OPTIMAL TRANSPORT METHODS FOR UNDERSTANDING MODEL ROBUSTNESS

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Abstract. Across vast array of applications, mathematics is used to build models which create pathways from inputs to outputs. These models can often be seen as probability measures: discrete (empirical measures over a given data set) or continuous (resulting from an SDE), over finite-dimensional spaces or over pathspaces. The theory of Optimal Transport (OT) offers powerful fully non-parametric tools to measure distances between probability measures, trace geodesics in the space of probability measures, project onto its subsets. In this talk, I will survey some recent advancements that leverage OT tools and intuition, to describe and manage models, helping with selecting/calibrating models and quantifying model uncertainty. I will use questions from mathematical finance as my motivating examples while focusing on providing an overview of the field with its novel mathematical contributions and challenges. In particular, I will discuss robust pricing and hedging and its link to Martingale-OT, non-parametric calibration via Semimartingale-OT, and Wasserstein distributionally robust optimization and the resulting non-parametric Greeks and risk measurements. I will also mention some applications in statistics and machine learning.

The talk is based on works with many collaborators, including: D. Bartl, S. Drapeau, S. Eckstein, G. Guo, I. Guo, B. Joseph, T. Lim, G. Loeper, S. Wang and J. Wiesel.

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