Bayesian Geographically Weighted Regression with Fused Lasso Penalty

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The primary objectives of spatial data analysis are, predicting the response variable's values at unobserved locations, and interpreting the relationship between response variables and covariates. These objectives are expected to be achieved by the proposed Geographically Weighted Regression (GWR). GWR's different estimated coefficients for each location express location-specific heterogeneity.However, smaller numbers of observation locations can lead to numerical instability in GWR's coefficient estimations [1]. To resolve this problem, Bayesian GWR (BGWR) has been proposed, which estimates GWR parameters in a Bayesian framework. BGWR enables coefficient estimation through a higher numerical stability than in GWR, by assuming identical prior distributions for regression across locations.Nevertheless, these methods may continue to produce coefficient estimates that differ significantly between adjacent locations. Values between adjacent locations are expected to be similar; therefore, we propose a method that combines Bayesian Fused Lasso [2] with the prior distribution of coefficients in BGWR. The proposed method is expected to improve prediction accuracy, by facilitating coefficient equivalence at nearby locations.

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