Optimization for ML CS295
TTh 2:00-3:20 PM
Website: https://panageas.github.io/optml2021/

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Office Hours: By appointment.

Textbook: Convex Optimization: Algorithms and Complexity by S. Bubeck (online).
Recommended: Understanding Machine Learning: From Theory to Algorithms by Shai Shalev Shwartz and Shai Ben-David (online).
Remark: Some lectures (e.g., non-convex optimization) are not part of these books.

Prerequisites: Introductory undergrad courses* in Optimization, Linear Algebra and Probability & Statistics.

Course Description: This course will provide a theoretical overview of modern optimization methods used in machine learning and data science. In particular we will deal with the following: Convexity, Gradient Methods, Stochastic variants, Accelerated Methods, Online Learning and Applications to Game Theory, Maximum Likelihood Estimation, Non-convex Optimization, Critical and Saddle Points, Non-negative matrix factorization, min-max optimization (GANs), Markov Decision Precesses, Fundamentals in PAC learning.

Course Objectives: Learn some of the important, known theoretical guarantees about particular optimization techniques commonly used in machine learning; Read and understand applied and theoretical papers about Optimization for Machine Learning: Evaluate most important Algorithms, and algorithm convergence guarantees; Characterize trade-offs between time, size of data and accuracy.

Grading Policy:

- **Scribing lecture notes (30%)**: Deadline is 3 weeks after the lectures using a **Latex** template. Possible to work in groups.
- **Homework (30%)**: One homework that will be given during the first two weeks of lectures. You must use **Latex** for your answers (provide a pdf file). Each student has to work individually.
- **Research Project or presenting a paper (35%)**: Write a report in **Latex**. Research projects will be available during the third week of the lectures. Possible to work in groups.
- **Participation (5%)**: Come to the lectures!

*Basic knowledge.