Journée de rentrée 2025 du GT CalVa

Rapport sur les contributions

https://indico.math.cnrs.fr/e/12636

ID de Contribution: **1** Type: **Non spécifié**

Mirror and Preconditioned Gradient Descent in Wasserstein Space

As the problem of minimizing functionals on the Wasserstein space encompasses many applications in machine learning, different optimization algorithms on ℝd have received their counterpart analog on the Wasserstein space. We focus here on lifting two explicit algorithms: mirror descent and preconditioned gradient descent. These algorithms have been introduced to better capture the geometry of the function to minimize and are provably convergent under appropriate (namely relative) smoothness and convexity conditions. Adapting these notions to the Wasserstein space, we prove guarantees of convergence of some Wasserstein-gradient-based discrete-time schemes for new pairings of objective functionals and regularizers. The difficulty here is to carefully select along which curves the functionals should be smooth and convex. We illustrate the advantages of adapting the geometry induced by the regularizer on ill-conditioned optimization tasks, and showcase the improvement of choosing different discrepancies and geometries in a computational biology task of aligning single-cells

Orateur: KORBA, Anna

Classification de thématique: Exposés

ID de Contribution: **2** Type: **Non spécifié**

Phénomène de Lavrentiev pour des problèmes multidimensionnels

On présente quelques résultats sur le phénomène de Lavrentiev pour des problèmes de calcul des variations multidimensionnels scalaires.

L'objectif principal est d'identifier un cadre naturel et synthétique d'hypothèses vérifiées par l'intégrande pour écarter un tel phénomène.

Orateur: BOUSQUET, Pierre

Classification de thématique: Exposés

ID de Contribution: **3** Type: **Non spécifié**

Ensembles quasi-minimaux et domaines de John en dimension 2 et 3

Les ensembles quasi-minimaux sont des ensembles dont la mesure de Hausdorff ne peut être réduite au-delà d'un certain pourcentage lorsqu'on les déforme. Cette notion, introduite par David et Semmes, permet de représenter des surfaces qui minimisent des énergies très irrégulières, mais aussi des fractures sans déformation dans des solides inhomogènes. Dans cet exposé, je présenterai un travail en collaboration avec Yana Teplitskaya pour déterminer leur régularité optimale en dimensions 2 et 3 : les ensembles quasi-minimaux séparent un domaine en une famille localement finie de domaines de John locaux. D'autre part, on a montré que cette condition est suffisante pour la quasi-minimalité en toutes dimensions.

Orateur: LABOURIE, Camille

Classification de thématique: Exposés

ID de Contribution: **4** Type: **Non spécifié**

Convergence rates for the incompressible limit of nonlinear diffusion equations

Nowadays a vast literature is available on the Hele-Shaw or incompressible limit for nonlinear degenerate diffusion equations. This problem has attracted a lot of attention due to its applications to tissue growth and crowd motion modelling as it constitutes a way to link soft congestion (or compressible) models to hard congestion (or incompressible) descriptions. Nevertheless, little is known about the rate of convergence of this asymptotic. In this talk, I will address the question of estimating the rate in the presence of external drifts. In a joint work with Tomasz Dębiec and Benoit Perthame, we computed the rate in a negative Sobolev norm for generic bounded potentials, while in a work in progress with Alpár Mészáros and Filippo Santambrogio, we provide improved results in the 2-Wasserstein distance which are global in time thanks to the contractivity property that holds for strictly convex potentials. I will present these two results, which hold both for the barotropic pressure law (hence the porous medium equation) and for a singular pressure law with density constraints.

Orateur: DAVID, Noemi

Classification de thématique: Exposés

ID de Contribution: **5** Type: **Non spécifié**

On two optimal control problems of Hamilton-Jacobi equations

This talk is about the optimal control problems of Hamilton-Jacobi equations. The first one appear in Mean field games and is a kind of generalization of optimal transport problems, in which one pays a congestion cost. The surprising feature of the problem is that the optimal solution develops a free boundary separating a region in which the HJ equation becomes elliptic and a region in which it remains of order 1 (joint work with S. Munoz and A. Porretta). The second one appears in traffic flow: one tries to regulate the traffic on a line by acting at a specific point (a junction). One can show that the control is bang-bang, which suggests that, in this context, traffic lights are more efficient than speed limiters (joint work with P. Souganidis).

Orateur: CARDALIAGUET, Pierre

Classification de thématique: Exposés