IE 598: Games, Markets, and Mathematical Programming

Syllabus

Instructor: Jugal Garg

Description: This course will introduce students to the theory of games and markets and their strong connections to mathematical programming techniques. It will include solution concepts in game theory such as Nash equilibrium and correlated equilibrium, their computation; zero-sum games and minimax theorem; extensive form games; repeated games; competitive equilibrium in markets; utility maximization; strategic analysis; among others. It will be shown that many problems in these areas can be formulated as network flow, linear programming (LP), convex programming (CP), and complementarity (LCP, NCP) problems.

The course will also touch upon the topics of fair division, resource allocation, bargaining, and mechanism design without money.

Grading Policy:

- Mid-term exam (20%)
- Final exam (40%)
- Project (40%)

Texts:

- Algorithmic Game Theory. Eds. Nisan, Roughgarden, Tardos, Vazirani (username=agt1user, password=camb2agt), Cambridge, 2007.
- A Course in Game Theory by Osborne and Rubinstein, MIT Press, 1994.
- Game Theory: Analysis of conflict by Roger Myerson, Harvard Press, 1997.
- Multiagent Systems, by Shoham and Leyton-Brown, Cambridge, 2008.
- Approximation in Economic Design by Jason Hartline