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An expectation-based space-time scan statistic for ZIP-distributed data

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Abstract

An expectation-based scan statistic is proposed for the prospective monitoring of spatio-temporal count data with an excess of zeros. The method, which is based on an outbreak model for the zero-inflated Poisson distribution, is shown to be superior to traditional scan statistics based on the Poisson distribution in the presence of structural zeros. The spatial accuracy and detection timeliness of the proposed scan statistic is investigated by means of simulation, and an application on weekly cases of *Campylobacteriosis* in Germany illustrates how the scan statistic could be used to detect emerging disease outbreaks. An implementation of the method is provided in the open source R package `scanstatistics` available on CRAN.

Keywords: EM algorithm, disease surveillance, scan statistic, spatio-temporal, zero-inflated Poisson.

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