Isfahan University of Medical Sciences

Department of Biomedical Engineering

CoOp	Convex Optimization	Spring 2018

Course information

Lecturer: Hossein Rabbani

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  Telephone: 37925262

Lectures: 10–12, 14–16, Tuesdays

TA: Ms. Parisa Ghaderi

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  Office hours will be announced in class and/or posted on the web site.

Website: `http://www.scholoqy.com/`, AccessCode: VXHXN-ZZB65

Course Outline: This course concentrates on solving convex optimization problems that arise in engineering applications. The syllabus includes presenting the basic theory of convex optimization, and concentrating on modeling aspects and results that are useful in applications. Topics include convex sets, convex functions, optimization problems, least-squares, linear and quadratic programs, semidefinite programming, optimality conditions, and duality theory. Applications to signal and image processing, statistics and machine learning, and biomedical engineering are presented. We also will discuss on subgradient, cutting-plane, ellipsoid and proximal methods and introduce the non-convex problems.

Course objectives: By the end of the course you should be able to solve many biomedical engineering problems using convex optimization methods.

Course Prerequisites: Familiarity with MATLAB, digital signal Processing

Assessments: Your knowledge and understanding of the course material will be tested in the assignments, mid-term and final exam, and final project.

Assignments: There will be several homework and lab assignments. These will be available on the website and you must submit them before the announced deadline.

Final Project: Each student must choose a project according to the course outline based on a recently published paper. Students should select an appropriate paper, discuss with the instructor, and get approval before the end of this year. Alternatively, a list of some open projects/papers you may choose from will be provided

at the website of class. Students will be expected to make a presentation of their project and prepare a report. Grades for the projects will be based on implementation (in MATLAB or ...), clarity of report, your ability to justify the results, depth of analysis and discussion. The projects should be presented one month after your final exam.

Midterm Exam: TBA

Final Exam: TBA

Final grade: The final grade will be based on the 30% of the mark of the mid-term exam, 40% of the mark of the final exam, plus 30% of the mark of the assignments, plus 10% of the mark of the final project.

Useful Textbooks:

- *Boyd, Stephen, and Lieven Vanderberghe. Convex Optimization. Cambridge, UK: Cambridge University Press, 2004. ISBN: 9780521833783.*

- *Bertsekas, Dimitri. Convex Optimization Theory. Nashua, NH: Athena Scientific, 2009. ISBN: 9781886529311.*

- *Ben-Tal, Aharon, and Arkadi Nemirovski. Lectures on Modern Convex Optimization: Analysis, Algorithms, and Engineering Applications (MPS-SIAM Series on Optimization). Philadelphia, PA: Society for Industrial Mathematics, 2001. ISBN: 9780898714913.*

- *Daniel P. Palomar and Yonina C. Eldar, Eds., Convex Optimization in Signal Processing and Communications, Cambridge University Press, 2009.*

- *Dimitri P. Bertsekas. Constrained Optimization and Lagrange Multiplier Methods. Academic Press, 1982.*

Useful Websites:

- "Boyd's website (Stanford University)"

- "(MIT University)"

- "(CMU University)"

- "(HKUST University)"