Indiana University Indianapolis
Department of Mathematical Sciences

STATISTICS SEMINAR

12:15pm—1:15pm, Tuesday, November 19, 2024
Zoom Meeting: Meeting ID: 845 0989 4694

Speaker: **Chi Zhang**
Department of Biomedical Engineering, Oregon Health & Science University

Title: **Advancing Data Driven and AI empowered Systems Biology Approaches**

Abstract:

The functional activities of biological systems include both intracellular functions such as transcriptional regulation, metabolism, and signaling transduction, and as well as intercellular activities such as cell-microenvironment and cell-cell interactions. In recent years, we focused on developing new systems biology approaches to quantify biological functions and predict biological relations in disease using omics data. In the past years, we developed a research framework named, "data-driven and AI empowered systems biology", which aims to quantify biological processes and approximate its dynamic property using non-time course omics data. We have established mathematical foundations, including computational principles, new learning functions, optimizers, and relevant theories, and generalized the analysis from metabolic system to biosynthesis and processing of large molecules, transcriptional regulation, signaling transduction and cell-tissue interactions, as well as enabled the usage of multi-omics data. By applying this approach to different disease systems, we identified new drug targets to improve the efficacy of immunotherapy for cancer treatment and predicted the trend of metabolic shifts throughout cancer progression.

Bio:
Dr. Chi Zhang is an Associate Professor of Biomedical Engineering at Oregon Health & Science University (OHSU) and a member of the Center for Biomedical Data Science, Brenden-Colson Center for Pancreatic Care and Knight Cancer Institute at OHSU. Dr. Zhang receive his bachelor's degree in mathematics from Peking University in 2010 and Ph.D. in Bioinformatics from the University of Georgia with a minor in Statistics in 2015. He joined Indiana University School of Medicine (IUSM) as an assistant professor in 2016, was promoted to

a tenured associate professor in 2022, associate director of the Center for Computational Biology and Bioinformatics in 2023, and then joined OHSU in 2024. His research focuses on studying the mathematical representations of biological processes, relations, and functions in omics data; developing new systems biology models and AI methods to enable in silico simulation and perturbation analysis of disease systems; understanding biochemical and metabolic variations in the microenvironment of different diseases; and developing explainable and fair AI models for biomedical data. Dr. Zhang received the NIH NIGMS Maximizing Investigators' Research Award (MIRA) (R35), NSF career award, and American Cancer Society Research Scholar Award, and multiple R01s. Dr. Zhang also leads the bioinformatics and biostatistics analysis in the NCI Pancreatic Ductal Adenocarcinoma Stromal Reprogramming Consortium. Recent studies from Dr. Zhang's lab have been published on Genome Research; Nucleic Acids Research; Advanced Sciences; Briefings in Bioinformatics; Blood; Journal of Clinical Investigation; NeurIPS; AAAI; UAI; ICASSP; Biometrics; and Pharmaceutical Statistics. Research driven by applications of the computational methods developed by Dr. Zhang resulted in research articles in the New England Journal of Medicine, Nature Medicine, Cell Metabolism, Nature Genetics, etc.