Differential Calculation and Optimisation

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

Semester
Printemps

In brief

- **Ametys Code:** N6EE01A
- **Open to exchange students:** Yes

Presentation

Description

This course will present Taylor's various developments for applications between two finite-dimensional vector spaces. In particular, the concepts of Hessian matrix, Jacobian matrix, and gradient vector will be introduced.

A taxonomy of optimization problems will be presented, enabling students to situate their problem in relation to the theoretical and numerical tools available for solving problems. Next, the various relationships that verify the extrema of a differentiable function (zero gradient, inertia of the Hessian matrix in the unconstrained case) will be presented, with an emphasis on the rigorous application of the necessary and sufficient conditions available. The emphasis is therefore on understanding the structure of the problem and the precise use of mathematical conditions. The following outline has been proposed:

· Introduction: classification of problems, convexity

· Existence, uniqueness, local/global minimum, necessary and sufficient conditions of order 1 and 2.

· Optimization algorithms based on Newton/Gauss-Newton/Conjugate Gradient