

MA 714: Topics in Discrete Math, Spring 2019

Discrete and Mixed-Integer Optimization

Instructor

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Office hours: Monday, Wednesday, Friday 3-4 pm, and by appointment

Textbook

- M. Conforti, G. Cornuéols, G. Zambelli, Integer Programming, Graduate Text in Mathematics, Springer 2014.

References

- D. Bertsimas and R. Weismantel, Optimization over Integers, 2005.
- R. Vanderbei, Linear Programming: Foundations and Extensions, 2008. (Available through the UK Library as an e-text free of charge)
- R. Fourer, D. Gay, and B. Kernighan, AMPL: A Modeling Language for Mathematical Programming, 2002. (Free to download from AMPL's webpage)

Topics

Discrete and Mixed-Integer Optimization problems are popular in Operations Research and Mathematical Analytics because of their great modeling power and because of the availability of convenient solvers. However, they are typically very hard to solve, both in theory and practice. This course will present the following aspects:

- Modeling techniques, modeling languages and optimization software
- Formulations and relaxations
- Algebra and geometry of integer optimization
- Branch-and-cut method and cutting plane theory
- Convexification and decomposition methods
- Some most recent developments on the research frontier.

Prerequisites

There are no graduate-level prerequisites for this course. Knowledge of linear algebra and basics of linear optimization are helpful. Solving homework will require ability to read and write mathematical proofs, and familiarity with a programming language of your choice.

Grading

Homework will be assigned occasionally to solidify the material in the lectures. Grades will be determined by class participation and homework assignments.