Linearization of the Wasserstein distance

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Abstract

This work studies an explicit embedding of the set of probability measures into a Hilbert space, defined using optimal transport maps from a reference probability density. This embedding linearizes to some extent the 2-Wasserstein space, and enables the direct use of generic "linear" supervised and unsupervised learning algorithms on measure data, while retaining some of the geometry of the Wasserstein distance. Our main result is that the embedding is (bi-)Hölder continuous, when the reference density is uniform over a convex set, and can be equivalently phrased as a dimension-independent Hölder-stability results for optimal transport maps. Joint work with A. Delalande and F. Chazal.

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