Séminaire de Probabilités et Statistique

Mardi 30 novembre à 14h00

Laboratoire Dieudonné

Salle Fizeau - LJAD

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Strong error bounds and conditional propagation of chaos for systems of interacting neurons in a diffusive scaling

We consider the stochastic system of interacting neurons introduced first in De Masi et al (2016), in a diffusive scaling. The system consists of N neurons, each spiking randomly with rate depending on its membrane potential. At its spiking time, the potential of the spiking neuron is reset to 0 and all other neurons receive an additional amount of potential which is a centred random variable of order $1/\sqrt{N}$. In between successive spikes, each neuron's potential follows a deterministic flow. We quickly discuss the convergence of the system, as N tends to infinity, to a limit nonlinear jumping stochastic differential equation. We then establish a strong convergence result, stated with respect to an appropriate distance, with an explicit rate of convergence. The main technical ingredient of our proof is the coupling introduced by Komlos, Major and Tusnady of the point process representing the small jumps of the particle system with the limit Brownian motion.

Joint work with Dasha Loukianova and Xavier Erny.