

# Indian Statistical Institute

## Applied Statistics Unit

### SEMINAR NOTICE

**Speaker:** Nabarun Deb, University of Chicago

**Title:** Trade-off Between Dependence and Complexity in Nonparametric Learning  
Rates: an Empirical Process approach

**Date:** 9 January, 2024

**Time:** 16:15 hours

**Online Platform:** (<https://meet.google.com/rwx-abuh-oec>)

**Abstract:** Empirical process theory for iid observations has emerged as a general tool for understanding the generalization properties of various statistical problems. However, in many practical applications where the data exhibit temporal dependencies (e.g., in finance, medicine, etc.), the corresponding empirical processes are much less understood. Motivated by this observation, we present a general bound on the expected supremum of empirical processes under standard mixing assumptions. Unlike most prior work, our results cover both the long and the short range regimes of dependence. Our main result shows that the learning rate in a large class of nonparametric problems is characterized by a non-trivial trade-off between the complexity of the underlying function class and the dependence among the observations. This trade-off reveals a new phenomena, namely that even under long-range dependence, it is possible to attain the same (minimax optimal) rates as in the i.i.d. setting, provided the underlying function class is complex enough. We demonstrate the practical implications of our findings by analyzing various statistical estimators ranging from fixed to growing dimensions. Our main examples include a comprehensive case study of generalization error bounds in nonparametric regression over smoothness classes in fixed dimension, high-dimensional additive regression using sparse neural nets, and estimating the optimal transport distance between two probability distributions.

This is joint work with Debarghya Mukherjee.

**All are invited to attend.**