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Estimating the spectral properties of spatial point processes

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Understanding how objects are distributed in space, like trees in a forest, can reveal important patterns. One way to study these patterns is through spectral methods, which analyze the data in terms of frequencies. This approach focuses on estimating a quantity called the structure factor.

In this work, we establish a minimax lower bound: we quantify the best possible accuracy that any estimator of the structure factor can achieve, depending on how smooth the underlying pattern is. We then construct an estimator that reaches this optimal accuracy. However, it requires prior knowledge of certain properties of the data.

To make our method practical, we design a data-driven procedure that automatically learns these properties. It works by repeatedly thinning the points at random (i.e., removing some points) and exploiting correlations between different frequencies.

Thématiques

Spatial statistic; Spectral inference

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