EECS 127 / EE 227AT Fall 2018
L. El Ghaoui, A. Bayen

Optimization Models in Engineering

Syllabus

Weekly schedule

- Lectures: Tu/Th: 12.30pm - 2pm, Stanley 105
- Discussion (choose one):
  - W: 5pm - 6pm, Stanley 106
  - Th: 5 - 6pm, LeConte 4

Office Hours

- L. El Ghaoui (when he lectures), Tu/Th: 2pm - 3pm, 421 Sutardja Dai Hall
- A. Bayen (when he lectures), Tu/Th: 2pm - 3pm, 109 McLaughlin Hall
- P. Hidalgo-Gonzalez, Tu: 10am - 11am, Cory 212 (on Sept 11th: Cory 400)
- M. Ng, F: 10am - 11am, Soda 651
- R. Lopez, M: 2.30pm - 3.30pm, Cory 258
- Larry Yang, F: 3pm - 4pm, Soda 651
- N. Tripuraneni, M: 10am - 12pm, Soda-Alcove-341A

Course catalog description

This course offers an introduction to optimization models and their applications, ranging from machine learning and statistics to decision-making and control, with emphasis on numerically tractable problems, such as linear or constrained least-squares optimization.

Course material

- Set of slides from lectures
- Exercises from discussion

- Optimization Models, G.C. Calafiore and L. El Ghaoui, Cambridge University Press , October 2014
- Livebook

Course outline
For a detailed schedule of what will be covered in each lecture and their accompanying readings from the book and Livebook, refer to lecture notes zero.

1. Linear algebra
    - Vectors and functions
    - Matrices and linear maps
    - Symmetric matrices and eigenvalues
    - Singular value decomposition
    - Linear equations
    - Least-squares and variants
2. Conic optimization
    - Linear optimization
    - Quadratic optimization
    - Second-order cone optimization
    - Robust optimization
3. Convex optimization
    - Convexity
    - Convex optimization problems
    - Weak duality
    - Strong duality
4. Applications
    - Machine learning
    - Engineering design
    - Finance
    - Control applications

Prerequisites
We recommend to have taken linear algebra at the level of Math 54 or higher, and vector calculus.

Exams
Exams will take place during class, unless specified otherwise. We will allow each student one, double-sided (handwritten) cheat sheet of notes for each exam. There will be no make-up exams, except for medical emergencies. For severe medical emergencies, with proper medical documentation, we will treat requests on a case by case basis based on the severity of the situation.

- Midterm 1: Sept 25th
- Midterm 2: Nov 6th
- Final: Dec 14th, 8am - 11am, room TBD
- Quiz 1: Sept 4th
- Quiz 2: Oct 16th

Homework due dates
Homework will be due at 5pm on gradescope. For instructions on how to submit, refer to slides from lecture zero. No late homeworks are allowed.

- HW 1: Thursday Sept 6th
- HW 2: Thursday Sept 20th
- HW 3: Thursday Oct 11th
- HW 4: Thursday Oct 25th
- HW 5: Thursday Nov 8th
- HW 6: Tuesday Nov 27th

Homework parties
There will be one homework party per homework. They will take place on Mondays or Tuesdays depending on the homework. uGSIs will run the parties.

- Party HW 1: Tuesday Sept 4th, 6pm - 7.30pm, Soda 306 HP
- Party HW 2: Monday Sept 17th, 6pm - 8pm, Soda 306 HP
- Party HW 3: Tuesday Oct 9th, 5pm - 7pm, Cory 540AB

- Party HW 4: Monday Oct 22nd, 6pm - 8pm, Soda 306 HP
- Party HW 5: Tuesday Nov 6th, 6pm - 8pm, Soda 306 HP
- Party HW 6: Tuesday Nov 20th, 6pm - 8pm, Soda 306 HP

Homework and midterms regrade process
Requests need to be submitted to eecs127requests@gmail.com within one week following release of grades. Requests need to submit a single pdf containing (1) typed nature of the request and explanations of the request, (2) original scanned/graded homework/midterm. We will regrade the entire document (homework or midterm), thus, be aware that your grade can go up or down.

Extra credit activities
The following activities will receive extra credit:

- Scribing. Refer to slides from lecture zero for instructions. For questions, contact Nilesh.
- Piazza. At the end of the semester, we will determine the top five collaborators (in terms of correct answers to questions posted). For questions, contact Nilesh.
- Bonus problems in some homeworks.

The extra credit provided by these activities will be at discretion of the staff.

Grading system
Homework is worth 40%, midterm 20% and final 40%. We will drop the lowest of the two midterms, thus the highest midterm counts for 20%. Quizzes do not count for the final grade.

Disabled Students Program (DSP)
You need to have the DSP send us (instructors and head GSI) your letter as soon as possible. With the letter from the DSP, we know exactly what to do, and we can ask for the resources to do it.

Collaboration and Honor code
Throughout the semester, you are encouraged to collaborate with other students in the class. However, directly copying from your peers assignments will not be tolerated. If we discover dishonest behaviour took place during exams/homework, your case will be reported to the College of Engineering or to your home college/department.

Staff

- Professor Laurent El Ghaoui (elghaoui@berkeley.edu, office: 421 Sutardja Dai Hall)

- Professor Alexandre Bayen (bayen@berkeley.edu, office: 109 McLaughlin Hall)
- Head GSI Patricia Hidalgo-Gonzalez (patricia.hidalgo.g@berkeley.edu)
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