STAT 471: Linear and Nonlinear Programming

Fall 2016

Instructor: Li Wang

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Office hours: MWF 10:00-11:00am
Lectures Time: MWF 2:00-3:00pm
Location: 208 TH
Prerequisite: Calculus, Linear Algebra
Textbook: [1] David G. Luenberger, Yinyu Ye. Linear and Nonlinear Programming, 2016 Edition.
[2] Stephen Boyd and Lieven Vandenberghe. Convex optimization. Cambridge university press, 2004.

Course Description:
Mathematical Optimization is to solve a problem that consists of maximizing or minimizing a real function by choosing input values (variables) from a set, which is defined by finitely or infinitely inequalities. Optimization theory and numerical technique are very important for a wide range of applied science, including computer science, operations research, optimal control and so on. A lot of practical problems are formulated as an optimization problem, and numerical optimization methods are used to solve them globally or locally.

Homework Assignments:
Homework will be assigned weekly by announcement. No late homework will be accepted for any reasons. The lowest homework score will be dropped.

Exams:
There will be one midterm exam given during the regular lecture hour. (Week 9 Wednesday)

Make-up exam policy:
There will be no make-up exams for this course.

Grading:
The final course grade will be based on homework assignments, midterm and final exams.
30% Homework, 20% Midterm Exam, 50% Final Exam

Disability Policy:
Students with disabilities who require accommodations for access and participation in this course must be registered with the Office of Disability Services (ODS).

Tentative Course Outline:
The weekly coverage might change as it depends on the progress of the class.

Week	Content
Week 1	• Introduction • Linear Programming: Examples and Properties • Linear Programming: Examples and Properties
Week 2	• Linear Programming: Simplex Method • Linear Programming: Simplex Method • Linear Programming: Simplex Method
Week 3	• Linear Programming: Duality Theory • Linear Programming: Duality Theory
Week 4	• Linear Programming: Conic Linear Programming • Linear Programming: Conic Linear Programming • Linear Programming: Conic Linear Programming
Week 5	• Convex Sets. • Convex Sets. • Convex functions: definition and examples.
Week 6	• Convex functions: definition and examples. • Convex optimization: examples • Convex optimization: examples
Week 7	• Convex Optimization: duality (I) • Convex Optimization: duality (II) • Convex Optimization: duality (III)
Week 8	• Convex Optimization: applications • Convex Optimization: applications • Convex Optimization: applications
Week 9	• Review for Midterm • Midterm • Unconstrained Minimization: Optimality Conditions
Week 10	• Unconstrained Minimization • Unconstrained Minimization • Unconstrained Minimization: Gradient Descent method
Week 11	• Unconstrained Minimization: Steepest Descent method • Unconstrained Minimization: Newton method • Conjugate Direction Methods
Week 12	• Conjugate Direction Methods • Constrained Optimization: Optimality Conditions • Constrained Optimization: Optimality Conditions
Week 13	• Constrained Optimization: Optimality Conditions • Newton Method with Equality Constraints • Penalty and Barrier Methods
Week 14	• Newton/Conjugate method and Penalty Functions • Primal and Dual methods
Week 15	• Primal and Dual methods • Primal and Dual methods • Review for Final Exam