ORT Braude College
Department of Software Engineering
Department of Information Systems Engineering

61993 – Game Theory

Credit Points: 3
Hours: 3 lecture hours
Prerequisites:
Software Engineering: 11102 Algebra 1 for Software Engineering, 61760 Probability Theory for Software Engineering, 61753 Algorithms
Information Systems Engineering: 11102 Algebra 1 for Software Engineering, 51709 Probability Theory, 61753 Algorithms
Corequisites: None

Course Description

Game theory deals with the analysis of strategic situations which involve players with conflicting goals and attempts to answer questions such as what is the best strategy for each participant and how to predict the outcome of a given game. The purpose of the course is to review a variety of topics related to the encounter between three areas: economics, game theory and computer science. The course will include lectures that develop the relevant theory and discuss the related practical applications. The course begins with a short introduction to game theory. We will then review variety of classic topics and contemporary issues, specifically concentrating on algorithmic aspects.

Course Structure

The course includes frontal lectures. The students will be requested to submit homework assignments and have to take a final exam.

Grading

Final exam – 85%
Homework assignments– 15% (a student must successfully pass the final exam in order to account homework grade)

Course Contents

1. Introduction to game theory: strategic form games, dominant/dominated strategies, Nash equilibrium in discrete and continuous games
2. Price of Anarchy/Stability

3. Network routing games
4. Load balancing and scheduling games
5. Auction theory and its use in sponsored search markets (i.e. Google ad auctions)
6. Mechanism design, VCG mechanism
7. Stable Matchings
8. P2P games
9. Bitcoin and cryptocurrency

Bibliography

The course doesn't follow any specific textbook.

Recommended texts:

1. OSBORNE, M.J., Introduction to Game Theory, Oxford Univ. Press. 2004.
2. OSBORNE, M.J., RUBINSTEIN, A., A Course in Game Theory, MIT Press. 1994.
3. LEYTON BROWN, K., SHOHAM, Y., Essentials of Game Theory: A Concise, Multidisciplinary Introduction, Morgan & Claypool Publishers. 2008.
4. NISAN , N., ROUGHGARDEN , T., TARDOSH, E., VAZIRANI, V., Algorithmic Game Theory, Cambridge University Press, 2007 https://www.cs.cmu.edu/~sandholm/cs15-892F13/algorithmic-game-theory.pdf
5. EASLEY D., KLEINBERG, J,. Networks, Crowds and Markets: Reasoning about a Highly Connected World http://www.cs.cornell.edu/home/kleinber/networks-book

After studying Algorithmic Game Theory, the student should be able to:

	Learning Objective
1	Describe and explain the applications of game theory and the basic solution concepts in static and dynamic games.
2	Analyze different solution concepts in various types of games and use a variety of tools to find equilibria.
3	Distinguish between the different types of games, and classify a given game accordingly.
4	State and explain the fundamental algorithmic game theory models, distinguish between them and be able to convert a multi-agent decision situation into a correct analytic model.
5	Understand the way in which algorithmic game theoretic models can be applied to a variety of real-world scenarios in computer science and related applications.
6	Assess the influence of competition on strategic situations in various computer science problems, predict the outcomes and design algorithms accordingly.

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