

EE 381V  
**Introduction to Optimization**  
Spring 2018

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Office hours: TBD -- via Skype and in-person on campus

TA: TBD

Optimization plays a fundamental role across engineering and computer science. Continuous and Discrete Optimization have revolutionized a number of applications, from scheduling, matching, and routing on the discrete side, to machine learning, data analytics and artificial intelligence on the continuous side. The innovations and advances have transformed entire industries. How does Google or Apple Maps find an optimal (shortest) route from a source to a destination? How does Uber or Lyft decide which driver to allocate to which customer? What are the basic algorithms that solve large regression and classification problems in predictive analytics?

These are all questions that we will study and understand, in addition to much more.

This course will serve as an introduction to modeling, applications and algorithms of discrete and continuous optimization. The students will learn how to model the real world within the paradigms of linear programming, mixed integer linear programming, and more general convex optimization. We will emphasize interesting applications where these classes have had impact in industry, including applications in data mining and machine learning (no prior knowledge of Machine Learning is required).

The students will then learn how to then solve these formulations using available software, such as Gurobi, CPLEX and CVX.

Finally, we will also look under the hood of some of the basic algorithms, including the Simplex Algorithm (for linear programming) and also gradient descent and Newton's method, for general convex optimization, and learn the basics of how these run.

Requirements: The class will have a significant hands-on component on working with real problems and real examples, and solving examples of real problems. Laptops with wifi access, Python, Numpy, Pandas installed are required. Additional tools will be discussed when introduced.

Course Material: Introduction to Linear Optimization, by Dimitris Bertsimas and John Tsitsiklis.

Grading:

- Homework: 40%
- In-class midterm 1: 15%
- In-class midterm 2: 15%
- Final Project: 30% teams of 1-2.
  - Final presentations, 15 minutes each, last Saturday of the class
  - Report due last Saturday of the class
- There will be no final exam.

Collaboration: Discussion of homework questions is encouraged. Please be absolutely sure to submit your own solutions that you type yourself. If you collaborate with someone, you must acknowledge your collaborators on the front page of your homework.

No late homeworks will be accepted.

#### University Honor Code

“The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.”

#### College of Engineering Drop/Add Policy

The Dean must approve adding or dropping courses after the fourth class day of the semester.

#### Students with Disabilities

UT provides upon request appropriate academic accommodations for qualified students with disabilities. Please contact the Office of Dean of Students at 471-6259 or [ssd@uts.cc.utexas.edu](mailto:ssd@uts.cc.utexas.edu).

#### Emergency Preparedness

Every member of the university community must take appropriate and deliberate action when an emergency strikes a building, a portion of the campus, or entire campus community. Emergency preparedness means we are all ready to act for our own safety and the safety of others during a crisis.

Students requiring assistance in evacuation must inform the instructor in writing of their needs during the first week of class. This information must then be provided to the Fire Prevention Services office by fax (512-232-2759), with "Attn. Mr. Roosevelt Easley" written in the subject line.

You may want to bookmark the emergency Web site <http://www.utexas.edu/emergency/> because it is updated with information during actual emergencies or campus closures.

The university collects cell phone numbers from members of the campus community for emergency text messages. You can sign up for campus text alerts online. If you would like more information regarding emergency preparedness, visit

<http://www.utexas.edu/safety/preparedness>