven. 2013. "Game Theory: An Introduction." Princeton: Princeton University Press. ⇒
  Chapters 3, 4-4.3.4.
- ◦ Geddes, Barbara. 1991. "A Game Theoretic Model of Reform in Latin American Democracies." American Political Science Review 85: 371-392.

Week 4: Mixed Strategy Nash Equilibrium & Graphing Equilibrium Spaces

Wednesday, January 27, 2021   Zoom @ 1:30 PST

- ⊙ Problem Set 2 Due
- • Tadelis, Steven. 2013. *Game Theory: An Introduction*. Princeton: Princeton University Press. ⇒
  Chapters 5 - 6.2.
- ◦ Krehbiel, Jay N. 2016. "The Politics of Judicial Hearings: The Role of Public Oral Hearings in the
  German Constitutional Court." *American Journal of Political Science* 60: 990-1005.

Week 5: Extensive Form Games & Subgame Perfect Nash Equilibrium

Wednesday, February 3, 2021   **Zoom @ 1:30 PST**

⊙ Problem Set 3 Due

● Tadelis, Steven. 2013. *Game Theory: An Introduction*. Princeton: Princeton University Press. ⇒ Chapters 7 (skip section 7.2.2) and 8-8.3.3 (skip section 8.3.4)

○ Helmke, Gretchen and Mitchell S. Sanders. 2006. "Modeling Motivations: A Method for Inferring Judicial Goals from Behavior." Journal of Politics 68: 867-878.

Week 6: Repeated Games & Bargaining

Wednesday, February 10,   **Zoom @ 1:30 PST**

⊙ Problem Set 4 Due

● Tadelis, Steven. 2013. *Game Theory: An Introduction*. Princeton: Princeton University Press. ⇒ Chapters 10-10.4 and 11-11.3

○ Gowa, Joanne and Edward D. Mansfield. 1993. "Power Politics and International Trade." American Political Science Review 87: 408-420.

Week 7: Review & Midterm Week

Wednesday, February 17,   **Zoom @ 1:30 PST**

⊙ Problem Set 5 Due

Week 8: Static Games with Incomplete Information & Bayesian Nash Equilibrium

Wednesday, February 24, 2021   **Zoom @ 1:30 PST**

⊙ Midterm Exams Due

● Moore, Will H. and David A. Siegel. 2013. "An Introduction to Probability." In *A Mathematics Course for Political & Social Research*. Princeton: Princeton University Press. ⇒ Focus on section 9.2.3

● Gibbons, Robert. 1997. "An Introduction to Applicable Game Theory." *Journal of Economic Perspectives* 11: 127-149.

● Tadelis, Steven. 2013. *Game Theory: An Introduction*. Princeton: Princeton University Press. ⇒ Chapters 12 - 12.2.1

Week 9: Dynamic Games with Incomplete Information I: Perfect Bayesian Equilibrium

Wednesday, March 3, 2021   **Zoom @ 1:30 PST**

⊙ Problem Set 6 Due

● Tadelis, Steven. 2013. *Game Theory: An Introduction*. Princeton: Princeton University Press. ⇒ Chapters 15 - 15.2 and 16-16.2.

○ Vanberg, Georg. 2001. "Legislative-Judicial Relations: A Game-Theoretic Approach to Constitutional Review." *American Journal of Political Science* 45: 346-361.

Week 10: Dynamic Games with Incomplete Information II: Signaling Games & Cheap Talk

Wednesday, March 10, 2021

⊙ Problem Set 7 Due

- Tadelis, Steven. 2013. *Game Theory: An Introduction*. Princeton: Princeton University Press. ⇒ Chapter 18.1 and 18.3 (skip 18.2)

○ Wolford, Scott. "Showing Restraint, Signaling Resolve: Coalitions, Cooperation, and Crisis Bargaining." *American Journal of Political Science* 58: 144–156.