Overview

1. Introduction (Lecture 1 + Introductory slides)
    - What is an optimization problem?
    - Examples of optimization problems.
2. Unconstrained optimization and iterative algorithms (Lectures 2-5)
    - Unconstrained optimization
    - Convex functions
    - Gradient descent (steepest descent, step length, linear least squares)
    - Convergence of iterative methods
    - Convergence of gradient descent
    - Newton's method
    - Machine learning / supervised learning
3. Linear Programming Theory (Lectures 6-10)
    - Convex sets
    - Linear programming duality: a first glance
    - Polyhedra
    - Farkas' Lemma
    - Linear programming duality
    - A first algorithm
    - Optimality condition for linear programming

Questions and Answers

Q: Which lectures are relevant for the test?

A: Weeks 1-5 (lectures 1-10).

Q: What do we have to know from the lectures?

A: The following *will not* be asked, though the statements should be known:

- Python code will not be part of the test;
- Proofs in Section 4.3 on the convergence of gradient descent. What needs to be remembered from this section is that gradient descent has *linear* convergence (implied by the last Theorem in that section).
- Proof of Theorem 5.6 (quadratic convergence of Newton's method), though the statement should be known.
- Section 5.2 (Quasinewton methods)
- Proof of Lemma 7.8.
- Proof of Corollary 9.3.

As a rule of thumb, it is beneficial for the understanding to know the proof ideas, though precise reconstruction of proofs will not be asked.

Q: Which problems are relevant?

A: Problem that use Python or require cutting a shape out of paper will not be relevant to the test. More precisely, the following problems will not feature:

- Part B problems.
- Problem 2.1(c) (the derivation).
- Problem 2.3
- Problem 3.2