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*Multi-marginal monotonicity and convex analysis*

Similar to the two-marginal case, multi-marginal monotonicity and convex analysis arise naturally in the framework of multi-marginal optimal transport theory. However, even for classical cost functions, unlike in the two-marginal case, multi-marginal monotonicity and convex analysis is a largely an unexplored territory. We present natural problems and discuss open questions, recent resolutions and generalizations from the well studied two-marginal monotone operator theory and convex analysis to the multi-marginal settings. In particular, we discuss the existence of explicit  $c$ -splitting potentials and multi-marginal maximal monotonicity theory.