Indiana University-Purdue University Indianapolis
Department of Mathematical Sciences

STATISTICS SEMINAR

12:15pm—1:15pm, Tuesday, April 09, 2024
Zoom Meeting: Meeting ID: 845 0989 4694

Speaker: **Yuexia Zhang**
Department of Management Science and Statistics,
University of Texas at San Antonio

Title: **Inverse Probability Weighting-based Mediation Analysis for Microbiome Data**

Abstract:

Mediation analysis is an important tool to study causal associations in biomedical and other scientific areas and has recently gained attention in microbiome studies. Using a microbiome study of acute myeloid leukemia (AML) patients, we investigate whether the effect of induction chemotherapy intensity levels on the infection status is mediated by the microbial taxa abundance. The unique characteristics of the microbial mediators—high-dimensionality, zero-inflation, and dependence—call for new methodological developments in mediation analysis. The presence of an exposure-induced mediator-outcome confounder, antibiotic use, further requires a delicate treatment in the analysis. To address these unique challenges in our motivating AML microbiome study, we propose a novel nonparametric identification formula for the interventional indirect effect (IIE), a measure recently developed for studying mediation effects. We develop the corresponding estimation algorithm using the inverse probability weighting method. We also test the presence of mediation effects via constructing the standard normal bootstrap confidence intervals. Simulation studies show that the proposed method has good finite-sample performance in terms of the IIE estimation, and type-I error rate and power of the corresponding test. In the AML microbiome study, our findings suggest that the effect of induction chemotherapy intensity levels on infection is mainly mediated by patients' gut microbiome.

Bio:
Dr. Yuexia Zhang is an assistant professor in the Department of Management Science and Statistics and a core faculty of School of Data Science at the University of Texas at San Antonio. Before this, she

was a postdoctoral fellow at the University of Toronto. She received her Ph.D. degree in Statistics from Fudan University. Her research interests include but not limited to causal inference, missing data, longitudinal data analysis, high-dimensional statistics, robust estimation, and interdisciplinary research.