

**The College of Arts & Sciences**  
**Department of Mathematical Sciences**

Colloquium

# **Professor Wei Sun**

**Purdue University**

**Wednesday, February 21, 2024**

**French Hall West, Room 2109**

**3:45-4:45pm**

## ***Online Statistical Inference for Matrix Contextual Bandit***

This talk focuses on online decision-making via reinforcement learning (RL), particularly when contextual information is represented as a matrix with low-rank model structure. Existing RL algorithms prioritize reward maximization, neglecting statistical inference. Addressing this gap, we propose an adaptive online procedure for statistical inference for low-rank matrix contextual bandit. Conventional low-rank estimators are biased in sequential settings, and existing inference approaches lack consideration for low-rankness. To overcome these challenges, we introduce a novel online debiasing procedure that simultaneously addresses both biases. The proposed debiased estimators exhibit asymptotic normality, and the constructed confidence intervals are valid for both parameter inference and optimal policy value inference tasks. Our inference results are built upon a newly developed low-rank stochastic gradient descent estimator and its non-asymptotic convergence result, which is also of independent interest. This is joint work with Qiyu Han and Yichen Zhang.

**Refreshments will be served 3:00-3:30 pm in the Faculty Lounge  
4118 French Hall West**