Title:

Adaptive density estimation under low-rank constraints

Abstract:

In this talk, we address the challenge of bivariate probability density estimation under low-rank constraints for both discrete and continuous distributions. For discrete distributions, we model the target as a low-rank probability matrix. In the continuous case, we assume the density function is Lipschitz continuous over an unknown compact rectangular support and can be decomposed into a sum of K separable components, each represented as a product of two one-dimensional functions. We introduce an estimator that leverages these low-rank constraints, achieving significantly improved convergence rates. Specifically, for continuous distributions, our estimator converges in total variation at the one-dimensional rate of (K/n)^{1/3} up to logarithmic factors, while adapting to both the unknown support and the unknown number of separable components. We also derive lower bounds for both discrete and continuous cases, demonstrating that our estimators achieve minimax optimal convergence rates within logarithmic factors. Furthermore, we introduce efficient algorithms for the practical computation of these estimators.