Math 180 Syllabus

Yuecheng Zhu

November 2, 2015

Lecture: MWF 12pm -1pm, DRL 3C2
Lecturer: Yuecheng Zhu

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Textbook: There is no required textbook. However, *Analytic Methods for Lawyers*, 2nd Ed, by Jackson ect. is recommended.

Grading: Participation and Homework 25%, Two mid-terms $2 \times 25\%$, A Final Paper 25%. There will be about 10 homework. The first mid-term will be Oct 2, Friday. The second will be Nov 2, Monday. The final paper will be due Dec 15.

Topics:

Decision Analysis Aug 26, 28, 31

- Decision tree
- Probability and Expectation
- Trial, Game Show, Stocks, Car Sale

Introduction to Game Theory Sep 2-Oct 7

- Dominant strategies, the prisoner’s dilemma (Problem 1).
- Maxmin and minmax strategies, the camping problem (Problem 2).
- Dominated strategies, Iteratively elimination of dominated strategies, two bars problem (Problem 3).
- Nash equilibrium, battle of sexes (Problem 4). The Higher love version, the lower love version.
- Eliminating weakly dominated strategies, sacking Rome (Problem 5).
- Put yourself in other’s shoes plus eliminating strictly dominated strategies, the number game (Problem 6), the political spectrum problem (Problem 7).
- Nash equilibrium again, formal definition.
- Best response against mixed strategies, the graph when your opponent only has two strategies (Problem 8).
- Best response, eliminating the strategies that are never best responses. Penalty kick game (Problem 9) (simplified version in class, complicated version in homework, and final version in 1st mid-term).
- A continuous spectrum of strategies, a study group problem (Problem 10)
- Mixed again mixed, Battle of sexes again (Problem 11)
- Mix Nash equilibrium, the tennis problem (Problem 12), tax audit problem (Problem 13)
- Evolutionarily stable strategies, coordinate ants vs defect ants (Problem 14).
- Evolutionarily stable strategies by Nash equilibrium.

(Fall break)

Basic Probability Theory Oct 12-30

- Sample space, outcomes, events, and probabilities.
- Unions, intersections, and complements, the addition rule, the inclusion-exclusion rule.
- Roll two dice, flip coin ten times, birthday experiment.
- The fifty-fifty fallacy.
- Friendship Paradox.
- Independent events and the multiplication rule, coins and dice, cards, winning the lottery twice.
- misuse of multiplication rule in law, DNA evidence.
- Baseball, Laws of average fallacy.
- People vs Collins.
- Conditional probabilities, Boys and Girls.
- Bayes’ rules, testing for a disease, women receive A.
- Use Bayes’ rule as a measure of evidence, spam filtering, stocks and economy crisis,
- Use Bayes’ rule to compare hypothesis, homework problem.
- The Monty Hall problem.
- People vs Simpson.

Statistics

Introductory Finance