Spatially Varying Autoregressive Models for Prediction of New HIV Diagnoses

In demand of predicting new HIV diagnosis rates based on publicly available HIV data that is abundant in space but has few points in time, we propose a class of spatially varying autoregressive (SVAR) models compounded with conditional autoregressive (CAR) spatial correlation structures. We then propose to use the copula approach and a flexible CAR formulation to model the dependence between adjacent counties. These models allow for spatial and temporal correlation as well as space-time interactions and are naturally suitable for predicting HIV cases and other spatio-temporal disease data that feature a similar data structure. We apply the proposed models to HIV data over Florida, California and New England states and compare them to a range of linear mixed models that have been recently popular for modeling spatio-temporal disease data. The results show that for such data our proposed models outperform the others in terms of prediction.