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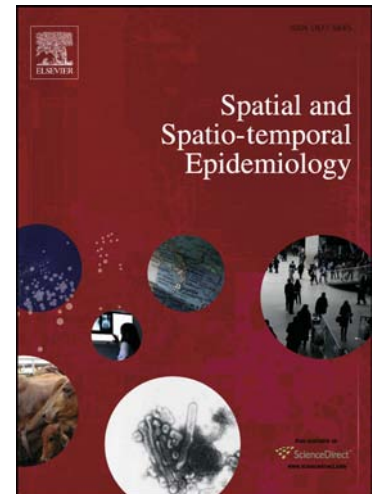
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Bayesian cluster detection via adjacency modelling

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Abstract

Disease mapping aims to estimate the spatial pattern in disease risk across an area, identifying units which have elevated disease risk. Existing methods use Bayesian hierarchical models with spatially smooth conditional autoregressive priors to estimate risk, but these methods are unable to identify the geographical extent of spatially contiguous high-risk clusters of areal units. Our proposed solution to this problem is a two-stage approach, which produces a set of potential cluster structures for the data and then chooses the optimal structure via a Bayesian hierarchical model. The first stage uses a spatially adjusted hierarchical agglomerative clustering algorithm. The second stage fits a Poisson log-linear model to the data to estimate the optimal cluster structure and the spatial pattern in disease risk. The methodology was applied to a study of chronic obstructive pulmonary disease (COPD) in local authorities in England, where a number of high risk clusters were identified.

Keywords: Clustering, Conditional autoregressive model, Disease mapping, Spatial modelling

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