

Statistics and Data Science Seminar

Prediction with Spatially Dependent Functional Covariates

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Abstract: We present a novel spatial model that predicts scalar responses based on functional predictors observed at spatial locations. We incorporate two spatial components in the modeling, (i) spatial correlation between infinite-dimensional functional predictors and (ii) spatially heterogeneous associations between responses and functional covariates at different locations, by introducing a spatially varying functional coefficient model. It allows the functional coefficients to vary with location. To preserve spatial continuity on the low dimensional representation of functional predictors, we employ nonparametric data-adaptive functions for basis expansion under a Bayesian framework and place spatial priors on projection coefficients. We further propose the spatial variable selection, which allows spatially heterogeneous sets of non-null coefficients over locations by borrowing information across neighbors. The basis function estimation, model parameter estimation, and model selection can be jointly performed through Bayesian hierarchical modeling. For the prediction on new observations, we propose the unified approach which enables the estimation of nonparametric basis functions adaptive to new functional predictors and simultaneously draws predictive values from posterior prediction distribution in MCMC implementation. The model performance is demonstrated in simulation studies and an application to a crop yield prediction.

Wednesday, March 3 at 4:00 PM in Zoom