Quantifying the strength of dependence of a point process on a covariate under the presence of nuisance covariates

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Point processes are used to model random occurrence of objects in space. In practical applications, the point process distribution is often assumed to be influenced by a set of covariates. The significance of the individual covariates needs to be determined in order to decide which covariates should be included in the following inferential steps. This is rather straightforward if the covariates are independent but not so much if they are correlated.

We propose a summary characteristic quantifying the strength of dependence between a point process and a covariate of interest, taking into account a set of nuisance covariates potentially influencing the point process. The summary characteristic is inspired by the partial correlation coefficient from the classical statistics and enables direct comparison of different models. Furthermore, we propose several nonparametric tests aimed at determining significance of the covariate under the presence of nuisance covariates. The tests are based on the random shift approach with either torus or variance correction.

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