Environmental Statistics - Exam

Spatial Point Processes

May 19, 2021

The exam folder contains `examPP.Rdata` - a workspace with the object `X`, a point pattern about a fish species, and `cov` quantifying the presence of plankton in the sea.

Create a new R script and save it as "`LastnameNamePP.R`".

Answer all questions below on the script, and number them according to the following order.

First of all, call the package `spatstat` and load the `examPP.Rdata` workspace.

1. Plot the covariate and add the points to the plot with point symbol 19
2. Plot the observation window and compute its area specifying the measurement unit
3. What is the distribution of the number of points? What is the parameter in the simplest case?
4. How many points do we expect to observe over a 5×5 feet area?
5. Estimate the probability of having 0 points over one square unit
6. Plot the empirical distribution function of the nearest neighbour distance, compared to the one under the hypothesis of a Poisson process.
7. What can you say about the plot? Can you draw conclusions on the dataset?
8. Fit an inhomogeneous Poisson process where the intensity depends only on the covariate 'cov'
9. What is the value of the intensity in the upper-left corner of the window, where the covariate is 0.006?
10. Plot the model output; describe what you have plotted
11. Compare the fitted model to another inhomogeneous Poisson process where the intensity depends on the coordinate x. Which model do you prefer?

When you are done, send the R script to professors Altieri and Greco and ask for feedback of receipt. Afterwards, you may close and leave.