**Economics 809: Advanced Information Economics and Game Theory**

**“The Economics of Choice and Chance”**

**(offered Tu/Th 4-515PM by** [**Lones Smith**](https://www.lonessmith.com/) **starting mid-Spring Term, after Marzena stops)**

My first year PhD theory class is a sequence of static economic stories, solved with Lagrangians.

This course is largely independent except I assume very basic game theory learned in the fall of MA or PhD econ. The math level is basic probability and basic calculus, but you should think of yourself as having “analytic sophistication”. This means you love playing around with simple fun models and seeing where they lead. It is a great accompaniment if you plan on advanced macro or labor or finance or doing modeling in any applied field.

A typical economic story starts with an informational or dynamic friction, or story enrichment that changes everything. Here, I teach my secret theory math tricks and tools – some known to few in the world that allow you to swing from the trees. I then show you how I have applied them, and you can think of how you would apply them. These tools will help you solve your best stories in information or strategic twists. Many of them are written down nowhere, and so mastery of them gives you a career advantage.

I will hand out two homeworks and a take home final to learn the tools. I will suggest easier algorithmic questions after each segment and harder open questions that might lead to joint research in the rare event of smart insight and/or extreme enthusiasm.[[1]](#footnote-1) The grade is 2/3 the problems and 1/3 a final presentation of some mini topic of a classic paper (usually not your own!). Advanced theory grades are A or AB or B assuming you try hard throughout.

*Mini Course 1: Monotone Methods in Economics* (≈3 lectures)

* Topkis Review: Supermodularity and Quasi-supermodularity
* Monotone Comparative Statics under Certainty
	+ Stochastic Dominance by the Method of Cones
	+ Logsupermodularity, Total Positivity, and the Variation Diminishing Property
	+ Logconcavity
* Supermodular and submodular Games

*Mini Course 2: Information, Learning, and Social Learning* (≈2 lectures)

* Value of Information: Blackwell’s Theorem; Law of Large Demand for Information
* Location family signals and informational inertia
* Informational Herding and Social Learning

*Mini Course 3: Search and Experimentation* (≈2 lectures)

* Stochastic Dynamic Programming Primer
* Static Search (Stigler, Portfolio Choice: simultaneous search)
* Pandora's Box Problem and Web Search
* MultiUnit Search
* Multiarmed Bandits via Optimal Stopping
* The Kelly Criterion and the MIT Blackjack Team

*Mini Course 4: Pairwise Matching Models* (≈3 lectures)

* TU Matching: Becker’s Marriage Model and Comparative statics
* Dynamic Sorting with Incomplete Information
* Directed Search: College-Student Sorting and Author-Paper Sorting
* Random Matching and
	+ Vigilance: counterfeiting, contagion, driving, Swiss Cheese Model
	+ Optimal Stopping: Search and Matching Models

*Mini Course 5: Ito Calculus, Optimization, and Optimal Stopping*(≈2 lectures)

* Applications to Information Demand
* The Optimal Level of Experimentation
* Nonconcavity in the value of information
* Optimal dynamic contests

*Mini Course 6: Timing Games* (≈1 lecture)

* Rushes (bubbles, sorority rushes, tipping points)
* Aspirational Bargaining
* Conversational Wars of Attrition

Possible Topics for Student Presentation (or dream up your own)

1. Herding with Other Payoffs: When Managers Cover Their Posteriors
2. Shannon Entropy in Economics
3. Voir Dire and Optimal Search
4. Optimal Learning with Finite Memory (Andrea Wilson, 2014)
5. Global Games (Morris and Shin)
6. Potential Games in Economics
7. Exotic: Rescorla–Wagner learning model for animals
1. I have many papers joint with past students. Nine of my top five economics journal publications, plus a few others published in top field journals, emerged from past advanced theory classes, including Wisconsin students. [↑](#footnote-ref-1)