BAYESIAN INFERENCE FOR GAUSSIAN EXCURSION SET GENERATED COX PROCESSES WITH SET-MARKING

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Cox point process is a hierarchical stochastic model for clustered point patterns. It is based on a random intensity being some non-negative random field and, conditional on the intensity, the points are distributed according to the inhomogeneous Poisson process. Matérn cluster process, log Gaussian Cox process and Poisson-gamma Cox process are well-known examples. A recent suggestion is a further Cox process where the intensity is defined by a random closed set with different point intensities within and outside the set. In this particular case the information is remarkably increased if, in addition to the point locations, the intersection of the point pattern and the generating random set is observed. More precisely, if a point belongs to the random set, the point is marked by “1”, otherwise by “2”. This type of marking is named as set-marking.

Statistical inference for the Cox process class is basically difficult; a general estimation method seems to be the minimum contrast method while the maximum likelihood method is in most cases intractable. However, setting the Gaussian excursion set as the random set model, the likelihood and the Bayesian approach are applicable for the random set generated Cox process with set-marking. We consider the Bayesian method for this model where the random set is obtained through thresholding a Gaussian continuous-parameter random field. A point pattern of pine saplings is analysed in a situation where the soil of a clear-cut forest area has been mounded before planting and natural seeding.