Game Theory

Spring 2023-2024
Class Meeting Time Tuesday 13:00 - 14:30
Location: Naftali 004

Instructor: Dr. Maya Diamant **Email:** maya.diamant@gmail.com
Office: Recanati 040 **Office Hours**: by appointment

I. Overview

The aim of this course is to analyze decision-making in situations where several decision makers interact. Decision-making in such circumstances has unique characteristics which are the result of the influence that each individual's decision exerts on all other decision makers.

Decision-making in interactive situations is the subject matter of game theory. The types of interactions to which this theory applies are many and varied. Individuals engaged in electing a chair person of an organization, employers and employees negotiating terms of employment, competing firms, parties in the parliament, or countries in conflict are all examples on which game theory can shed light.

Any conflict is a "game". Analyzing the conflict using game-theoretic tools may enable us to better understand how the participants ("players") are going to act. This analysis may show that under the current conditions the conflict cannot have a "good" solution. But using these tools we can suggest how to change the "rules of the game" in a way that would make the players promote a socially desired outcome by their own rational and "selfish" decisions.

II. Learning Objectives

This course should prepare students to:

1. Understand basic concepts and tools of game theory.
2. Use these concepts and tools to model and analyze strategic conflicts in order to provide new insights.

III. Course Requirements

- **Final Assignment:** 80% of final grade.
  Students are required to submit an electronic copy of final assignments, rather than a hard copy. Electronic submission is possible via email to the lecturer with cc to the program's office.
  In this class there will be no late submissions and no incompletes will be given.
- **Exercises:** 20% of final grade (four exercises, 5% per exercise).
- **Participation and Attendance:**
  - Attendance in class is required. If you have any Corona-related issues preventing you from attending class (Covid symptoms, quarantine or any other problem) please approach me and ask for a special permission for Zoom attendance.
  - Participation in class discussions and games may grant you up to 5 bonus points.

Final Assignment – Description:
Try to implement at least one of the concepts that were discussed in class to analyze an interactive conflict situation. The goal of the analysis is not reaching an unequivocal solution of the case. It is discussing the case from a game theoretical point of view, in a way that would emphasize the aspects which are relevant to interactive decision making and provide a new insight into the case.
You may write up to four pages + one page of charts, diagrams etc.
The final assignment should be submitted by groups of two students via moodle.
Due date: **TBA**.

Exercises – description:
Six exercises will be given during the semester; due date is the beginning of the next class. Each exercise consists of 2-3 questions.
Students are required to submit **at least four** exercises (5% per exercise). If you submit more than four, the best four of them will be chosen.
Exercises should be submitted on time, by groups of two students, via moodle.

IV. Class Schedule (note: Schedule may slightly change, readings may be added)

Class 1
Introduction: games and decisions

Class 2
Dominant strategies, or when it is possible to disregard competitors

- The prisoner's dilemma – why does he confess?
- The tragedy of the commons and other social disasters.

Class 3
Utility

- Irrational? Not necessarily. Introducing subjective preferences.

Class 4-5
Strategic dominance relationship

- How to think about what my competitor thinks about what I think about him…
- Where should I place my store and what political stance should I express?
- Strategic voting in the board of directors.
- Strict vs. weak dominance

Class 6-7
Strategic equilibrium

- Stable agreements and assurances.
- The traffic light as a mediator.
- Coordination between partners and load distribution among competitors: multi-player games.

Class 8
Mixed Strategies

- Being unpredictable. Penalty kicks: Do football players study game theory?

Zero-sum games

- When stability, optimality and security coincide.

Class 9-10
Dynamic competition

- Identifying strategic alternatives.
- Who can guarantee a win? Mr. Zermelo and chess.
- Perfect equilibrium, or your threats do not frighten me.

Class 11-12
Nature moves

- Should the defendant accept a plea or go to trial, and how to avoid nuisance suits.

Strategic decision making under imperfect information

- Does the competitor opt for war?
- Insured people can be better off being ignorant, or how did the meteorologist bring famine.
- Is it possible to disregard information in interactive situations?

Class 13
Summary, final assignment instructions, Q&A, feedback.

Optional topics (if we have time)

1. Mechanism design: How to set a competitive environment and incentive scheme in order to achieve your goals: From the judgment of Solomon to income tax.
2. Cooperative games.
3. Equilibrium in traffic networks: What will happen to the traffic if we close Sixth Avenue? One has to see to believe it.
4. Auctions.

Recommended Reading:
Maschler, M., Solan, E. and S. Zamir, Game Theory. Cambridge University Press (2013).
Osborne, M., An Introduction to Game Theory, Oxford University Press (2004).
Dixit, A. and S. Skeath, Games of Strategy, Norton (1999).
Dixit, A. and B. Nalebuff, Thinking Strategically, Norton (1991).
Morrow, J., Game Theory for Political Scientists, Princeton University Press (1994).

V. Academic Fraud

Any person found guilty of academic fraud will be subject to severe sanctions. Some examples of academic fraud include:

- plagiarism or cheating of any kind;
- submitting work of which the student is not the author, in whole or in part (except for duly cited quotations or references);
- presenting research data that has been falsified or concocted in any way; and
- submitting, without written prior approval from the professors concerned, the same work for more than one course.

VI. Classroom rules

- The use of cell phones/smart phones is not allowed, except for pedagogical purposes (class learning activities).
- Laptops are allowed only if the lecturer agrees.
- Students are expected to arrive to all classes on time. Lateness can count as missing a class.