

UE Mathematical optimization



Niveau d'étude
Bac +5



ECTS
6 crédits



Crédits ECTS
Echange
6.0



Composante
UFR
Informatique,
mathématiques
et
mathématiques
appliquées
(IM2AG)



Période de
l'année
Automne (sept.
à dec./janv.)

Diplômes intégrant cet élément

- Master Informatique

- > **Langue(s) d'enseignement:** Anglais
- > **Ouvert aux étudiants en échange:** Oui
- > **Crédits ECTS Echange:** 6.0
- > **Code d'export Apogée:** GBX9AM90

Présentation

Description

This course deals with

- Topic 1: convex analysis
- Topic 2: convex programming
- Basic notions: vector space, affine space, metric, topology, symmetry groups, linear and affine hulls, interior and closure, boundary, relative interior
- Convex sets: definition, invariance properties, polyhedral sets and polytopes, simplices, convex hull, inner and outer description, algebraic properties, separation, supporting hyperplanes, extreme and exposed points, recession cone, Carathéodory number, convex cones, conic hull
- Convex functions: level sets, support functions, sub-gradients, quasi-convex functions, self-concordant functions
- Duality: dual vector space, conic duality, polar set, Legendre transform

- Optimization problems: classification, convex programs, constraints, objective, feasibility, optimality, boundedness, duality
- Linear programming: Farkas lemma, alternative, duality, simplex method
- Algorithms: 1-dimensional minimization, Ellipsoid method, gradient descent methods, 2nd order methods
- Conic programming: barriers, Hessian metric, duality, interior-point methods, universal barriers, homogeneous cones, symmetric cones, semi-definite programming
- Relaxations: rank 1 relaxations for quadratically constrained quadratic programs, Nesterovs #2 theorem, S-lemma, Dines theorem Polynomial optimization: matrix-valued polynomials in one variable, Toeplitz and Hankel matrices, moments, SOS relaxations

Heures d'enseignement

CM	CM	36h
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Infos pratiques

Contacts

Responsable d'UE

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Campus

➤ Grenoble - Domaine universitaire