

Modeling zero-Modified spatiotemporal counts using generalized estimating equations

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We develop a spatiotemporal GEEbased estimation procedure for zeromodified count data that requires only that its mean and variance match those of a hurdle binomial model. Rather than modeling the generation mechanism of zeros, our primary focus is specifying and estimating the conditional mean of the nonzero counts via link functions embedded in the GEE framework. To capture spatial and temporal dependence arising from repeated areal measurements, we employ an iterative nonparametric update of a working correlation matrix, ensuring robustness to misspecification of the unknown dependence structure. Regression parameters are obtained by a Newton-Raphson solver applied to the GEE, and we approximate their variability with a block jackknife estimator to deliver reliable standard errors and confidence intervals. Simulation studies under varying zero proportions and spatialcorrelation strengths demonstrate that our method yields satisfactory bias. Achieves better interval coverage compared to naive GEE. Finally, we apply the proposed approach to annual extreme rainfall counts in northern Taiwan for the three years 2016, 2017, and 2019, revealing significant effects of temperature, radiation, and total precipitation on the frequency of extreme rainfall.