Math 661 Optimization

Fall 2022, UAF

instructor: Ed Bueler
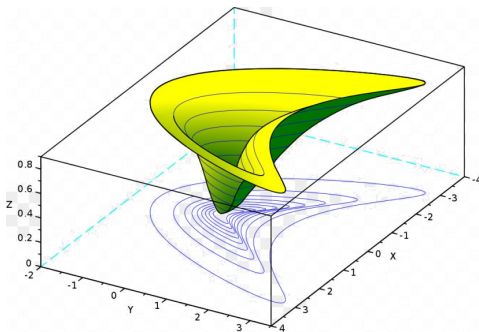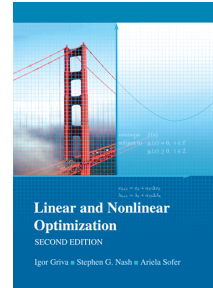   `elbueler@alaska.edu`

course website: `bueler.github.io/opt/`

CRN: 76523 (in-person)
     76522 (sync zoom)

room & time: Chapman 206
     MWF 3:30–4:30 pm

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 focuses on the ideas, geometry, algorithms, and applications of continuous optimization.

Every homework assignment includes numerical experimentation using Matlab, Python, Julia, or etc. (your choice). Mathematical proofs are 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 the mathematics of 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 recommended!

Topics:

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

Applications:

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