

2017-CUBA-CU-96

School: Spatial Statistic and Extreme value

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Development date: March 06- 15, 2017

Motivation of developing the school

For about 25 years, the University of La Habana organizes international conferences in applied mathematics: the International Workshop on Operations Research (IWOR) and International Conference on Operations Research are organized alternately in La Habana and in Paris. The ICOR conferences usually hosts between 80 and 100 persons.

During ICOR 2014 were pointed out several themes that may interest young researchers, graduate students and doctorants. One of them were Extreme Value Theory and Spatial Statistics. Indeed, many problems such dengue epidemics or extreme climate events that affect Cuba needs these tools.

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Antecedents and motivations

The research school will focus on spatial statistics and extreme events, with applications in epidemiology and food risks. The main courses will be:

1. Spatial Statistics: Geostatistics
2. Spatial Statistics: data on grid
3. Extreme events: univariate case
4. Extreme events: multivariate and spatial case
5. Epidemiology and spatial epidemiology
6. Food Risk (including extremes)

The school is suited for students, faculty members and non-specialists or practitioners wishing to orient their research to spatial modeling, assessing tail risks and their applications in epidemiology and food risks. The research school also will try to attract researchers from other disciplines like epidemiologists or nutritionists with a good statistical background. Indeed the school aims to be the place for meeting, training and exchanging but also it aims to create a community around these themes.

The organization in the University of La Habana allows to get participants from different Cuban Caribbean and South American Universities as well as specialists of research institutions.

Objectives

The school will consist in a "classical" part with courses and lectures but also practical works and projects using the R software.

There will be 6 courses of 3 lectures each (3h per lecture). Last Friday will be dedicated to lectures (6 to 10 research talks) of 45 minutes. Both Wednesdays will be free and dedicated to social events.

The speakers of the research talks will be chosen in order to illustrate or complete the courses

Information on the courses:

Prof. Cécile Hardouin , FRANCE

Description of the course Spatial on Lattice:

In epidemiology, data are often collected on a discrete set of sites, for instance administrative districts. Markov Random Fields are useful for modelling such data. The spatial dependence is expressed locally, the distribution at one site depending on its neighbors.

We focus on Besag's auto-models, a class of Markov Random Fields. We present various models and their inference, with examples in the epidemiological context and their extension to spatiotemporal.

Prof. Gwladys Toulemonde, FRANCE.

Description of the course: Extremes I

Extreme events are generally related to severely damaging hazards and their inherent scarcity make any decision related to them difficult. The main issue consists in extrapolating from observed levels to unobserved ones and extreme value theory (EVT) provides a class of models to enable such extrapolation. This part of this course is devoted to univariate EVT. Two approaches will be presented : blockmaxima and threshold exceedances.

Applications will be addressed using the R software.

Prof. Carlo Gaetan, ITALY

Description of the course: Extremes II

This course represents the next step of the study of univariate extremes (Extremes I) and is devoted to multivariate extreme value theory. Two approaches will be also presented : block-maxima and threshold exceedances. An introduction to spatial extreme modelling will be proposed. Finally applications on real data set will be addressed with the R software.

Prof. María Dolores Ugarte , SPAIN

Description of the course: Epidemiology

In the last decades, the study of incidence/mortality data in a region has been established as a basic tool in public health data analysis. This permits to identify potential risk factors of a certain disease and to discover health inequalities. This course will cover classical techniques for risks estimation, simple statistical models for smoothing risks and more sophisticated statistical models including spatial dependence. Real data will be used to illustrate the procedures.

Prof. Jessica Tressou FRANCE

Description of the course: Food Risk

Certain foods may contain varying amounts of chemicals which may cause major health problems when accumulating inside the body in excessive doses.

These events are most of the time rare. In a static approach, extreme value theory can be used to model the tail of the exposure distribution but it does not account for the kinetics of the chemical of interest in the human body.

Ruin models can be adapted to model the dynamic of the exposure.

Prof. Liliane Bel , FRANCE

Description of the course: Geostatistics For spatially recorded data.

Taking into account the resulting spatial dependency is a crucial issue for inference. Assuming an underlying random field with stationary increments, modelling the spatial dependency amounts to estimate a variogram, that will be the main tool for predicting/simulating spatial or spatiotemporal processes. Various kriging

techniques for spatial prediction will be presented and some applications in environmental field will be addressed with R software.

The Local Committee is

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Supporters

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