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Particle Approximation of the Doubly Parabolic Keller-Segel Equation in the Plane

vendredi 8 mars 2024 09:00 (50 minutes)

In this talk, we study a stochastic system of N particles associated with the parabolic-parabolic Keller-Segel system in the plane. This particle system is singular and non Markovian in that its drift term depends on the past of the particles. When the sensitivity parameter is sufficiently small, we show that this particle system indeed exists for any $N \geq 2$, we show tightness in N of its empirical measure, and that any weak limit point of this empirical measure, as $N \to \infty$, solves some nonlinear martingale problem, which in particular implies that its family of time-marginals solves the parabolic-parabolic Keller-Segel system in some weak sense. The main argument of the proof consists of a "Markovianization" of the interaction kernel: We show that, in some loose sense, the two-by-two path-dependant interaction can be controlled by a two-by-two Coulomb interaction, as in the parabolic-elliptic case. This is a joint work with N. Fournier (Sorbonne Université).

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