



Theoretical Statistics and Mathematics Unit

Indian Statistical Institute

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SEMINAR

Date: July 13, 2026

Time: 04:15 PM

VENUE:

L-Infinity, 5th Floor, A.N. Kolmogorov Bhavan, ISI Kolkata

SPEAKER:

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TITLE:

On distribution-free two-sample tests based on optimal transport and related ideas for high-dimensional data

ABSTRACT:

In recent years, optimal transport and its applications have become increasingly popular in statistics. The central idea is to transform an unknown distribution into a known reference distribution while satisfying an optimality criterion. One important application is the construction of distribution-free tests that are valid against general alternatives. However, such methods often fail to deliver satisfactory performance when the data dimension is comparable to or larger than the sample size. In this article, we investigate the high dimensional behavior of several two-sample tests based on optimal transport and show that the choice of the reference distribution can significantly affect their performance. In such settings, a judicious choice of the reference distribution can lead to improved performance in high dimensions. Our theoretical analysis motivates the construction of a class of distribution-free two-sample tests based on carefully selecting the reference distribution, leading to what we call minimum-cost derangement tests. Interestingly, many popular distribution-free two-sample tests fall within this class, thereby connecting existing methods with the theory of optimal transport.

We further study the behavior of the proposed tests in high-dimensional, low-sample-size settings. Simulation studies and analyses of benchmark datasets are provided to illustrate their effectiveness.

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