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Global contraction of second-order Langevin dynamics and applications

Friday, 27 February 2026 09:50 (20 minutes)

In this talk, we study the long-time behaviour of second-order Langevin dynamics and establish global contraction in an L^1-Wasserstein distance with an explicit dimension-free rate. The contraction result is not restricted to forces corresponding to strongly convex confining potentials. It rather includes multi-well potentials and non-gradient-type forces. In the proof, we use a coupling approach and construct a distance function carefully adjusted to the coupling.

As a consequence, we outline how this result and the associated proof technique can be extended to analyse nonlinear Langevin dynamics with distribution-dependent forces and to establish uniform-in-time propagation of chaos for the corresponding particle system. Further, we discuss applications to kinetic Langevin samplers, that is, numerically implementable discretisations of the dynamics.

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