Game Theory Course:

School of ECE, University of Tehran, Spring 2024

Description:

This course is an introduction to the fundamentals of game theory and its applications. The focus of the course is mainly on the multi agent/player decision making problem under different settings like cooperation, competition, bargaining and coalition formation. Motivations are drawn from real-world multi agent systems like: Socio-economic networks, Blockchains, Crowdsourcing/Crowdsensing, Wireless networks, Smart grids, Intelligent transportation networks, Markets/Auctions, Recourse allocation problems, and Biological systems. The course emphasizes theoretical foundations, mathematical tools, modeling, and equilibrium notions under different circumstances.

References:

- Ozdaglar A., Game Theory with Engineering Applications, MIT Course Online 2010.
- Fudenberge D., Birole J., Game Theory, MIT Press, Cambridge, Massachusetts, 1991.
- Martin J. Osborne and Ariel Rubinstein, A course in game theory, MIT Press, 1994.
- Dario Bauso, Game Theory with Engineering Applications, Society for Industrial and Applied Mathematics (SIAM), 2016.
- Basar, T., Olsder, G. J., Dynamic non-cooperative game theory, Second Edition, SIAM, 1999.
- D. Fudenberg, Levine D., The theory of learning in games, MIT Press, Cambridge, Massachusetts, 1998.
- Ross Cressman, Evolutionary Dynamics and Extensive Form Games, MIT Press, Cambridge, Massachusetts, 2003.
- Shoham, Yoav, and Kevin Leyton-Brown. Multiagent systems: Algorithmic, game-theoretic, and logical foundations. Cambridge University Press, 2008.
- Nisan, Noam, et al., eds. Algorithmic game theory. Vol. 1. Cambridge: Cambridge University Press, 2007.
- Selected recent research papers.

Content:

1- Introduction, Basic definitions (game, strategy, equilibrium …).
2- Strategic form of the game.
3- Extensive form of the game (game trees) and repeated games.
4- Bayesian Games.
5- Nash Bargaining and cooperative games.
6- Coalitional games.
7- Learning in games.
8- Evolutionary game theory.
9- Mechanism Design.

Grading: Final (10) – Homework (5) – Quizzes (3) – Project (2+) - Presentations (+) – Regular Attendance in the class (+)