



Fast Estimation of Spatially Dependent Temporal Trends Using Gaussian Markov Random Fields

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Abstract:

There is a need for efficient methods for estimating temporal trends in spatio-temporal data. A suitable model for such data is a space-varying regression model, where the regression coefficients for the spatial locations are dependent. The spatial covariance structure is specified using a second order intrinsic Gaussian Markov Random Field prior. Model parameters are estimated using the Expectation Maximization (EM) algorithm, which allows for feasible computation times for relatively large data sets. Results are illustrated with simulated data sets and real vegetation data from the Sahel area in northern Africa. The results indicate a substantial gain in accuracy compared to methods based on independent ordinary least squares regressions for the individual pixels in the data set. Use of the EM algorithm also gives a substantial performance gain over Markov Chain Monte Carlo-based estimation approaches.

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