FRIEDRICH-SCHILLER-
UNIVERSITÄT
JENA
Fakultät für Mathematik und Informatik

Institut für Mathematik

Seminar zur Stochastik

Mittwoch, 25. November 2026
10:15 Uhr
SR 259, UHG, Fürstengraben 1

Dr. Gonçalo dos Reis
(University of Edinburgh)

“Simulation of mean-field SDEs: some recent results”

Abstract: We review recent results on the simulation of McKean-Vlasov stochastic differential equations (MV-SDEs). The first set of results concerns the simulation of MV-SDEs with super-linear growth in both the spatial and interaction components of the drift, along with a non-constant Lipschitz diffusion coefficient.

The second set of results is far more curious. It examines the weak convergence properties of the Leimkuhler-Matthews methods, a non-Markovian Euler-type scheme with the same computational cost as the standard Euler method, for approximating the stationary distribution of a one-dimensional MV-SDE, specifically a mean-field (overdamped) Langevin equation (MFL). Under a strong convexity assumption, we provide both weak and strong error estimates in finite and infinite time horizons. Through a careful analysis of the variation processes and the Kolmogorov backward equation for the associated particle system, we show that the method attains a weak order of convergence rate of 3/2 in the long-time limit - exceeding the standard Euler method’s weak order of 1.

While we use an interacting particle system (IPS) to approximate the MV-SDE, we show the convergence rate is independent of the dimension of the IPS, and this includes establishing uniform-in-time decay estimates for moments of the IPS, the Kolmogorov backward equation and their derivatives. The theoretical findings are supported by numerical experiments.

This presentation is (loosely) based on the joint work [1], [2].
[1] Chen, X., Dos Reis, G., Stockinger, W. and Wilde, Z., 2025. Improved weak convergence for the long-time simulation of mean-field Langevin equations. Electronic Journal of Probability, 30, pp.1-81.
[2] X. Chen, G. dos Reis. 2024, "Euler simulation of interacting particle systems and McKean-Vlasov SDEs with fully superlinear growth drifts in space and interaction" IMA Journal of Numerical Analysis, 44, no. 2, 751-796.

Alle Interessierte sind herzlich eingeladen!

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