Lab: Point Pattern Analysis

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Lab Objective

Analyze spatial point patterns using CSR (complete spatial randomness) as a null model. Detect clustering or repulsion, evaluate the effect of spatial heterogeneity, and test the independence between two point patterns.

Part 1: Introduction and CSR

(1a) Generate a point pattern with complete spatial randomness (CSR) using intensity $\lambda = 100$. Plot it.

(1b) What is complete spatial randomness (CSR) and which statistical model represents it?

(1C) Generate: an aggregated pattern using rMatClust(), a repulsive pattern using rMaternII(). Plot all three patterns (CSR, aggregation, repulsion) side-by-side.

(1d) What visual differences do you observe between the three patterns?

Part 2: Ripley's K and null model testing

(2a) Compute and plot Ripley's K function with simulation envelopes for each of the three patterns.

(2b) How do you interpret a K(r) curve above or below the theoretical curve? Which of the patterns significantly deviates from CSR? At what range of distances?

Part 3: Heterogeneous intensity

(3a) Simulate a heterogeneous point pattern with a non-uniform intensity function as argument of *rpoispp*. Plot the pattern.

(3b) Why can a density gradient be mistaken for spatial analyses?

(3c) Compare K estimates with and without correcting for heterogeneity (express the pattern in the *simulate* argument of the function *envelope*).

(3d) Which characteristic helps distinguish a density gradient from true clustering/aggregation?