SPARSE SPATIALLY CLUSTERED COEFFICIENT MODEL VIA ADAPTIVE REGULARIZATION

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Venue: Room 102, Shanghai Center for Mathematical Sciences

Abstract:

Large spatial datasets with many spatial covariates have become ubiquitous in many fields in recent years. A question of interest is to identify which covariates are likely to influence a spatial response, and whether and how the effects of these covariates vary across space, including potential abrupt changes from region to region. To solve this question, a new efficient regularized spatially clustered coefficient (RSCC) regression approach is proposed, which could achieve variable selection and identify latent spatially heterogeneous covariate effects with clustered patterns simultaneously. By carefully designing the regularization term of RSCC as a chain graph guided fusion penalty plus a group lasso penalty, the RSCC model is computationally efficient for large spatial datasets while still achieving the theoretical guarantees for estimation. RSCC also adopts the idea of adaptive learning to allow for adaptive weights and adaptive graphs in its regularization terms and further improves the estimation performance. RSCC is applied to study the acceptance of COVID-19 vaccines using county-level data in the United States and discover the determinants of vaccination acceptance with varying effects across counties, revealing important within-state and across-state spatially clustered patterns of covariates effects.