

Optimal Transport Methods in Machine Learning: from the Sinkhorn algorithm to Generative Adversarial Networks

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We start by recalling tools from the classical optimal transport (OT) theory, and then we introduce new developments in OT, specifically what is now called causal optimal transport (COT). We illustrate how the concept of causality in OT is the suitable one in order to tackle dynamic problems, where time plays a crucial role, especially in a financial context. We then consider regularized optimal transport problems, and the Sinkhorn algorithm used for computing entropic OT. Further, we review recent development of generative adversarial networks (GANs), which employ tools from OT theory. We then combine all the above concepts to train a network to generate or predict (financial) time series. Finally, we discuss the results and the numerical challenges.