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ISE 599: Stochastic Optimization

Fall 2013 —T,Th—2 pm-3:20 pm
Location: KAP 148

Instructor: Suvrajeet Sen
Office: OHE 310P
Office Hours: TBD
Contact Info: s.sen@usc.edu.

Course Description

Stochastic Optimization is one of the more rapidly growing areas of optimization. Unlike traditional deterministic optimization models, this paradigm allows us to model uncertainty associated with the decision-making process. In essence, they provide formal tools for including random variables within constrained optimization problems. Such models find applications in a variety situations arising in engineering, science, business, and public policy.

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Learning Objectives

The purpose of this course is to help the student understand when stochastic optimization may be necessary, and what class of models may be most appropriate in different circumstances. We will cover several important algorithms, including the L-shaped method, stochastic approximation (aka stochastic quasi-gradient method) and stochastic decomposition. We will also introduce some stochastic integer programming algorithms which use decomposition-coordination techniques. Although most of the course will be devoted to two-stage models, students will also be introduced to multi-stage stochastic optimization models and algorithms

Prerequisite(s): A first graduate course in optimization. The ability to program in some high level language is also essential.

Course Notes:

Readings, and power point slides will be provided by the instructor. .

Required Readings and Supplementary Materials

Required readings and supplementary materials will be posted on the web.

Description and Assessment of Assignments

Students will be

Grading Breakdown

Students will be graded on two mid-term exams (20% each), a final exam (20%), homework (20%) and a project (20%). The project will require some level of computing.

Assignment Submission Policy

Homework assignments will be submitted during the class period. The project will require a presentation during a class period.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Readings and Homework	**Deliverable/ Due Dates**
Week 1 Dates	Stochastic Programming Applications	Papers and Lecture Notes	
Week 2 Dates	Applications (Contd) and Alternative Formulations of Risk	Papers and Lecture Notes	
Week 3 Dates	Alternative Formulations of Risk	Papers and Lecture Notes	
Week 4 Dates	Two-stage Stochastic LPs: L-shaped method	Lecture Notes	
Week 5 Dates	Test + Regularized L-shaped method	Lecture Notes	
Week 6 Dates	Sampling Methods for Two-stage Stochastic LPs (SAA+SQG)	Lecture Notes	
Week 7 Dates	Sampling Methods for Two-stage Stochastic LPs (SD)	Lecture Notes	
Week 8 Dates	Sampling Methods for Two-stage Stochastic LPs	Lecture Notes	
Week 9 Dates	Test + Two-stage Stochastic IPs	Papers	
Week 10 Dates	Two-stage Stochastic IPs	Papers	
Week 11 Dates	Test + Multi-stage SPs	Lecture Notes	
Week 12 Dates	Scenario Aggregation Algorithm	Papers	
Week 13 Dates	Multi-stage SD	Papers	
Week 14 Dates	Mult-stage SD + Project presentations	Papers	
Week 15 Dates	Project presentations		
FINAL Date			**Date:** **For the date and time of the final for this class, consult the USC *Schedule of Classes* at www.usc.edu/soc.**

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as

possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. Website and contact information for DSP: http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *SCampus*, the Student Guidebook, (www.usc.edu/scampus or http://scampus.usc.edu) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/. Information on intellectual property at USC is available at: http://usc.edu/academe/acsen/issues/ipr/index.html.

Emergency Preparedness/Course Continuity in a Crisis

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.

Please activate your course in Blackboard with access to the course syllabus. Whether or not you use Blackboard regularly, these preparations will be crucial in an emergency. USC's Blackboard learning management system and support information is available at blackboard.usc.edu.