Topics in Game Theory
Spring 2019

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Office hours: Thursday 2-4 pm
or by appointment
Uris hall, Room 218

CLASS SCHEDULE
Fridays 9:30am-12:45pm, Uris 306. (On March 8 - Uris 331.)

PRE-REQUISITES
There are no formal pre-requisites for this class. In particular, the course will be self-contained and accessible to students who did not take an introductory course in game theory. Knowledge of basic probability theory is assumed.

COURSE OVERVIEW
The course will consist of three modules.

Solutions for non-cooperative games. Rationalizability is one of the most commonly used solution to games in strategic and extensive form. We explore the relation of this solution with iterative elimination of strictly or weakly dominated strategies. Iterative elimination of weakly dominated strategy is notoriously known for its paradoxical nature. We present a remedy to this puzzling concept. We show how to properly extend iterative elimination of dominated strategies to games with infinite set of strategies. The art of mediation is found in the way the mediator does not reveal the same information to the various parties. This leads to the notion of correlated equilibrium. We generalize this notion to non-probabilistic mediators.

Games with incomplete information. These games are described and solved using Harsanyi type spaces. We study the meaning of players’ types and present various ways to describe type spaces. In particular, the relation between type spaces and Markov chains will be presented. Harsnyi’s doctrine refers to the assumption that players in a game with incomplete information share a common prior. We study the implication of this commonly made assumption, its relation to the notion of common knowledge and to no-
trade theorems. Conditions for the existence of a common prior are given in terms of no-trade properties and iterative expectations of random variables.

**Cooperative game theory.** Cost allocation problems and the Aumann-Shapley pricing will be presented. Solutions to bankruptcy problems will be studied, and in particular, a puzzling a two millennia old solution to such problems will be explained in terms of modern cooperative game theory. Assortative matching (rich people marrying rich people, for example) will be studied in the context of Gale-Shapley matching model. Finally, bargaining theory with agendas, and with interim agreements will be presented.

**ASSIGNMENTS AND GRADING**

Four hand-in assignment will be assigned over the course of the term. The final grade will be the average of the grades of these assignments.

**SESSION TOPICS**

1. Rationalizability and domination
2. The paradox of iterative elimination of weakly dominated strategies
3. Iterative elimination in infinite games
4. Probabilistic and non-probabilistic correlated equilibrium
5. Types of players in games with incomplete information
6. Common priors and the agreement theorem
7. No trade theorems and the characterization of the existence of a common prior
8. Types and Markov chains
9. Cost allocation
10. Bankruptcy problems
11. Assortative matching
12. Bargaining with agenda and interim agreements