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Wassertein Sobolev spaces: numerics and deep learning over P2

Monday, 12 June 2023 16:00 (1 hour)

We start the talk by presenting general results of strong density of sub-algebras of bounded Lipschitz functions in metric Sobolev spaces. We apply such results to show the density of smooth cylinder functions in Sobolev spaces of functions on the Wasserstein space $\mathcal{P}_2$ endowed with a finite positive Borel measure. As a byproduct, we obtain the infinitesimal Hilbertianity of Wassertein Sobolev spaces.

As a first application, we consider the numerical approximation of the 2-Wasserstein distance by smooth cylinder functions defined on data points. In particular, we show that the 2-Wasserstein distance can be approximated by deep neural networks trained over data points. The Hilbert space structure and the density of smooth cylinder functions allow also to solve numerically variational problems over Wassertein Sobolev spaces and we shall present a few results of numerical approximation in this context.

The talk presents a collection of results with Pascal Heid, Giacomo Sodini, and Giuseppe Savaré.

Presenter: FORNASIER, Massimo (TUM München)