ABSTRACTS

François Baccelli

Dynamical Systems on Point Processes and Geometric Routing in Stochastic Networks

This talk is motivated by the study of geometric routing algorithms used for navigating stationary point processes. The mathematical abstraction for such a navigation is a class of non-measure preserving dynamical systems on counting measures called point-maps. The talk will focus on two objects associated with a point map f acting on a stationary point process Φ : * The f-probabilities of Φ, which can be interpreted as the stationary regimes of the routing algorithm f on Φ. These probabilities are defined from the compactification of the action of the semigroup of point-map translations on the space of Palm probabilities. The f-probabilities of Φ are not always Palm distributions. * The f-foliation of Φ, a partition of the support of Φ which is the discrete analogue of the stable manifold of f, i.e., the leaves of the foliation are the points of \Phi with the same asymptotic fate for f. These leaves are not always stationary point processes. There always exists a point-map allowing one to navigate the leaves in a measure-preserving way. Joint work with Mir-Omid Haji-Mirsadeghi, Sharif University, Department of Mathematics.

Jean-Claude Belfiore

Lattice Theta series: From physical layer security to high power fiber optics transmission

The motivation of this presentation is to show how both one- and two-variable theta series of Euclidean lattices, are becoming fundamental objects in communication systems.
We will focus on two applications involving theta series.

- First one is the coding problem on the wiretap Gaussian channel. The design criterion of codes is based on the minimization over lattices of the one-variable theta series.
- Second one is the waveform design for optical transmission over fiber in the nonlinear regime. Because of the integrability of the transport equation, transmitting with two-variable theta waveforms is an elegant solution to that problem.

After having presented the two problems, we will show how coding constructions over lattices can help us to

1. Compute theta series of exceptional lattices for first problem
2. Provide some superposition principles for second problem.

Eric Moulines

When Moreau meets Langevin: Sampling from high-dimensional log-concave non-smooth densities

Recently, the problem of designing MCMC sampler adapted to high-dimensional distributions and with sensible theoretical guarantees has received a lot of interest. The applications are numerous, including large-scale inference in machine learning, Bayesian nonparametrics, Bayesian inverse problem, aggregation of experts among others. When the density is L-smooth (the log-density is continuously differentiable and its derivative is Lipshitz), we will advocate the use of a "rejection-free" algorithm, based on the discretization of the Euler diffusion with either constant or decreasing stepsizes. We will present several new results allowing convergence to stationarity under different conditions for the log-density (from the weakest, bounded oscillations on a compact set and super-exponential in the tails to the strong concavity). When the log-density is not smooth (a problem which typically appears when using sparsity inducing priors for example), we still suggest to use a Euler discretization but of the Moreau envelope of the non-smooth part of the log-density. An importance sampling correction may be later applied to correct the target. Several numerical illustrations will be presented to show that this algorithm (named

MYULA) can be practically used in a high dimensional setting. Finally, non-asymptotic bounds convergence bounds (in total variation and wasserstein distances) are derived.