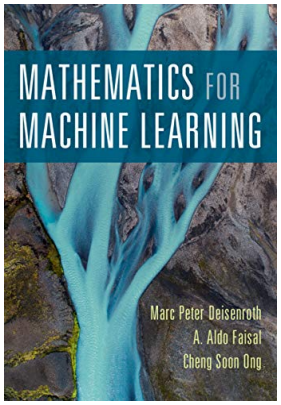
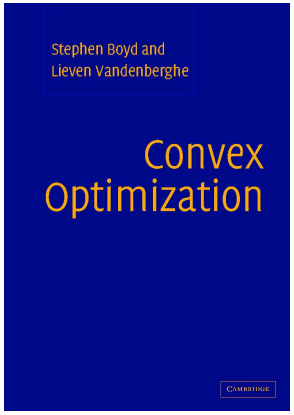
Introduction

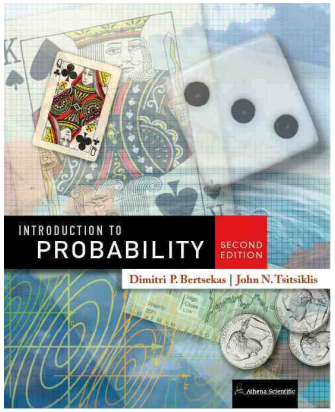
Introduction to Optimization for Machine Learning
M1 MLSD/AMSD

October 17, 2023

Textbook







- Mathematics for Machine Learning[1], Cambridge University Press, Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong
- Convex Optimization, Cambridge University Press, by Stephen Boyd and Lieven Vandenberghe
- Introduction to Probability, 2nd edition, Athena Scientific, by Dimitri P. Bertsekas and John N. Tsitsiklis

[1] The entire textbook can be downloaded at `https://mml-book.github.io/`

Organization

- Part I: Mathematical background
  1. Linear Algebra, vector and matrix
  2. Matrix Decomposition
  3. Vector Calculus
  4. Probability and Statistics
- Part II: Optimization
  1. Unconstrained Optimization
  2. Gradient Descent Algorithms
  3. Newton Algorithm
  4. Constrained Optimization
- Part III: Some Standard Machine Learning Problems
  1. Linear Regression
  2. Dimensionality Reduction with PCA and SVD
  3. Classification with Logistic Regression
  4. Classification with Softmax Regression
  5. Classification with Support Vector Machines