Regularization techniques for inhomogeneous Gibbs point process models with a diverging number of covariates

Abstract: The Gibbs point processes (GPP) constitute a large class of point processes with explicit dependence between points. In the spatial point process framework, this dependence is often called interaction. Depending on the relative distance between the points, this interaction can be attractive or repulsive. Feature selection procedures are an important topic in high-dimensional statistical modeling. In this paper, composite likelihood approach with convex and nonconvex penalty functions is proposed to handle this kind of problems for inhomogeneous GPP. We particularly investigate the setting where the number of covariates diverges as the domain of observation increases. Furthermore, under some conditions provided on the spatial GPP and on the penalty functions, we show that the oracle property, the consistency and the asymptotic normality still hold for such a setting. Through simulation experiments, we validate our theoretical results and finally, an application to tropical forestry datasets illustrates the use of the proposed approach.

Keywords: Gibbs point process, high dimensional regression, composite likelihood, regularization method, feature selection.