Schrodinger Bridges on Discrete Domains

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Dynamical optimal transport is a field in mathematics and computer science involving interpolation between two probability measures. While dynamical optimal transport on continuous domains is well-understood, algorithms for solving the problem numerically struggle with both accuracy and efficiency. We apply existing theory surrounding Schrödinger bridges to arrive at a system of discrete dual variables which approximate the solutions to the dynamical optimal transport problem. We then propose a novel application of Sinkhorn's algorithm which can be used to numerically solve the dynamical optimal transport problem on discrete surfaces. We show empirically that this algorithm exhibits state-of-the-art performance on interpolation of probability measures defined on triangular meshes. We then propose an entropy-regularized variation of the semi-discrete optimal transport problem, in analogy to continuous Schrödinger bridges posed by Lavenant et al. and prove a result regarding the form of its solution.

Awards Won:

Third Award of $1,000

American Mathematical Society: Third Award of $500

National Security Agency Research Directorate : Second Place Award “Mathematics”