Theoretical Statistics and Mathematics Unit

Indian Statistical Institute

203 B.T. Road, Kolkata-700108

MONDAY COLLOQUIUM

Date: August 03, 2026 **Time:** 04:15 P.M.

Venue: L-infinity, Stat-Math Unit (5th Floor, A.N. Kolmogorov Bhavan), ISI Kolkata

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TITLE:

"HARMLESS" sequential sampling for estimating level sets of response functions

ABSTRACT:

We propose a two-stage design for estimating a root or boundary defined by an unknown regression function observed with noise. In many applications, including dose-finding clinical trials, it is desirable to learn the zero level set while allocating observations mainly on one \emph{safe} side of the unknown boundary. Classical one-sided stochastic approximation procedures guarantee finite overshoot but achieve convergence rates governed by the imposed bias, which are slower than the parametric rate.

In Stage I, a one-sided stochastic approximation is used to obtain a conservative preliminary estimator while preserving finite overshoot. In Stage II, additional observations are collected locally on the safe side and a local regression estimator is constructed. We show that the resulting estimator is asymptotically normal with the parametric rate, despite the finite-overshoot constraint. We further show that a variant of Polyak–Juditsky averaging fails to recover the parametric rate under finite-overshoot designs. Extensions to multivariate boundary estimation are developed for both linear and smooth nonparametric level sets. To demonstrate the effectiveness of our procedure for risk-controlled decision making, we conduct extensive simulations and apply it to a bank loan dataset to estimate the maximal borrower feature level that keeps the default probability below a prescribed threshold.

This is joint work with Ya'acov Ritov and Yue Yu.

ALL ARE CORDIALLY INVITED

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