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THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

PHD STUDENT SEMINAR

Regret Minimization and Statistical Inference in Online Decision Making with High-dimensional Covariates

By

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Abstract

This talk investigates regret minimization, statistical inference, and their interplay in high-dimensional online decision-making based on the sparse linear context bandit model. We integrate the ε-greedy bandit algorithm for decision-making with a hard thresholding algorithm for estimating sparse bandit parameters and introduce an inference framework based on a debiasing method using inverse propensity weighting. Under a margin condition, our method achieves either $O(T^{1/2})$ regret or classical $O(T^{1/2})$-consistent inference, indicating an unavoidable trade-off between exploration and exploitation. If a diverse covariate condition holds, we demonstrate that a pure-greedy bandit algorithm, i.e., exploration-free, combined with a debiased estimator based on average weighting can simultaneously achieve optimal $O(\log T)$ regret and $O(T^{1/2})$-consistent inference. We also show that a simple sample mean estimator can provide valid inference for the optimal policy's value. Numerical simulations and experiments on Warfarin dosing data validate the effectiveness of our methods.

Date : 7 May 2025 (Wednesday)
Time : 3:00pm
Venue : Room 3494 (near Lifts 25/26)

All are Welcome!