MA 5037: Optimization Methods and Applications
Syllabus and Introduction

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Syllabus

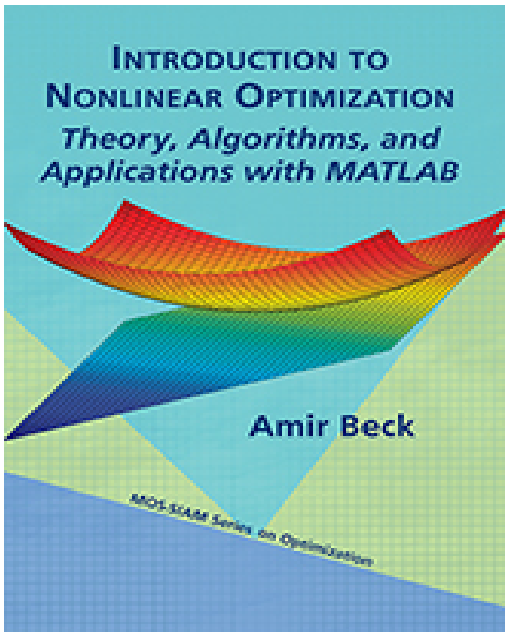
- **Instructor:** Prof. Suh-Yuh Yang (楊肅煜)
  - Office: M315, Hong-Jing Hall
  - Phone: 03-4227151 extension 65130
- **Office hours**: Tuesday 10:00 $\sim$ 12:00 am or by appointment.
- **Prerequisites**: (Advanced) Calculus, Linear Algebra, Numerical Analysis, and some knowledge of software MATLAB: `http://matlab.math.ncu.edu.tw/`
- **Assignments**: Approximately every two weeks, will consist of theoretical problems or computer projects. The students are encouraged to discuss homework with other classmates. *Direct copying is absolutely not allowed.*
- **Examinations:** there will be *a midterm and a final exam.*
- **Grading policy:** *assignments 40%, midterm 30% and final 30%.*

Course objective

- This course will provide the foundations of the theory of nonlinear optimization as well as some related algorithms and will present a variety of applications from diverse areas of applied sciences.
- This course combines three pillars of optimization: *theoretical and algorithmic foundation, familiarity with various applications, and the ability to apply the theory and algorithms on actual problems.*

Textbook

Amir Beck, *Introduction to Nonlinear Optimization - Theory, Algorithms, and Applications with Matlab,* MOS-SIAM Series on Optimization, SIAM, 2014.



http://www.siam.org/books/mo19/

Errata: http://www.siam.org/books/mo19/mo19_err.pdf

Important dates

- The period for adding and dropping a course: 09/05-09/19, 2018
- The period for withdrawing a course: 10/22-12/07, 2018
- National Day: October 10 (Wed), 2018, *no class!*
- Midterm: 11/07 (Wed), 2018
- Sports Day: November 21 (Wed), 2018, *no class!*
- New Year's Day: January 01 (Tue), 2019, *no class!*
- Final: 01/09 (Wed), 2019

This course will cover the following topics

- **Chapter 1:** Mathematical preliminaries
- **Chapter 2:** Unconstrained optimization
- **Chapter 3:** Least squares
- **Chapter 4:** The gradient method
- **Chapter 5:** Newton's method
- **Chapter 6:** Convex sets
- **Chapter 7:** Convex functions
- **Chapter 8:** Convex optimization
- **Chapter 9:** Optimization over a convex set
- **Chapter 10:** Linearly constrained problems
- ***Chapter 11:** The Karush-Kuhn-Tucker conditions
- ***Chapter 12:** Duality