Organisation: Economics 208 meets throughout Fall Quarter, from 8:00-9:20 on Mondays and Wednesdays in Economics 300. The seven lectures in my segment will be on November 8, 13, 15, 20, 22, 27, and 29. My office hours throughout the quarter will be Wednesdays from 2:00-3:00 or by appointment. The course segment website is linked at http://dss.ucsd.edu/~vcrawfor/#Courses.

Instead of a final exam, each segment will have its own take-home mini-exam/long problem set. You are expected to work on these individually, i.e. without consulting any classmates, faculty (except us), etc. My mini-exam will be posted on the course website by the end of class on November 29 and due by 4 p.m. Friday, December 1. This date is firm, except in case of severe, unforeseeable events, in which case exceptions must be requested as soon as possible, and before the deadline. The exam will include a flexible essay question, which is given at the end of this syllabus. This question is meant to help you think about how to use behavioral game theory to do economics; its choices give you some freedom to make it about the kind of economics you are interested in. An optional problem set, which should be good practice for the final exam and may help you think about some of the issues we discuss in lectures, will also be posted by November 8.

Introduction: Behavioral game theory is a blend of traditional game theory and empirical knowledge whose goal is the understanding of strategic behavior needed for applications. Such understanding includes topics from behavioral decision theory plus two topics that are specific to multi-person settings: (1) preference interdependence (such as altruism, envy, spite, or reciprocity); and (2) players’ models of other players. Here I narrow the focus to (2), assuming that behavior is (mostly) rational in the decision-theoretic sense and self-interested. I further subdivide (2) into: (2a) how players model others’ decisions in initial responses to games with no clear precedents; and (2b) how players learn to predict others’ decisions in repeated play of analogous games.

Traditional game theory has approached questions (2a) and (2b) in very different ways. Initial responses are assumed to be determined by players thinking about the game and forming self-confirming beliefs about each other's decisions, which (if they are rational) lead them to equilibrium immediately. Learning is modeled by assuming that players adjust their beliefs in repeated play of analogous games in sensible, “adaptive” (but non-equilibrium) ways, which normally make them converge to an equilibrium eventually. Thus traditional models of initial responses assume that players have perfect mental models of others, while traditional models of learning assume that players have simplified models, which substitute direct observation of others’ past decisions for the strategic reasoning that underlies equilibrium models of initial responses.

Behavioral game theory adapts these approaches in three ways, corresponding to (1), (2a), and (2b) above. (2a) starts from the observation that in games of any complexity, initial responses in the lab, and presumably in the field, are normally “strategic” in that they reflect attempts to use others’ incentives to predict their decisions, but they often deviate systematically from equilibrium. This raises the question, “If people are strategic but don’t always play an equilibrium, what do they do?” Answering this question is essential in applications involving games without clear precedents. (When the stock market re-opens after 9/11, do you sell airline stocks—or buy them on the theory that others will be too eager to sell? How will Bill Gates react when your start-up enters one of
“his” markets? Where on the coast of France do you land on D-Day?) The answer is also important in games with cloudy precedents, though the question of how players react to imperfect analogies is still on the research frontier. Finally, the answer is important in analyzing the comparative statics of changing a game’s rules or payoffs; and in mechanism design, which involves creating new games that may have to “work” the first time (as in the FCC spectrum auctions).

(2b) seeks to identify the structure of players’ learning rules. That structure determines whether, and how quickly, players will converge to equilibrium in a stationary environment, and how they will adjust to changes in the environment. It also has more subtle implications. If a typical application gives players ample opportunity to learn from others’ previous decisions in analogous games, but the games have multiple equilibria, then learning is history-dependent and its limiting outcome is influenced by both the structure of players’ learning rules and their initial responses.

As suggested above, behavioral game theory is inherently partly empirical. Because the kind of observability and controllability needed to test theories of strategic behavior is found only rarely in the field, most of the evidence comes from experiments. (The extent to which lab results “transfer” to analogous field environments is now a hot topic in experimental economics, but it will not be discussed here.) My approach in both (2a) and (2b) will be first to review existing evidence and use it to identify the most useful parts of traditional theories and measure behavioral parameters the theory does not reliably determine; and then (at least for (2a) to illustrate the use of the resulting models to resolve empirical puzzles by “re-doing” certain parts of strategic microeconomics.

The course will begin by reviewing the leading theories of initial responses to games (iterated reasoning about rationality or beliefs, backward and forward induction, and equilibrium-selection conventions based on structure, framing, and/or fairness) and using evidence to explore how the factors they consider influence behavior. The course will then discuss the leading theories of adaptive learning, using evidence to explore the structure of learning rules and how learning interacts with initial responses to determine limiting outcomes.

We will cover topics in the order in which they are listed, but there are many more topics and readings than we can possibly cover in seven lectures. (I have tried to be fairly comprehensive for those of you who want to study behavioral game theory in more depth.)

I don’t list topics week by week because the rate of progress is hard to predict.

Outline and Readings: The most important readings are marked *. Several are from:

(“CC”) Colin Camerer, Behavioral Game Theory: Experiments on Strategic Interaction, Princeton, 2003


1. Overview of behavioral game theory and game experiments

*CC, Chapter 1, “Introduction”; Appendix 1.1, “Basic Game Theory”; and Appendix 1.2, “Experimental Design”

Useful background readings include (spaces separate topics):


KR, Chapter 1, “Introduction to Experimental Economics” by Alvin Roth

2a. Theory and evidence on initial responses to games

i. Iterated dominance and equilibrium in simultaneous-move games

*CC, Chapter 5, “Dominance-Solvable Games”
*VC, Section 4, “Dominance and Iterated Dominance”

Useful background readings include (spaces separate topics):


Example applications (spaces separate topics):

http://www.mitpressjournals.org/loi/qjec?cookieSet=1

(http://www.jstor.org/jstor/)


On the last two papers, see also lecture slides on "Outguessing and Deception in Novel Strategic Situations" at http://dss.ucsd.edu/~vcrawfor/SMUPubLecSlides.pdf or (slightly different) http://dss.ucsd.edu/~vcrawfor/KelloggMEDSDeceptionSlides.pdf


**ii. Backward induction, subgame-perfectness, and forward induction in extensive-form games**


Useful background readings include (spaces separate topics):


iii. Selection among multiple strict equilibria via structure, framing, fairness, or complexity

*CC, Section 4.1, "Unstructured Bargaining"; Chapter 7, “Coordination”
*VC, Section 5, “Simultaneous Coordination”


Useful background readings include (spaces separate topics):


Vincent Crawford "Adaptive Dynamics in Coordination Games," *Econometrica* 63 (January 1995), 103-143: Section 2 (pp. 106-109, especially footnote 8) (http://www.jstor.org/jstor/ or http://dss.ucsd.edu/~vcrawfor/Crawford95EMT.pdf)


Alvin Roth, "Toward a Focal-Point Theory of Bargaining," Chapter 12 (pp. 259-268) in Roth, (ed.), *Game-Theoretic Models of Bargaining*, Cambridge, 1985

2b. Theory and evidence on adaptive learning

i. Overview of adaptive learning models

*CC, Chapter 3, "Mixed-Strategy Equilibrium Games"; Chapter 6, "Learning"
*Colin Camerer and Teck-Hua Ho, "Experience-weighted Attraction Learning in Normal Form Games," *Econometrica* 67 (1999), 827-874 (http://www.jstor.org/jstor/)

Useful background readings include (spaces separate topics):


ii. Equilibrium selection via learning

*VC, Section 6, “Dynamic Evidence”
Useful background readings include (spaces separate topics):


Vincent Crawford "Adaptive Dynamics in Coordination Games," *Econometrica* 63 (January 1995), 103-143 (http://www.jstor.org/jstor/ or http://dss.ucsd.edu/~verawfor/Crawford95EMT.pdf)


**iii. Rule learning and strategic teaching (not covered in lectures)**

*CC, Section 6.7, "Rule Learning"

Useful background readings include:


iv. Learning from imperfect analogies (not covered in lectures)

Useful background readings include (spaces separate topics):


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(The essay question for the mini-exam is on the next page.)
This essay question will be part of the mini-exam. It is meant to get you thinking about how to use behavioral game theory to do economics; the choice gives you some freedom to make the question about the kind of economics you are interested in. My references should be easy to find.

Write a brief (one-page or less) essay on how research on the parts of behavioral game theory studied in this segment should change how we think about your choice of one of the following kinds of application. For some or perhaps all of them, more than one answer is defensible. Full credit will be given for any answer that includes a coherent and empirically plausible rationale. In some cases, there are readings on the syllabus beyond those discussed in class that may be helpful.

(a) the standard use of the revelation principle in designing auctions or incentive schemes
(b) the standard use of the Folk Theorem to characterize outcomes sustainable as implicit contracts in complete-information repeated games
(c) the use of subgame-perfect equilibrium to predict outcomes in infinite-horizon alternating-offers bargaining with complete information, as in Rubinstein (Econometrica 1982)
(d) the use of sequential or perfect Bayesian equilibrium in models with “crazy types” to characterize reputation building, as in Kreps and Wilson, Milgrom and Roberts, or all of the above (Journal of Economic Theory 1982)
(e) the use of refinements such as the “intuitive criterion,” as in Cho and Kreps (Quarterly Journal of Economics 1987), to derive unique predictions despite multiple equilibria in signaling games
(f) the use of rational expectations and/or perfect foresight assumptions in dynamic macroeconomic models to predict the effects of policy changes, as in the Lucas critique, Kydland and Prescott, “Rules versus Discretion…” (Journal of Political Economy 1977), or Barro, “Are Government Bonds Net Wealth?” (Journal of Political Economy 1974)
(g) the use of refinements such as risk-dominance to derive unique predictions despite multiple equilibria in macroeconomic models based on coordination failure like those discussed in Cooper and John (Quarterly Journal of Economics 1988)
(i) the use of ergodic evolutionary dynamics to characterize equilibrium selection in the “long run” in games played repeatedly in populations, as in Kandori, Mailath, and Rob; or Young (Econometrica 1993)

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