Optimal intensity estimation of the intensity function of an inhomogeneous spatial point process

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Although optimal from a theoretical point of view, maximum likelihood estimation for Cox and cluster point processes can be cumbersome in practice due to the complicated nature of the likelihood function and the associated score function. It is therefore of interest to consider alternative more easily computable estimating functions. We derive the optimal estimating function in a class of first-order estimating functions. The optimal estimating function depends on the solution of a certain Fredholm integral equation and reduces to the likelihood score in case of a Poisson process. We discuss the numerical solution of the Fredholm integral equation and note that a special case of the approximated solution is equivalent to a quasi-likelihood for binary spatial data. The practical performance of the optimal estimating function is evaluated in a simulation study and a data example.