FSF3850 Numerical Linear Programming 7.5 credits

Numerisk linjärprogrammering

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for FSF3850 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

A Master degree including at least 30 university credits (hp) in in Mathematics (Calculus, Linear algebra, Differential equations and transform method), and further at least 6 hp in Mathematical Statistics, 6 hp in Numerical analysis and 6 hp in Optimization.

Suitable prerequisites are the courses SF2812 Applied Linear Optimization and SF2520 Applied Numerical Methods, or similar knowledge.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

That the student should obtain a deep understanding of the mathematical theory and the numerical methods for linear programming.

After completed course, the student should be able to

- Derive fundamental concepts related to polyhedrals of linear programs
- Explain fundamental duality concepts for linear programming.
- Explain how the simplex method works, primal simplex, dual simplex, steepest edge.
- Explain how interior methods work, in particular primal-dual methods

Course contents

The course deals with theory and algorithms for linear programming problems.

From the 1940s the simplex method, developed by Dantzig, was the only practically used method for solving linear programming problems. Khachian had in the late 1970s presented the polynomial ellipsoid method, but it had not been successful in practice.

When Karmarkar presented his interior method in 1984, all this changed. This method was polynomial and also claimed to be superior to the simplex method in practice.

Karmarkar's method lead to an "explosion" within the area of linear programming. Gill et. al. soon showed that Karmarkar's method was equivalent to a logarithmic barrier method, and the development of new interior methods was rapid. This "competition" between the simplex method and interior methods has lead to significant improvement in both types of method. The purpose of this course is to reflect this development. Some more advanced aspects of the simplex method are included, e.g., steepest edge, partial pricing, and of the interior-point methods e.g., predictor-corrector methods. In particular, we try to understand how the different methods work.

Disposition

Lectures.

Course literature

Announced when the course is offered.

Examination

- INL1 - Assignment, 7.5 credits, grading scale: P, F

Based on recommendation from KTH’s coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

The examination is by homework assignments and a final oral exam.

Other requirements for final grade

Homework assignments and a final oral exam.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.