



Theoretical Statistics and Mathematics Unit, Kolkata
INDIAN STATISTICAL INSTITUTE

SEMINAR

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VENUE:

L - 1

(4th Floor, A.N. Kolmogorov Bhavan), ISI Kolkata

TITLE:

A New Perspective on Denoising Based on Optimal Transport

SPEAKER:

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ABSTRACT:

In the standard formulation of the classical denoising problem, one is given a probabilistic model relating a latent variable Θ and an observation Z , and the goal is to construct a map to recover the latent variable from the observation. The posterior mean, a natural candidate for estimating Θ from Z , attains the minimum Bayes risk (under the squared error loss) but at the expense of over-shrinking the Z , and in general may fail to capture important features of the prior distribution (e.g., variance, low dimensionality, discreteness, sparsity). To rectify these drawbacks, in this paper we take a new perspective on this denoising problem that is inspired by optimal transport (OT) theory and use it to study a different, OT-based, denoiser at the population level setting. We rigorously prove that, under general assumptions on the model, this OT-based denoiser is mathematically well-defined and unique, and is closely connected to the solution to a Monge OT problem. We then prove that, under appropriate identifiability assumptions on the model, the OT-based denoiser can be recovered solely from information of the marginal distribution of Z and the posterior mean of the model, after solving a linear relaxation problem over a suitable space of couplings that is reminiscent of standard multi-marginal OT problems.

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