

Learning Nonlocal Mean Field Schrödinger Bridges

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In this work, we propose a learning-based framework for solving the mean-field Schrödinger bridge (MFSB) problem. The proposed four-step algorithm alternates between forward and backward drift learning, with an interaction-learning step inserted between them. This design reduces the computational cost of the MFSB problem, in which the evaluation of nonlocal interactions dominates the overall complexity. We quantify how perturbations in the learned interaction affect the resulting stochastic bridge, thereby establishing a stability guarantee for the proposed method. Numerical experiments demonstrate that our approach achieves substantial acceleration over existing solvers while maintaining comparable solution accuracy.