Seminar: 2/19/2024

Jeffrey S Morris
University of Pennsylvania
Co-authors: Quy Cao, Hojin Yang, Veera Baladandayuthapani, Benny Renn, Elizabeth Sweeney

Title: Quantile Functional Regression for Distributional regression of biomedical imaging data

Abstract: In many areas of science, technological advances have led to devices that produce an enormous number of measurements per subject, including biomedical imaging data. Frequently, researchers deal with these data by extracting summary statistics from these data (e.g. mean or variance) and then modeling those, but this approach can miss key insights when the summaries do not capture all of the relevant information in the raw data. One of the key challenges in modern statistics is to devise methods that can extract information from these big data while avoiding reductionist assumptions. In this talk, we will discuss methods for modeling the entire distribution of the measurements observed for each subject and relating properties of the distribution to covariates, with possible smooth nonlinear covariate and longitudinally varying affects. We apply this method to two biomedical imaging applications: one computing how the distribution of pixel intensities within a glioblastoma region relate to various biological and clinical factors, and the second using quantitative susceptibility mapping measuring inflammatory processes in brain imaging from multiple sclerosis patients. This general approach has many important applications, including many biomedical imaging applications, as well as wearable device data from accelerometers, blood pressure, and blood sugar monitors, as well as other types of high frequency data streams.