Math 661 Optimization

instructor: Ed Bueler
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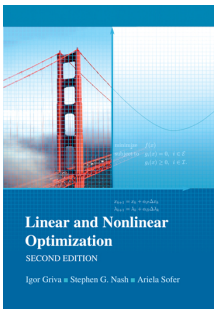
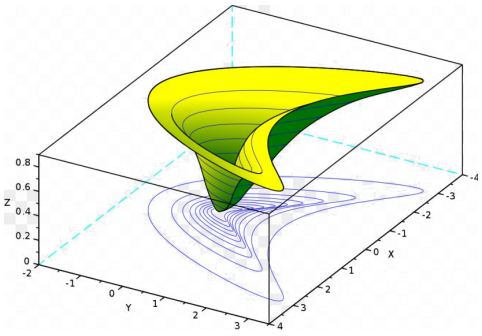
CRN: 76523 (in-person)
76522 (zoom)

course website: bueler.github.io/opt/

textbook: Griva, Nash, & Sofer, *Linear and Nonlinear Optimization*, 2nd ed, SIAM Press 2009



prerequisites: calculus, linear algebra, some computer programming



Mathematical optimization is essential technology for science, engineering, and economics. This graduate-level introduction to continuous optimization focuses on ideas, geometry, algorithms, and applications.

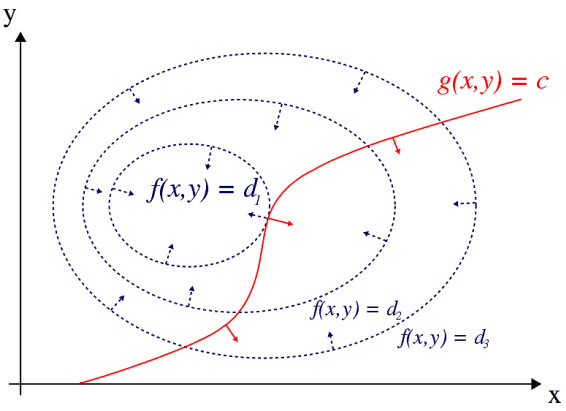
Every homework assignment includes numerical experimentation using Matlab, Python, Julia, or etc.; *your choice*. Mathematical rigor (proof) is used when appropriate, and linear algebra is always present. There is a student-chosen project and two in-class exams.

At the end you will understand optimization problems as they arise in applications, know how to select algorithms, and apply optimization software based on understanding of theory and standard examples.

While the course is delivered hybrid, in-person attendance is preferred!

Topics:

- Linear and nonlinear optimization
- Iterations: Newton, quasi-Newton, CG
- Line search and trust region methods
- Linear programming
- Simplex and interior-point methods
- Equality/inequality constraints
- KKT conditions



Applications:

- Machine learning.
- Inverse methods in geophysics.
- Shape optimization in engineering.
- Operations research.