MATH 485: MODERN OPTIMIZATION ALGORITHMS

Instructor: Dr. Zev Woodstock
When: Fall 2026, MWF 11:30 – 12:20

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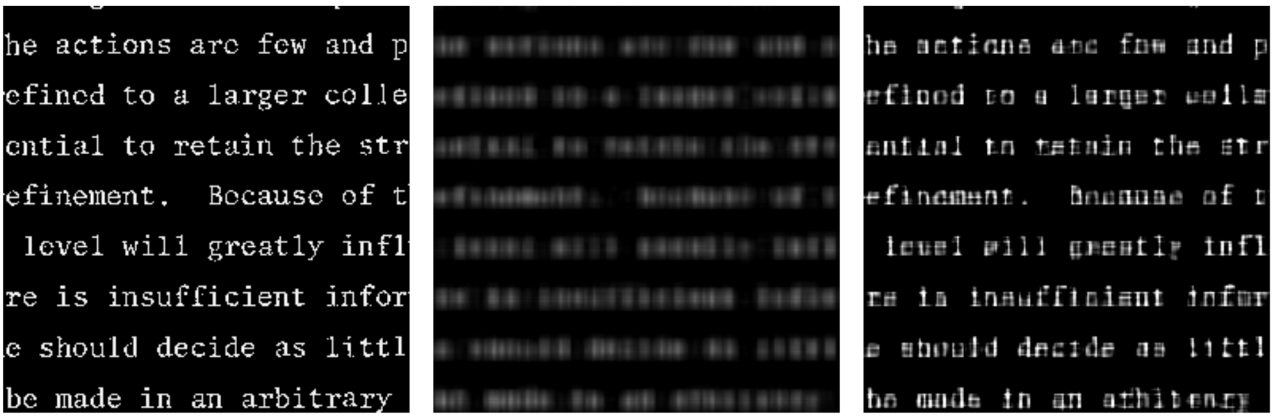
In addition to being a 400-level math class, this class will also count towards the list of restricted electives for the **Computational Analytics Minor**.

Cool list of stuff you'll learn:

- Subdifferential calculus
- Convex analysis
- Convex optimization
- Nonconvex optimization
- Nondifferentiable optimization
- Proximity operators
- Advanced gradient descent techniques
- Frank-Wolfe algorithms
- Projection-based algorithms
- Low-memory Newton-type methods (BFGS, L-BFGS, etc.)
- Learn how to model problems in machine learning, image recovery, and signal processing; solve these problems using theory and/or code.

Official description: This course will cover nonlinear optimization with an emphasis on both theory and implementation of algorithms used in engineering, machine learning, and the sciences. Topics may include first-order methods (e.g., SGD, proximity operators, subdifferential calculus), second-order methods (e.g., Newton, BFGS), Lagrange / KKT theory, fixed-point theory, and heuristics (e.g., simulated annealing, branch-and-bound). Students will mathematically model modern problems with a variety of challenges (e.g., nonsmoothness or nonconvexity), which will be overcome via judicious selection and implementation of algorithms using software.

Prerequisites: Linear algebra, (ideally multivariable) calculus, and some coding experience: MATH 248, and [MATH 238 or MATH 300] or permission of instructor.



Original Observation Recovery