

Spatio-temporal determinantal point processes and a kernel-based test for first-order separability

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Determinantal point processes (DPPs) are models for regular spatial point patterns. They have densities in a closed form, moment expressions can be easily evaluated for them and realizations from these models can be quickly simulated. In this study, we propose spatio-temporal counterparts of the spatial DPPs. We present spatio-temporal DPPs and their statistical properties and give examples of these models considering spatio-temporal covariance functions which are separable and non-separable in space and time. We then propose a novel statistical test for the first-order separability of the spatio-temporal DPPs using a machine learning technique called Hilbert–Schmidt independent criterion, which uses the kernel trick for feasibility. Based on our simulation study, the empirical level of the test is close to the nominal level or a bit conservative, and the power is reasonably good.