Department of Biostatistics and Medical Informatics Seminar

Zhenhua Lin, Ph.D.

Dean's Chair Associate Professor
Department of Statistics and Data Science
National University of Singapore
https://blog.nus.edu.sg/zhenhua/

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12:00-1:00 pm – Morgridge Hall Seminar 1524

Zoom Meeting: 966 3372 9112
https://uwmadison.zoom.us/j/96633729112?pwd=tHFc9i1dAAgmXe05uWtw8wXBIQZxGB.1 **Passcode: 621125**

Regression with Complex Data Objects: Geometry and Biomedical Applications

Abstract: Modern biomedical studies increasingly generate complex data objects such as covariance and connectivity matrices, probability distributions, and other observations that naturally reside in nonlinear metric spaces, where standard regression methods based on vector operations are no longer directly applicable. In this talk, I will consider regression from two complementary perspectives. First, when the response is a metric-space-valued object indexed by a scalar predictor such as time, I will introduce total-variation-regularized Fréchet regression, which provides an intrinsic way to recover piecewise-constant structure while respecting the geometry of the response space; an application to task-related fMRI data illustrates its use for detecting changes in dynamic functional connectivity. I will then consider the reverse setting, where the response is binary but the covariate is a metric-space-valued object. Motivated by classical logistic regression, we construct a geometrically defined binary regression model using distances and angles between geodesics, and apply it to functional-connectivity matrices from the Human Connectome Project to distinguish motor and language-processing tasks. Together, these results illustrate how familiar regression ideas can be extended beyond Euclidean spaces while retaining interpretability and relevance to complex biomedical data.

Bio: Zhenhua Lin is a Dean's Chair Associate Professor in the Department of Statistics and Data Science at the National University of Singapore, where he previously held a Presidential Young Professorship. He received his BSc in Computer Science from Fudan University, master's degrees in Statistics and Computing Science from Simon Fraser University, and PhD in Statistics from the University of Toronto. His research spans functional, non-Euclidean and high-dimensional data analysis, as well as modern statistical machine learning. He serves as an Associate Editor for Statistics and JASA/TAS, and previously served on the editorial board of Bernoulli. His research papers have appeared in leading venues including The Annals of Statistics, JASA, JRSSB, Biometrika, Biometrics, NeurIPS and ICML.

School of Medicine and Public Health
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