Indiana University Indianapolis Department of Mathematical Sciences

STATISTICS SEMINAR

12:15pm—1:15pm, Tuesday, February 11, 2025 Zoom Meeting: Meeting ID: 845 0989 4694

Speaker: Shanghong Xie Department of Statistics, University of South Carolinae

Title: Identifying temporal pathways using biomarkers in the presence of latent non-Gaussian components

Abstract:

Time series data collected from a network of random variables are useful for identifying temporal pathways among the network nodes. Observed measurements may contain multiple sources of signals and noises, including Gaussian signals of interest and non-Gaussian noises including artifacts, structured noise, and other unobserved factors (e.g., genetic risk factors, disease susceptibility). Existing methods including vector autoregression (VAR) and dynamic causal modeling do not account for unobserved non-Gaussian components. Furthermore, existing methods cannot effectively distinguish contemporaneous relationships from temporal relations. In this talk, I will present a novel method to identify latent temporal pathways using time series biomarker data collected from multiple subjects. The model adjusts for the non-Gaussian components and separates the temporal network from the contemporaneous network. Specifically, an independent component analysis (ICA) is used to extract the unobserved non-Gaussian components, and residuals are used to estimate the contemporaneous and temporal networks among the node variables based on method of moments. The algorithm is fast and can easily scale up. We derive the identifiability and the asymptotic properties of the temporal and contemporaneous networks. We demonstrate superior performance of our method by extensive simulations and an application to a study of attention-deficit/hyperactivity disorder (ADHD), where we analyze the temporal relationships between brain regional biomarkers.

Bio:

Dr. Shanghong Xie is an Assistant Professor in the Department of Statistics at the University of South Carolina. She received her Ph.D. in Biostatistics from Columbia University. Her research interests include statistical machine learning, network analysis, functional data analysis, and precision medicine to address complex challenges in neuroscience, medicine, and public health.