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Spatial Fay-Herriot Models for Small Area Estimation with Functional Covariates

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(Submitted on 26 Mar 2013)

The Fay-Herriot (FH) model is widely used in small area estimation and uses auxiliary information to reduce estimation variance at undersampled locations. We extend the type of covariate information used in the FH model to include functional covariates, such as social-media search loads, or remote-sensing images (e.g., in crop-yield surveys). The inclusion of these functional covariates is facilitated through a two-stage dimension reduction approach that includes a Karhunen Lo\'{e}ve expansion followed by stochastic search variable selection. Additionally, the importance of modeling spatial autocorrelation has recently been recognized in the FH model; our model utilizes the conditional autoregressive class of spatial models in addition to functional covariates. We demonstrate the effectiveness of our approach through simulation and through the analysis of American Community Survey data. We use Google Trends search curves as functional covariates to analyze changes in rates of household Spanish speaking in the eastern half of the United States.

Submission history

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