CS 294 / Stat 260, Fall 2014:
Learning in Sequential Decision Problems

Lectures: Evans 334. Tuesday/Thursday 2:00-3:30.

Instructor:

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Office Hours:

Mon 1:00-2:00, 723 Sutardja-Dai Hall.
Thu 1:00-2:00, 399 Evans Hall.

Course description

This course will focus on the design and theoretical analysis of learning methods for sequential decision-making under uncertainty. Sequential decision problems involve a trade-off between exploitation (optimizing performance based on the information at hand) and exploration (gathering more information). These problems arise in many important domains, ranging from clinical trials, through computer network optimization and adaptive packet routing, to website and page content optimization, marketing campaign and internet advertising optimization, and revenue management.

Topics covered will include a selection from the following list. Stochastic and game theoretic formulations of sequential decision problems: multi-armed bandits, linear, convex, and Lipschitz bandits, large-scale (combinatorial) bandit problems, contextual bandits, Markov decision processes, approximate linear programming approaches to controlling MDPs, tools for finite sample regret analysis.

Prerequisites:

Probability theory or statistics (at the level of Stat 205A and 210A). Some previous exposure to algorithms, game theory, linear algebra, convex optimization will be helpful.

Assessment:

The assessment will have two components: presentation of a paper in class and participation in the discussion of these papers (30%=20% presentation + 10% participation), and a final project (70%).

The final project can be in any area related to the topics of the course. You might extend a theoretical result, develop a new method and investigate its performance, or run experiments on an existing method for a particular application, or do a combination of these. You will need to submit a written report and give a presentation in class. It is OK to work on projects in groups of two (please email an explanation if there's a good reason to work in a larger group). In all cases you will need to write the report individually. Project proposals are due on September 30 (please send one or two plain text paragraphs in an email message to bartlett at cs). Project reports are due on December 5. Please email a pdf file to bartlett at cs.