ID de Contribution: **16** Type: **Non spécifié**

Uniform in time propagation of chaos for the 2D vortex model

jeudi 21 mars 2024 17:20 (30 minutes)

We are interested in a system of particles in singular mean-field interaction and wish to prove that, as the number of particles goes to infinity, two given particles within that system become « more and more » independent, a phenomenon known as propagation of chaos. The interaction we will focus on comes from the Biot-Savart kernel, for which the nonlinear limit of the particle system satisfies the vorticity equation, arising from the 2D incompressible Navier-Stokes system.

We build upon a recent work of P.-E. Jabin and Z. Wang to obtain a uniform in time convergence. The approach consists in computing the time evolution of the relative entropy of the joint law of the particle system with respect to the nonlinear limit. We prove time-uniform bounds on the limit, as well as a logarithmic Sobolev inequality. From the latter, the Fisher information appearing in the entropy dissipation yields a control on the relative entropy itself, inducing the time uniformity.

This is joint work with A. Guillin and P. Monmarché.

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