Well-posedness and approximation of reflected McKean-Vlasov SDEs

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We establish well-posedness of reflected McKean-Vlasov SDEs and their particle approximations in smooth non-convex domains. We prove convergence of the interacting particle system to the corresponding mean-field limit with the optimal rate of convergence. We motivate this study with applications to sampling and optimization in constrained domains by considering reflected mean-field Langevin SDEs for sampling and reflected consensus-based optimization (CBO) models. We utilize reflection coupling to study long-time behaviour of reflected mean-field SDEs and investigate convergence of the reflected CBO models to the global minimum of a constrained optimization problem. Results of several numerical tests for CBO models are presented.

The talk is based on a joint work with Piers Hinds (Nottingham) and Akash Sharma (Gothenburg).