

ENGLISH OFFPRINT

**Competitive examination for admission to two 24-month research grants – “*Statistical models for remote sensing of air quality*” –
*Tutor: Prof. Alessandro Fassò***

Deadline for application: 30 days after announcement publication. See <http://elearning.unibg.it/concorsi/concorsibandi.nsf>

General objectives of the program:

The objective is to propose a statistical model for the dynamical spatio-temporal mapping of fine particles capable to monitor atmospheric pollution both in the Lombardia region and in Europe. The integration of data from the monitoring network and satellite data will provide a uniform spatial representation which will be independent of policy of investment in monitoring networks of the different nations and regions in Europe.

It will also streamline the existing monitoring networks, with significant savings at the regional level. From a methodological point of view, the innovative aspect is the estimation of a parametric or semi-parametric model estimation by an extension of the EM algorithm.

The several issues, that will be jointly addressed, refer to the missing spatial data, different spatial scales, data defined on different grids and large arrays of data.

The project involves collaboration with the Dept. of Statistics, Viadrina University, Frankfurt Oder (DE), il Dept. of Statistics, University of Glasgow (UK), il Dept. of Mathematics, University Jaime I, Castillon (S) e il Dept. of Mathematics, Universidade Técnica de Lisboa (PT).

Requirements:

PhD or a degree attained under the laws previously in force for the reform of the autonomy university education or degree in Statistics (Class 92 / S) or Mathematics (Class 45/S) or degree Master equivalent, or equivalent degree qualification obtained abroad.

Matters on which the candidates' qualifications should address:

Geostatistics, spatial-temporal models, hierarchical models, estimates for complex models, computational statistics, and compute-intensive.

Research Program:

Researchers will contribute to the main team objective, namely the construction of the calibration model space-time satellite data which is divided into several stages. The first is methodological and theoretical, will follow a significant part consisting of encoding and implementation in a distributed computing environment.

COSP: Preparing the module for managing data on different scales. We compare the Bayesian approach and one based on the likelihood.

Heterotopic Coregionalization: Extension of the algorithm of Zhang (2007) for completely heterotopic and autocorrelated data.

Module for missing data: Preparing the module for the management of missing data. This will form an integral part of the model. The missing data are not estimated by interpolation techniques, but they are an output of the same model.

EM Algorithm: The optimization of the likelihood for the valuation of maximum likelihood estimates can be a problem because of the dimensionality of the parameter vector. The EM algorithm is generalized here using an approximation that will handle the case said "completely heterotopic and autocorrelated".

Large covariance matrices: The use of tapering and reverse techniques of covariance matrices of large size will require a theoretical study on the asymptotic behavior of estimators derived from it.

Lombardia Region data: The collection of data on the Lombardia Region, includes: AOT, PM data, weather, altitude, land classification. This phase is shortened by knowledge of the regional sources. Ready georeferenced database for space-time analysis.

Lombardia Region Model: Identification, estimation and validation through crossvalidation and bootstrap techniques. This phase also includes the systematic quantification of the uncertainty of the model

European data: Collection of data relating to Central or Atlantic. Includes: AOT, PM data, weather, altitude, land classification. Much more expensive than RL for the multiplicity of sources. Ready georeferenced database for space-time analysis.

EU model: Identification, estimation and validation through crossvalidazione and bootstrap techniques. This phase also includes the systematic quantification of the uncertainty of the model.

Selection:

Selection is based on curriculum and publications assessment and an oral exam. The oral exam will take place on 19 November 2010 at 14:00 at the Department "Ingegneria dell'Informazione e Metodi Matematici", Via Marconi 5, Dalmine BG. Applicants with domicile outside of the Lombardia Region can be remotely interviewed via skype with webcam capability. It is the responsibility of the applicant to express his/her intention to do this by contacting by email the tutor, Prof. Alessandro Fassò, alessandro.fasso@unibg.it, at least 7 days before the interview.

Subject matter of the interview:

The interview will focus on the issues of the project.