Data Science Seminar

Hosted by the Department of Mathematics and Statistics

- Date: Tuesday, February 14, 2023
- Time: 12:00pm – 1:00pm
- Room: Whitney Hall 100E
- Speaker: Dr. Yuan Fang (Binghamton University)
- Title: Clustering disease trajectories: statistical method applications and evaluation.

Abstract

Biological and medical data increasingly have high dimensionality and complicated structures. Cluster analysis is a common exploratory analysis technique for identifying the underlying latent classes in a dataset. For many diseases, the underlying pathophysiology is complex, and heterogeneity in the natural history of the disease is common. Clustering the trajectories of disease progression can be helpful in understanding observed variability. In this talk, I will discuss the applications and evaluation of cluster analysis for identifying heterogeneity in longitudinal trajectories using a latent class mixed effect model (LCMM) approach. I will start with two examples of applying LCMM to identify latent patterns in trajectories: a) We have successfully applied LCMM and identified clinically meaningful subgroups in the disease progression of Duchenne muscular dystrophy; b) I will present preliminary results from our current study on the heterogeneity in trajectories of cognitive status, measured by a more complex outcome set, in participants from the community-based Framingham Heart Study. Then, I will show how to use simulation studies to evaluate the ability of LCMMs to accurately classify individuals for a wide range of noise and variability in trajectories and to provide guidelines for model specification when using this technique.

Biography of the speaker: Dr. Fang joined the Department of Pharmaceutical Sciences at Binghamton University in 2023. She received her Ph.D. in Mathematics and Statistics with a focus on Statistics from Binghamton University Department of Mathematical Sciences under the guidance of Dr. Sanjeena Dang. Her Ph.D. research mainly focused on developing novel unsupervised learning algorithms for non-standard data types that are usually encountered in biomedical research. Following her graduate studies, Yuan joined the group of Drs. Kathryn Lunetta and Joanne Murabito at Boston University School of Public Health as a postdoctoral associate. Her postdoc research focused on applying statistical tools to investigate the association between circulating immune cell phenotypes in the pro-inflammatory and regulatory pathways with cognitive decline, dementia, and Alzheimer's disease. She has also been working on quantifying the heterogeneity in decline trajectories of cognitive functions in the Framingham Heart Study participants. Yuan's current research focuses on studying lipid profiles for ceramide pathways in boys with Duchenne Muscular Dystrophy using multi-omics statistical and bioinformatics approaches. She is also interested in extending existing models and statistical approaches to clustering omics data and longitudinal data.