Mathematics, Statistics, and Computer Science **@ UIC**

Statistics and Data Science Seminar

Statistical Modeling and Inference for Next-Generation Functional Data

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Abstract: With the rapid growth of modern technology, many large-scale imaging studies have been or are being conducted to collect massive datasets with large volumes of imaging data, thus boosting the investigation of ''next-generation functional data.'' These enormous collections of imaging data contain interesting information and valuable knowledge, whichhas raised the demand for further advancement in functional data analysis. In this talk, we mainly focus on modeling and inference of the next-generation functional data. We propose using flexible multivariate splines over triangulation or tetrahedral partitions to handle irregular domain of the images that are common in brain imaging studies and in other biomedical imaging applications. The proposed spline estimators are shown to be consistent and asymptotically normal under some regularity conditions. We also provide a computationally efficient estimator of the covariance function and derive its uniform consistency. Finally, we discuss the inferential capabilities of the proposed method. To be more specific, we develop simultaneous confidence corridors for the mean of the next-generation functional data. The procedure is also extended to the two-sample case in which we focus on comparing the mean functions of random samples drawn from two populations. The proposed method is applied to analyze brain Positron Emission Tomography (PET) data of Alzheimer's Disease.

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