STAT 608A: Optimization methods in Statistics

Fall 2016

Basic information. Lecture Time: 4–5:30 PM MW, EH 1372
Instructor: Long Nguyen, xuanlong@umich.edu, WH 461, office hours: tba
Teaching Assistant: Roger Fan, rogerfan@umich.edu, office hours: tba

Course description. This is a graduate course on optimization methods with applications to statistics and machine learning. We will cover basic optimization algorithms and elements of convex analysis. Modern techniques such as subgradient methods, proximal algorithms, stochastic algorithms will also be discussed.

Textbook. There is no required textbook. Lectures will be provided by the instructor. For references:

- *Convex optimization*, Cambridge University Press (2009) by Stephen Boyd and Lieven Vandenberghe. Note that a pdf of this excellent and highly readable book is available online at the authors' website.

- *Introductory lectures on convex optimization*, Springer (2004) by Yuri Nesterov.

- *Nonlinear programming*, Athena Scientific (2016) by Dimitri P. Bertsekas.

You should access the Canvas class page for this course frequently. It will contain important announcements and homework assignments.

Tentative topics.

- Basic algorithms: gradient descent, accelerated gradient descent, Newton methods

- Elements of convex analysis: subdifferentials and subgradients, convex duality, infimum convolution theorem

- Constrained optimization: Lagrangian duality, subgradient methods

- Interior point method: self-concordant functions, path-following scheme

- Proximal algorithms

- Stochastic optimization

- Linear, quadratic and semidefinite optimization

Evaluation. There will be three homework assignments and one team project. Project topics tbd.