UNIVERSITÀ DEGLI STUDI DI BERGAMO

DIPARTIMENTO DI MATEMATICA STATISTICA INFORMATICA E APPLICAZIONI

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DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE E METODI MATEMATICI

Interdepartmental Seminar Series MAT-STAT
Day theme: *Space and space-time models for environmental complex data*
Tuesday, June 26th, 2012

Room 15 – Via dei Caniana 2 (Fac. of Economics) - Bergamo

A refreshment will follow

3:00 PM
Space time global models for climate ensembles
Dr S. Castruccio, Department of Statistics, The University of Chicago

Abstract: Climate models are mathematical models aimed at reproducing physical processes on a global scale and at predicting quantities like temperature and precipitation given some forcing inputs. Climate ensembles are collection of such runs with different initial physical conditions and different forcing scenarios. In previous work we used a nonlinear regression to statistically model the output to reproduce (emulate) the elements in the ensemble. The emulator was built on a coarse space resolution and focusing only on the mean structure. The purpose of this work is to build a statistical model that addresses the issue of emulating space/time dependence at grid resolution. Given the large size of the data, fitting these models requires fast algorithms for gridded data on the sphere×time domain and efficent ways of computing without storing very large matrices. The presence of independent repetitions in the climate runs based on different initial conditions leads to situations specific to computer output analysis; for example, in this setting diagnostic tools such as the variogram can be evaluated without any bias even in the presence of a spatial trend.

4:00 PM
Functional approach in the analysis and modelling of environmental data
Dr R. Ignaccolo, Department of Economics, University of Torino

Abstract: In many fields of environmental sciences, when data are a collection of values along a domain, such as height, depth or time, they can be considered as realizations of random functions and be treated through the Functional Data Analysis approach. In this talk, we show how this approach can be suitably adopted to cope with specific questions. First of all we propose a functional clustering procedure, where Partitioning Around Medoids (PAM) algorithm is embedded, to group stations of air quality monitoring networks in homogeneous clusters with respect to pollutant concentration levels and/or temporal profiles. Secondly, we present a functional approach to partition a land in zones characterized by different criticality levels of atmospheric pollution, that we call "Functional Zoning" and that meets two specific requirements: upscaling pollutant concentration data to the municipality scale, since municipalities are the reference territorial administrative units for undertaking actions; aggregating different pollutants in order to provide a multi-pollutant zoning outcome reflecting the air quality status. Finally, since both scientists and policy-makers need forecasted pollution levels at unmonitored sites, in order to predict a curve taking into account (functional) exogenous variables, we propose to extend the so-called kriging with external drift to the case of functional data.