

Conference Schedule

Day 1: Monday 28 oct. 2024

Plenary Session

Title: Random Projections: on sub-Gaussianity and sparsity

Speaker: Aurélien Garivier

Abstract:

Random projections are a simple and computationally efficient dimensionality reduction technique in unsupervised machine learning. They are based on the existence low-distortion embeddings of points from high-dimensional into low-dimensional Euclidean space. We will discuss in this talk how to construct such projections, and in particular the possibility to use simple and sparse matrices.

Parallel Sessions

Track 1: MACHINE LEARNING / APPRENTISSAGE Statistique

- **Session 1:** Theoretical guarantees in KL for Diffusion Flow Matching (M. Gentiloni)
- **Session 2:** Decorrelation of deformation models via shape representation by varifolds (R. Mouhli)
- **Session 3:** Particle Gradient Descent for Kernel logistic Regression via Sparse regularization on measures (A. Simoes)
- **Session 4:** An adaptive method for nonlinear model order reduction using sparse polynomials (S. Joel)

Track 2: Methodes Numeriques pour les EDP

- **Session 1:** Finite volume method for Cahn-Hilliard equations with surfactants (M. Castellano)

- **Session 3:** Discrete hypocoercivity for a nonlinear kinetic reaction model (**T. Laidin**)
- **Session 3:** Schémas uniformément précis pour les systèmes hyperboliques de relaxation (**Mahmoud**)

Track 3: Control

- **Session 1:** Computer-assisted proofs of non-reachability for the heat equation control system (**I. Hasenohr**)
- **Session 2:** Boundary bilinear optimal control of linear nonlocal parabolic problems involving an intergral kernel (**J. Larrouy**)
- **Session 3:** Contrôle en temps minimal d'un oscillateur à fréquence variable (**K. Lutz**)
- **Session 4:** On an optimal control of an ill-posed advection-diffusion model with nonlocal diffusion (**E. Rinaldo**)

Track 4: Branchement/Modèle stochastique pour la biologie et la santé

- **Session 1:** An individual-based stochastic model reveals strong constraints on allometric relationships with minimal metabolic and ecological assumptions (**V. Brodu**)
- **Session 2:** Inference of cell differentiation trajectories using a modified optimal transport method based on a probabilistic model of gene dynamics (**C. Fournié**)
- **Session 3:** Modèle dynamique pour la représentation de données d'expression des gènes en cellules uniques (**M. Gaillard**)
- **Session 4 :** Modélisation de la croissance de champignons filamenteux (**L. Kuwata**)

Day 2: Tuesday 29 oct. 2024

Plenary Session

Title: Dynamic regulation of motility in structured environments drives spatial organisation of bacterial crowds: insights from experimental data and mathematical modeling

Speaker: Michèle Romanos

Abstract:

Myxococcus xanthus, a social bacterium, exhibits fascinating collective behaviors such as rippling and swarming, where cells self-organize into complex patterns. This talk presents new biological data on these behaviors, featuring high-resolution analyses of cell movements and reversals. Based on these observations, we derive a kinetic model that identifies a key factor that facilitates the emergence of rippling patterns. Additionally, we introduce a 2D agent-based model that links bacterial reversals to congestion through dynamic motility regulation. This model provides a framework that accurately captures the two patterns observed in the data. The model also highlights the role of background anisotropy in pattern formation. This work is a collaboration with Vincent Calvez (Laboratoire de Mathématiques de Bretagne Atlantique), Târn Mignot and Jean-Baptiste Saulnier (Laboratoire de Chimie Bactérienne - Marseille).

Parallel Sessions

Track 1: EDP pour la biologie et la santé

- **Session 1:** A weighted finite volume scheme for growth-fragmentation models (**J. Granet**)
- **Session 2:** A model of oocyte population dynamics for fish oogenesis (**L. Fostier**)
- **Session 3:** On the Fundamental Equation of a mutation equation (**G. Garnier**)
- **Session 4:** Mathematical model of the circadian rhythm in a population of hepatocytes (**Maréchal Anastasia**)

Track 2: Optimisation

- **Session 1:** Inertial Methods with Viscous and Hessian driven Damping for Non-Convex Optimization (**R. Maulen-Soto**)

- **Session 2:** Sur la dualité entre les algorithmes de Frank-Wolfe et les méthodes de plans coupants (**T. Moquet**)
- **Session 3:** Existence of Monge maps for the Gromov-Wasserstein problem (**T. Dumont**)
- **Session 4:** Abstract Cutting Plane Method applied to Sparse Optimization (**S. Rakotomandimby**)

Track 3: STATISTIQUES

- **Session 1:** Variations régulières cachées de processus ponctuels de cluster (**F. Baeriswyl**)
- **Session 2:** Modélisation de la communication entre les lymphocytes T et les cellules dendritiques (**L. Brolon**)
- **Session 3:** Nonparametric Regression for Conditional Density Estimation (**A. Reisach**)
- **Session 4:** Variance of Mann-Kendall tau for ARMA process (**N Thibeaudeau Sutre**)

Track 4: Mécanique des Fluides et des Structures

- **Session 1:** Stability of partially congested travelling wave solutions of the pressureless Navier-Stokes equations with singular diffusion (**E. Deléage**)
- **Session 2:** Modélisation de la dynamique des membranes à courbure variable sous l'effet des fluctuations thermiques. (**M. Adel Djibaoui**)
- **Session 3:** Partial regularity and L^3 -norm concentration effects around possible blow-up points for the micropolar fluid equations (**H. Llerena**)
- **Session 4:** Solutions des équations de Navier-Stokes avec décroissance spatiale rapide forcée (**M. Pageard**)

Day 3: Wednesday 30 oct. 2024

Plenary Session

Title: The facilitated exclusion process and a Stefan problem

Speaker: Oriane Blondel

Abstract:

Abstract: We study an interacting particle system in one dimension that presents an absorbing phase transition. We will walk through some consequences of this phase transition for the large scale limit of the process, and notably the emergence of a free boundary problem in the hydrodynamic limit.

Paraller Sessions

Track 1: Probabilité mécanique statistique et EDS

- **Session 1:** Pénalisation d'arbres de Galton-Watson marqués (**S. Boulal**)
- **Session 2:** Hydrodynamic limit of a Facilitated Exclusion Process with slow and fast boundaries (**Da Cunha**)
- **Session 3:** ndes stationnaires pour l'équation de Gross-Pitaevskii avec bruit blanc en espace. (**Mackowiak**)
- **Session 4:** Percolation de premier passage avec dépendance (**Marivain**)

Track 2: Reaction Diffusion

- **Session 1:** Une équation de Fisher-KPP avec une dimension spatiale et une dimension phénotypique : persistance et propagation (**Boutillon**)
- **Session 2:** A class of fractional parabolic reaction-diffusion systems with control of total mass: theory and numerics (Daoud)
- **Session 3:** Regimes and mechanisms of inflammation described by reaction-diffusion systems (**El Hajj**)
- **Session 4:** Etude numérique de mod'eles non-locaux et leurs applications en biologie (**Marguet**)

Track 3: Methodes Numeriques pour les EDP

- **Session 1:** Approximation numérique du problème de continuation unique enrichi par une base de données pour les équations de Stokes (**James**)
- **Session 2:** Theoretical and numerical analysis of a diffusion problem on a moving domain (**Dupouy**)
- **Session 3:** A fully explicit numerical method for waves in quasi-incompressible media (**Ramiche**)
- **Session 4:** Serendipity pour les complexes discrets avec régularité supplémentaire (**Salah**)

Track 4: THEORIE DES JEUX

- **Session 1:** No-Regret Learning in Strategic Games: Geometry and Dynamics (Davide Legacci)
- **Session 2:** Escape Rate Games and Competitive Spectral Radii (Loïc Marchesini)
- **Session 3:** A Brouwer-Tarski fixed-point theorem (Yu)