Indian Statistical Institute

KOLKATA

Lecture Series

In

Statistics & Data Science

Organised by

ISRU, ISI Kolkata

Date :
November 12 and 13, 2026

Exploring Ideas.
Building Insights.
Shaping a Data-Driven Future.



Special Lecture: (Thursday, November 12, ISRU seminar room)

Title: Optimization by Monte Carlo **Time: 3:00 pm**

Speaker: Prof. Probal Chaudhuri, SMU, ISI Kolkata
Abstract: I shall talk about a class of probabilistic optimization techniques that use Markov chain Monte Carlo.

Lectures on Friday, November 13 (Room: 3.0, R.A. Fisher Bhavan)

Title: Evaluating the Randomness Assumption: A Novel Graph-Theoretic Approach

Speaker: Prof. Arnab Kumar Laha, **Time: 11:00 am**
RBI Chair Professor, ISRU, ISI Kolkata
Abstract: Randomness, or mutual independence, is a fundamental assumption underlying statistical inference and its applications across disciplines. However, assessing randomness remains challenging, as existing tests often detect only specific forms of dependence. We propose a novel graph-theoretic approach to testing randomness using random interval graphs (RIGs). Their key advantage is that their properties depend solely on independence, rather than on the underlying data distribution.

We exploit two key properties of RIGs—edge probability and vertex degree distribution—to develop the RIG-Edge Probability test and the RIG-Degree Distribution (RIG-DD) test. Extensive simulations demonstrate that these tests detect a broad range of dependencies, including conditional heteroskedasticity and chaotic behaviour. The RIG-DD test outperforms most existing tests of randomness considered in our comparisons. We also establish consistency of the RIG-DD test against some common dependence structures and present real-world examples illustrating the practical applicability of the proposed tests.

(joint work with Shriya Gehlot)

Coffee break: 11:55 am-12:10 am

Title: An Introduction to Time Series that you don't expect

Speaker: Prof. Diganta Mukherjee, ASU, ISI Kolkata **Time: 12:10 pm**
Abstract: A gentle introduction to time series with non-numeric data and situations where the data is not equi-spaced. The talk will focus on examples, pictures and some references.

Lunch Break: 1:05 pm-2:30 pm

Title: A semi-parametric model for assessing the effect of temperature on ice accumulation rate from Antarctic ice core data

Speaker: Prof. Debasis Sengupta, ASU, ISI Kolkata **Time: 2:30 pm**

Abstract: In this talk, we present a semiparametric model for describing the effect of temperature on Antarctic ice accumulation on a paleoclimatic time scale. The model is motivated by sharp ups and downs in the rate of ice accumulation apparent from ice core data records, which are synchronous with movements of temperature. We prove strong consistency of the estimators under reasonable conditions. We conduct extensive simulations to assess the performance of the estimators and bootstrap based confidence limits for the requisite range of sample sizes. Analysis of ice core data from two Antarctic locations over several hundred thousand years shows a reasonable fit. There is a very strong linear relationship between temperature and the apparent accumulation rate adjusted for thinning. On the other hand, the apparent accumulation rate exhibits a thinning pattern that should facilitate the understanding of ice condensation, transformation and flow over the ages.
(joint work with Radhendushka Srivastava)

Coffee break: 3:25 pm-3:40 pm

Title: Spatially-Indexed Longitudinal Distributional Outcome Regression for Environmental Monitoring

Speaker: Dr. Suman Majumder, ISRU, ISI Kolkata **Time: 3:40 pm**

Abstract: Characterizing longitudinal changes in region-specific distribution of environmental exposures, such as total nitrate (TNO3) concentrations, is critical for understanding localized ecological risks that are otherwise obscured by standard mean-level modeling. However, modeling longitudinal distributional outcomes across spatial regions presents significant methodological challenges. The random objects are spatio-temporally dependent, and mathematical constraints are inherent to distributional representations, such as, monotonicity of quantile functions. To address this, we propose a novel spatially-indexed longitudinal distributional outcome regression model. The distributional coefficients corresponding to the fixed effects of covariates are modeled using Bernstein basis polynomials, while spatio-temporal random effects are flexibly captured via tensor product expansions of splines. We develop a scalable Markov Chain Monte Carlo algorithm to explicitly account for spatial dependencies, and introduce a fast two-stage projected-posterior approach to preserve the monotonicity of the predicted subject-specific quantile functions. Extensive simulation studies demonstrate that the proposed framework achieves superior estimation accuracy and predictive performance compared to standard non-spatial distributional outcome regression. We apply our methodology to predict monthly, site-specific distributions of TNO3 concentrations across the contiguous United States. Accounting for spatial correlation provides substantially lower uncertainty in the estimated distributional effects and improves predictive performance over the non-spatial alternative, offering a robust, interpretable tool for spatio-temporal environmental monitoring.