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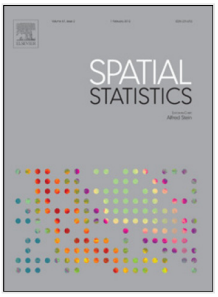

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A Bayesian spatial scan statistic for zero-inflated count data

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Abstract

Spatial scan statistics have been widely used in the detection and inference of spatial clusters. An extension to this statistic—the zero-inflated scan—was recently proposed for scenarios where the number of zero counts is greater than that predicted by most usual count models. In this work, we propose an efficient Bayesian spatial scan statistic for zero-inflated binomial data which overcomes computational limitations of previously proposed models set within a frequentist inferential framework. Our methodology is evaluated and compared with the frequentist approach using simulated data. Our simulations show that the performance of the Bayesian version is comparable to that of the frequentist zero-inflated scan. An advantage of the Bayesian approach is that routines can be carried through at a much higher speed; this is important when one considers full integration of the proposed methodology to an online cluster detection mechanism. In order to build an empirical distribution for computing the p-values needed for the decision process involved in the frequentist scan approach, considerable computational effort is expended for running simulations under the null hypothesis. The Bayesian approach does not require such procedure. An application to speeding tickets emissions in Federal District, Brazil, is presented.

Keywords: spatial clustering, spatial scan statistic, Bayesian statistics

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