MATHEMATICS 577: OPTIMIZATION

This is an introduction to the theory and algorithms of optimization covering the constrained and unconstrained minimization of linear and nonlinear real-valued functions. The material should be accessible to any "mature" student with a background in Calculus and linear Algebra.

Topics

Review of differential calculus.
1. First and second derivatives of a function
2. Extrema of real valued functions: Lagrange multipliers.
3. Extrema of real functions: Considerations of the second derivative.
4. Extrema of real functions: Considerations of convexity.

General results in optimization: Some algorithms.
1. The projection theorem. Some consequences.
5. Relaxation, gradient and penalty function methods for constrained problems.

Introduction to nonlinear programming
1. The Farkas Lemma, The Kuhn-Tucker conditions.
2. Convex programming: Necessary and sufficient conditions.

Introduction to linear programming
1. General results.
2. Examples of linear programming problems.
3. The simplex method.
4. Duality and linear programming.

Numerical issues in optimization
2. Globally convergent modifications of Newton type methods.


References