The Martingale Sinkhorn Algorithm

Grégoire Loeper*[1]

[1]BNP Paribas – BNP Paribas, BNP-Paribas – France

Abstract

Joint work with Manuel Hasenbichler, Benjamin Joseph, Jan Oblój and Gudmund Pammer
We develop a numerical method for the martingale analogue of the Benamou–Brenier optimal transport problem, which seeks a martingale interpolating two prescribed marginals which is closest to Brownian motion. Recent contributions have established existence and uniqueness for the optimal martingale under finite second moment assumptions on the marginals, but numerical methods exist only in the one-dimensional setting. We introduce an iterative scheme, a martingale analogue of the celebrated Sinkhorn algorithm, and prove its convergence in arbitrary dimension under minimal assumptions. In particular, we show that convergence holds when the marginals have finite moments of order $p > 1$, thereby extending the known theory beyond the finite-second-moment regime. The proof relies on a strict descent property for the dual value of the martingale Benamou–Brenier problem.
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*Speaker