SCALABLE CONDITIONAL TRANSPORT MAPS USING TENSOR TRAINS

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We present a novel offline-online method to mitigate the computational burden of characterizing posterior random variables in statistical learning. In the offline phase, the proposed method learns the joint law of the parameter and the observable random variables in the tensor-train (TT) format. In the online phase, the resulting conditional transport can generate the posterior random variables given newly observed data in real-time. Compared with normalizing flow techniques, the proposed method relies on function approximation and is equipped with a thorough performance analysis. The function approximation perspective also allows us to extend the capability of transport maps in challenging problems with high-dimensional observations and high-dimensional parameters using gradient-based dimension reduction. We demonstrate the efficiency of the proposed method on various statistical learning tasks in ordinary differential equations (ODEs) and partial differential equations (PDEs).