Variational problems and optimal transport

ECTS : 6

Volume horaire : 24

Description du contenu de l'enseignement :

Chapter 1: Convexity in the calculus of variations-separation theorems, Legendre transforms, subdifferentiability, -convex duality by a general perturbation argument, special cases (Fenchel-Rockafellar, linear programming, zero sum games, Lagrangian duality) -calculus of variations: the role of convexity, relaxation, Euler-Lagrange equations **Chapter 2: The optimal transport problem of Monge and Kantorovich** -The forrmulations of Monge and Kantorovich, examples and special cases (dimension one, the assignment problem, Birkhoff theorem), Kantorovich as a relaxation of Monge -Kantorovich duality - Twisted costs, existence of Monge solutions, Brenier's theorem, Monge-Ampère equation, OT proof of the isoperimetric inequality -the distance cost case and its connection with minimal flows **Chapter 3: Dynamic optimal transport, Wasserstein spaces, gradient flows** -Wasserstein spaces -Benamou-Brenier formula and geodesics, displacement convexity -gradient flows, a starter: the Fokker-Planck equation, general theory for lambda-convex functionals **Chapter 4: Computational OT and applications** -Entropic OT, Sinkhorn algorithm and its convergence -Matching problems, barycenters, -Wasserstein distances as a loss, Wasserstein GANs

Compétence à acquérir :

Mastering of variational and optimal transport methods used in economy.

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Université Paris Dauphine - PSL - Place du Maréchal de Lattre de Tassigny - 75775 PARIS Cedex 16