

## Stochastic Combinatorial Optimization ORI 397

Stochastic Combinatorial Optimization (SCO) will be offered only once, next semester, Winter 2009. The class has two main purposes:

- 1) To broaden our perspective on optimization by comparing the OR and CS approaches to several classic optimization problems.
- 2) To learn the fundamentals of doing research. I would consider this the primary goal of the class. Of the two goals, this one will be the most useful to students attending the class.

To achieve these two goals, the class will be structured as follows:

- 1) To start the class, I will give a series of lectures on Primal-Dual approximation algorithms. These lectures will build on your basic OR knowledge of duality to describe common methods of creating good approximate solutions to NP-hard problems. I will continue with a series of lectures on online algorithms. Through this second set of lectures, we will explore a common, robust CS approach to dealing with stochasticity.
- 2) Your class grade will be based on a single semester-long project. It is by doing this project that we will learn the fundamentals of doing research. Though it is a single project, you will have weekly due dates for sub-parts of the project. The project can be roughly described as follows:
  - It will be done in groups of 2. So, find someone you like to work with. Doing research in groups helps move things forward.
  - Your group will select the topic of your project, with my guidance. Selecting a topic you are interested in maintains your motivation to put in the required hours.
  - Your group will write a 25 to 30 page summary of 5 to 6 research papers on your selected topic. Parts of this summary will be due throughout the semester, and you

will receive weekly guidance in reading your papers and writing your summary. Through this summary, you will gain the background depth of understanding required for doing research in your chosen area.

- Your group will give two, hour-long presentations to the class on your research topic. As with reading and writing, you will receive guidance on how to create a good presentation on your topic. Giving useful and understandable talks is key to being a good researcher.
- Finally, your group will brainstorm several research problems arising from your summary. The research problems you brainstorm will vary in difficulty from "easily doable" to "looks really hard." In the final weeks of the semester, you will attempt to solve one of your research problems. Both the problems you brainstormed and the solution attempt will be written into your final document.

As you can see, goal 2) is by far the more important goal of this class. It is not an easy goal to achieve and it will require hard work both on your part and on mine. But, we will do certain things to help. Most importantly, each week, I plan to have an individual meeting with every group. During these meetings, we can discuss the papers you are reading, your writeup, and do practice talks for your class presentations. These meetings, the fact that you are working in a group, and weekly due dates on sub-parts of your project will make sure that you progress.

So, sign up for Stochastic Combinatorial Optimization (limited spots available! :) ). Be ready to work hard along with me, and we should have a very useful and enjoyable class. I hope that many of you would be able to publish your work as research papers the following summer.

For references on Primal-Dual approximation algorithms and online algorithms, see:

"Approximation Algorithms" by Vijay V. Vazirani

"Online Computation and Competitive Analysis", by Allan Borodin, Ran El-Yaniv

See you next semester,

Ned.