

Syllabus: Y Rinott

DECISION SUPPORT AND RECOMMENDER SYSTEM

1. Introduction to the course. Binary relations and their properties. Decision problem under certainty. Preference relations.
2. Probability background as needed. Subjective probability (Savage). Some background in statistics, and Bayesian statistics.
3. Lotteries, decisions under uncertainty.
4. Introduction to expected utility according to von Neumann-Morgenstern. von Neumann-Morgenstern axioms.
5. von Neumann-Morgenstern representation theorem.
6. Introduction to game theory. Various classifications of models in game theory. Examples, e.g. Prisoner's Dilemma, the Chicken game, and their relation to current politics (Trump and North Korea?). Definition of non-cooperative strategic game.
7. Pareto optimality, best response, removal of dominated strategies, Nash equilibrium and its computation.
8. Nash equilibria in non-cooperative strategic games. Strictly competitive (or zero-sum) non-cooperative strategic games. Maximization, maximin theorem, the relation to Nash equilibrium, and value of a strictly competitive (or zero-sum) game. Some examples.
9. Mixed and pure strategies for a non-cooperative strategic games. Expected utility for mixed strategy profiles. Mixed strategy Nash equilibrium.
10. Approximate Nash equilibrium, regret, Evolutionarily Stable Strategies (ESS).
11. Correlated equilibrium
12. Cooperative games and computation of Shapley's value.
13. Games with sequential actions.
14. Repeated and stochastic games.
15. Statistics as a game and implications. Some discussion of statistical decision rules.
16. Paradoxes, Arrow's impossibility theorem.
17. Social choice: aggregation of preferences, Gibbard - Satterthwaite theorem, manipulations, majority rules and individual rights.

Books that will be used:

K. Leyton-Brown, Y. Shoham: Essentials of Game Theory, Morgan & Claypool Publishers, 2008.

Can be downloaded from

<http://physics.ujep.cz/jskvor/KVM/TeorieHer/shoham.pdf>

D.M. Kreps: Notes On The Theory of Choice, Westview Press, 1988

W. Gaertner: A Primer in Social Choice Theory, Oxford University Press, 2009.

Presh Talwalkar : The Joy of Game Theory: An Introduction to Strategic Thinking Paperback 2014 (more for fun)