Environmental Statistics - Mock Exam

Spatial Point Processes

The exam folder contains `examPP.Rdata` - a workspace with the object `X`, a point pattern of poisonous mushrooms, and `cov`, a spatial covariate representing the humidity of the soil, in percentage.

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 dataset, extract the number of points and the area of the observation window
2. Plot the covariate and add the points to the plot.
   Can you see any relationship between covariate and pattern?
3. Estimate the intensity under a Homogeneous Poisson process.
   Interpret the result
4. Estimate the expected number of mushrooms for an area of 6x5 metres.
   Can you do it without knowing where the area is located? Why?
5. Derive the 95% confidence interval for the estimator of question 4.
6. Test the hypothesis of homogeneous Poisson process using a Chi-square test with 9 areas.
   Is the pattern random, regular or clustered?
7. Fit an inhomogeneous Poisson process where the intensity depends on the intercept and the covariate.
   What is the value of the intensity given that the humidity is equal to 10%?
8. Compare the fitted model and the homogeneous Poisson process.
   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.