

Numerical optimization

ECTS : 4

Volume horaire : 48

Description du contenu de l'enseignement :

Numerical Optimisation

1. *Introduction : a review of basic concepts in optimisation*

(a) *Optimality conditions, algorithms, convergence rates.*

2. *First part : Unconstrained optimisation-deterministic methods*

(a) *A crash course on gradient descent for smooth functions.*

(b) *The link with gradient flows.*

(c) *The case of non-convex functions.*

(d) *Acceleration of gradient descents.*

(e) *Newton and quasi-Newton methods.*

(f) *Complement : Back-propagation and machine learning.*

3. *Second part : Constrained optimisation-deterministic methods*

(a) *Penalisation method.*

(b) *The projected gradient method.*

(c) *Lagrange multipliers and duality-the interior point method.*

4. *Third part : Unconstrained optimisation-an introduction to stochastic methods*

(a) *Basic concepts in stochastic gradient descent. Convergence of the algorithm.*

(b) *Acceleration of stochastic gradient descent.*

(c) *(Mini)Batches.*

Compétence à acquérir :

Mastering traditional techniques in numerical optimisation.

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