MCEM algorithm for the log-Gaussian Cox process

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Abstract Log-Gaussian Cox processes are an important class of models for aggregated point patterns. They have been largely used in spatial epidemiology (Diggle et al., 2005), in agronomy (Bourgeois et al., 2012), in forestry (Moller et al.), in ecology (sightings of wild animals) or in environmental sciences (radioactivity counts).

A log-Gaussian Cox process is a Poisson process with a stochastic intensity depending on a Gaussian random field. We consider the case where this Gaussian random field is centered with exponential covariance function. Moreover we assume that we observe count variables in disjoint quadrats assumed to be the same up to a translation. In that special case, we consider the problem of the estimation of the parameters of the log-Gaussian Cox process. We propose a MCEM algorithm and compare this algorithm to a moments method. Our MCEM algorithm considers the non observed count variables and the Gaussian random field as hidden variables. Simulations show that, in most cases, this MCEM algorithm improves the precision of the estimations in comparison to the moments method.

As a future direction of this work, we will discuss the problem of the optimal sampling for estimation and prediction. We will also discuss the problem of hypothesis testing.

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