Lectures on Spatial point processes:
theory and practice illustrated with the R software

by Ege Rubak, Aalborg University, Denmark

Ege Rubak (PhD, Aalborg University) will visit the Laboratory Jean Kuntzmann (from Tuesday 17th February until Friday 25th February). During his stay, he will give a series of four lectures on the topic of spatial point processes.

Spatial point processes are mathematical models used to describe and analyse the geometrical structure of patterns formed by objects that are irregularly or randomly distributed in one-, two- or three-dimensional space. Examples include locations of trees in a forest, location of cases of cancer, blood particles on a glass, galaxies in a universe. These lectures aim at giving a survey on appropriate statistical methods to deal with such data.

These lectures will take place in Salle 1, Tour IRMA, Laboratoire Jean Kuntzmann. Two lectures are planned on Thursday 17th February (14:00->15:00 and 15:30->16:30) and the two other ones on Thursday 24th February (14:00->15:00 and 15:30->16:30). These talks are suited to any person interested in an introduction to the topic (PhD students, second-year master degree, colleagues from the Statistics department and other departments, ...).

For further information contact Jean-François Coeurjolly,
Jean-Francois.Coeurjolly@upmf-grenoble.fr.

Figure 1: Example of spatial point pattern data (1). Tropical rainforest data. Locations of 3605 trees in a tropical rainforest, with supplementary grid map of elevation (altitude).
Lecture information

The lecture series will introduce the basic theory of spatial point processes and many of the fundamental concepts used in the analysis of such processes. The focus is on practical applications of statistical methods in the area, and the lectures contain a multitude of examples. We will almost exclusively consider planar point processes, as the necessary software (R package spatstat) is mostly developed for observations in the plane.

Contents of lecture 1 (17/02/2011, 14:00-15:00) Examples of data including homogeneous and inhomogeneous point patterns, marked point patterns and point patterns with covariate information. Stationarity and first order properties. Non-parametric kernel estimation of point process intensities. Introduction to the Poisson point process.


Contents of lecture 3 (24/02/2011, 14:00-15:00): Point process densities. Papangelou conditional intensity. Non-Poisson models including Cox and Gibbs point processes.


Figure 2: Example of spatial point pattern data (2). Chorley-Ribble cancer data: The health authority mapped the domicile locations of all cases of cancer of the larynx and, for control purposes, a random sample of cases of lung cancer.