

Data Science Seminar

Hosted by the Department of Mathematical Sciences

- Date: Tuesday, October 4, 2022
- Time: 12:00pm - 1:00pm
- Room: Via Zoom
- Speaker: Dr. Chao Huang (Florida State University)
- Title: Shape-on-Scalar Regression Models: Going Beyond Prealigned Non-Euclidean Responses

Abstract

The problem of using covariates to predict shapes of objects in a regression setting is important in many fields. A formal statistical approach, termed geodesic regression model, is commonly used for modeling and analyzing relationships between Euclidean predictors and shape responses. Despite its popularity, this model faces several key challenges, including (i) misalignment of shapes due to pre-processing steps, (ii) difficulties in shape alignment due to imaging heterogeneity, and (iii) lack of spatial correlation in shape structures. We propose a comprehensive geodesic factor regression model that addresses all these challenges. Instead of using shapes as extracted from pre-registered data, it takes a more fundamental approach, incorporating alignment step within the proposed regression model and learns them using both pre-shape and covariate data. Additionally, it specifies spatial correlation structures using low-dimensional representations, including latent factors on the tangent space and isotropic error terms. Furthermore, the geodesic factor regression model is extended to a mixture of geodesic factor regression model, which can cluster objects and recover the underlying sub-group structure according to their shapes and covariates in Euclidean space. Both simulation studies and real data analysis are conducted to compare the performance of our proposed method with other existing methods.

Biography of the speaker: Dr. Huang is an Assistant Professor of Statistics at Florida State University. He obtained his PhD in Biostatistics from the University of North Carolina at Chapel Hill in 2019. His research focuses on statistical learning, medical image data analysis, manifold-valued data analysis, imaging genetics, and big data integration. In particular, he has an extensive research background in statistical learning of large-scale biomedical data including clinical, imaging, and genomic data. He was awarded the first year Assistant Professor award in 2020.

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