IE 453 - Topics in Optimization
Syllabus

Spring 2024

1 Course Information

Instructor:	Dr. Sinan Gürel
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Office Hours:	(by appointment)
Course meeting time:	TBA
Room:	TBA

2 Course Description

In the first part of this course, we will cover nonlinear optimization. Unconstrained and constrained nonlinear programming (NLP). We wll focus on optimality conditions and solution methods. Next, we will cover selected topics in discrete optimization such as relaxation approaches and strong formulations for integer programs.

3 Course Objectives

- Be able to formulate problems by using continuous/integer variables and linear/nonlinear functions.
- Understand optimality conditions and some well known methods for solving NLPs.
- Understand strong formulations and relaxations for IP problems.
- Understand valid inequalities, cutting plane and branch-and-cut algorithms.

4 General Requirements

4.1 Prerequisites

- Must have completed IE 252 Operational Research II.

4.2 Textbook

R.L. Rardin, Optimization in Operations Research, Prentice Hall (2000).

5 Topics

1. Nonlinear Programming
   (a) Unconstrained NLPs
      i. One Dimensional Search.
      ii. Local, Global Optimality.
      iii. Gradient Search Method.
   (b) Constrained NLPs
      i. Lagrange Multiplier Theory.
      ii. KKT optimality conditions.
2. Integer Programming
   (a) Introduction.
   (b) Modeling with Integer Variables.
   (c) Stronger LP Relaxations.
   (d) Branch-and-Bound Algorithm.
   (e) Cutting Plane Algorithms.
   (f) Branch and Cut.

6 Exams

- Pop Quizzes (15%)
- Midterm Exam (40%)
- Final Exam (45%)

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