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Analyzing point processes using Ripley's K-function and persistence homology

Abstract: The first half of this talk will give an introduction to two tools for analyzing point patterns, namely Ripley's K-function and persistence homology. A brief introduction to some of the most common stochastic models for point patterns will also be given. When analyzing the goodness of fit of a given point pattern to a hypothesized stochastic point process model, the K-function and persistence Betti numbers can be used as summary statistics. In the second half of the talk, I will present functional central limit theorems for both the K-function and persistence Betti numbers and show how these results can be used for doing statistics of point processes.

This is joint work with Christophe Biscio, Nicholas Chenavier, and Christian Hirsch.