Spatiotemporal Modeling of Zero-Inflated Data: A Robust Approach with Hurdle Models

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Abstract

Models incorporating spatiotemporal random effects have become prevalent in analyzing zero-inflated data with spatiotemporal correlations. However, the unknown spatiotemporal correlation structures challenge practical implementation, and erroneous assumptions may lead to flawed inferences. To address this, we assume the marginal distribution of the response variable follows a Hurdle binomial distribution. Employing Generalized Estimating Equations (GEE), we introduce an estimation procedure for regression coefficients. Notably, the spatiotemporal correlation parameters in the working correlation matrix are iteratively estimated non-parametrically. Furthermore, we estimate the variance of the regression coefficients using jackknife resampling for subsequent inferences. Simulation experiment results demonstrate the effectiveness of our proposed method, showing robust and reliable estimates of regression coefficients.

Keywords: Generalized Estimating Equations, Jackknife resampling, Spatiotemporal correlations, Simulation experiments, Zero-inflated data.

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