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A Scalable MCEM Estimator for Spatio-Temporal Autoregressive Models

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Very large spatio-temporal lattice data are becoming increasingly common across a variety of disciplines. However, estimating interdependence across space and time in large areal datasets remains challenging, as existing approaches are often (i) not scalable, (ii) designed for conditionally Gaussian outcome data, or (iii) are limited to cross-sectional and univariate outcomes. This paper proposes an MCEM estimation strategy for a family of latent-Gaussian multivariate spatio-temporal models that addresses these issues. The proposed estimator is applicable to a wide range of non-Gaussian outcomes, and implementations for binary and count outcomes are discussed explicitly. The methodology is illustrated on simulated data, as well as on weekly data of IS-related events in Syrian districts.

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