

ATENEO



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Weak Limits for Empirical Entropic Optimal Transport

Abstract: In this talk, we will delve into the asymptotic distribution of potentials and couplings in entropic regularized optimal transport for compactly supported probabilities in \mathbb{R}^d . Our analysis begins with the central limit theorem for Sinkhorn potentials—the solutions to the dual problem—demonstrating their convergence to a Gaussian process in $\mathcal{C}(S)$.

Next, we establish the weak limits of the couplings, the solutions to the primal problem, when evaluated on integrable functions. This result verifies a conjecture proposed by Harchaoui, Liu, and Pal in 2020.

Finally, we consider the weak limit of the entropic Sinkhorn divergence between two distributions P and Q under two hypotheses: $H_0 : P = Q$ and $H_1 : P \neq Q$. Under H_0 , the limit is a weighted sum of independent chi-squared random variables with one degree of freedom, while under H_1 , the limit is Gaussian. These findings provide a foundation for statistical inference based on entropic regularized optimal transport.

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