Optimisation under constraints

Component
École Nationale Supérieure d'Électrotechnique d'Électronique d'Informatique d'Hydraulique et des Télécommunications

In brief

- **Code ELP:** N8EE22C
- **Open to exchange students:** Yes

Presentation

Objectives

The aim of the course is to understand how to formulate and analyse an optimisation problem involving equality or inequality constraints. It also aims to present the classical methods used to solve this type of problem numerically, in particular the SQP, interior point, active set and Uzawa approaches.

Description

This module introduces the fundamentals of continuous optimisation under constraints, starting with the Lagrange function and associated multipliers. The Karush–Kuhn–Tucker conditions are presented and interpreted intuitively to understand the role of active constraints and the nature of stationary points. The course then describes the main numerical methods used in practice, such as SQP-type approaches, interior point or active set algorithms, and the Uzawa method (first algorithm). Simple examples illustrate the differences in behaviour between algorithms and their sensitivity to the choice of initial point. The course also emphasises the use of MATLAB solvers, notably fmincon, in order to establish a direct link between theory and implementation.

Pre-requisites

Non-contractual information.
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A basic understanding of continuous optimisation is recommended (1A-ENSEEIHT), in particular the concepts of gradient, Hessian, local convexity and descent methods. Basic skills in differential calculus and minimal experience with MATLAB or Python are desirable in order to understand the examples and experiment with the numerical methods presented.

Non-contractual information.
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