

High-Dimensional Spatial Quantile Function-on-Scalar Regression in Neuroimaging Analysis

Linglong Kong

University of Alberta
E-mail: lkong@ualberta.ca

Abstract: In this talk, we develop a novel spatial quantile function-on-scalar regression model, which studies the conditional spatial distribution of a high-dimensional functional response given scalar predictors. With the strength of both quantile regression and copula modeling, we are able to explicitly characterize the conditional distribution of the functional or image response on the whole spatial domain. Our method provides a comprehensive understanding of the effect of scalar covariates at different quantile levels and also gives a practical way to generate new images for given covariate values. Theoretically, we establish the minimax rates of convergence for estimating coefficient functions under both fixed and random designs. We further develop an efficient primal-dual algorithm to handle high-dimensional image data. Simulations and real neuroimaging data analysis are conducted to examine the finite-sample performance. Joint work with Zhengwu Zhang, Xiao Wang and Hongtu Zhu.