

Ashok Maitra Memorial Lecture 2025-26

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PUBLIC LECTURE

Date: 03 February 2026 (Tuesday)

Time: 4:30 PM

Venue: NAB-1, A. N. Kolmogorov Bhavan

TITLE:

Optimal matching of random point clouds, optimal transportation, and electrostatics

ABSTRACT:

The combinatorial optimization problem of matching two large point clouds can be seen as a special case of optimal transportation between measures, a ubiquitous variational problem. In statistics, it is natural to consider random points clouds that arise as empirical measures from sampling from a given distribution, like the uniform distribution and the Poisson point process.

When matching realizations of the Poisson point process (“shot noise”), two space dimension are known to be critical (Ajtai-Komlós-Tusn´ady). The subtle behavior in the critical case has been predicted by Parisi et. al., relying on the connection between the Monge-Ampère equation, which is the first variation of optimal transportation, and its linearization, the Poisson equation from electrostatics. Replacing shot noise by white noise, this provides an explicit Gaussian approximation. Ambrosio et. al. established these predictions rigorously on a macroscopic level.

A variational regularity theory, used as a large-scale regularity theory, allows to establish this connection down to the microscopic level of particle distances. It mimics De Giorgi’s approach to the regularity theory of minimal surfaces in the sense that a harmonic approximation result is at its center.

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