Sharp convergence in the total variation distance for Langevin dynamics

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In this presentation, we study an ordinary differential equation with a unique degenerate attractor at the origin, to which we add a Brownian noise with small parameter that regulates the magnitude of the noise. Under general conditions, for any fixed magnitude, as time tends to infinity, the solution of this stochastic dynamics converges exponentially fast in total variation distance to its unique equilibrium distribution.

We suitable accelerated the random dynamics and show that the preceding convergence occurs in a sharp-form, that is, the total variation distance of the accelerated random dynamics and its equilibrium distribution tends to a non-degenerate limiting profile, which corresponds to the total variation distance between the marginal of a suitable stochastic differential equation that comes down from infinity and its corresponding equilibrium distribution. The limiting profile that arises from this convergence is not a step profile that appears in the context of cut-off phenomenon for random processes.

Joint work Conrado da Costa (Durham University, UK) and Milton Jara (IMPA, Brazil).