Politecnico di Torino
Dipartimento di Scienze Matematiche "G. L. Lagrange"

DISMA

Ambasciata d'Italia
Dakar

Meeting on Statistical Methods and Applications

"From sharing knowledge to cooperation"

Politecnico di Torino, 9 June 2023, 11-15 (Rome time)
Dipartimento di Scienze Matematiche "G.L. Lagrange"
in Aula Buzano, and online

To participate, please, register here

The meeting is inspired by the idea that facing the challenging problems arising from globalization could benefit from cooperative research among countries with very different histories. Several lines of research in Statistics and its applications will be illustrated by diverse speakers, some in person and some online, ranging from theoretical to more applied topics. The goal of the day is to promote an exchange on the work performed by different research units acting in France, Italy, and Senegal in recent times, and to discuss cooperative actions devoted to sharing knowledge and to the training of young researchers.

PROGRAMME

11:00 *Wellcome:* **Eugenio Cavallo**, Scientific Attaché, Embassy of Italy in Dakar
Opening remark: **Giovanni Umberto De Vito**, Ambassador of Italy in Dakar
11:15 **Sophie Dabo**, University of Lille (France)
11:40 **Amir Khorrami Chokami,** University of Turin (Italy)
12:05 **Aliou Diop**, University of St.Louis (Senegal)
12:30 *Lunch break*
13:00 **Gianluca Mastrantonio**, Politecnico di Torino (Italy)
13:25 **Papa Ngom**, University of Dakar (Senegal)
13:50 **Mauro Gasparini**, Politecnico di Torino (Italy)

14.15 *Round table*: "Sharing knowledge and cooperation in research and training of young researchers", with the additional participation of prof. **Stefano Berrone,** chair of Collegio di Ingegneria Matematica.

15:00 *Conclusions*

Organizers: Valeria Chiadò Piat, Letterio Gatto, Mauro Gasparini
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CANTABILE FONDAZIONE ETS

POLIETNICO

Titles and Abstracts

Sophie Dabo
Université de Lille, France
Investigating spatial scan statistics for multivariate functional data

In environmental surveillance, cluster detection of environmental black spots is of major interest due to the adverse health effects of pollutants, as well as their known synergistic effect. Thus, this paper introduces new spatial scan statistics for multivariate functional data, applicable for detecting clusters of abnormal air pollutants concentrations measured spatially at a very fine scale in northern France in October 2021 taking into account their correlations. Mathematically, our methodology is derived from a functional multivariate analysis of variance(MANOVA), an adaptation of the Hotelling T^2-test statistic, and a multivariate extension of the Wilcoxon test statistic. The approaches were evaluated in a simulation study and then applied to the air pollution dataset.

Aliou DIOP
Université Gaston Berger, Saint-Louis, Sénégal
Statistics of extremes under random censoring

Estimation of the extreme-value index of a heavy-tailed distribution is addressed when some random covariate information is available and the data are randomly right-censored. A weighted kernel version of Hill's estimator of the extreme-value index is proposed and its asymptotic normality is established. Based on this, a Weissman-type estimator of conditional extreme quantiles is constructed. A simulation study is conducted to assess the finite-sample behavior of the proposed estimators.

Mauro Gasparini
Politecnico di Torino, Italy
Estimating Vaccine Efficacy

Few approaches, especially Bayesian, are presented to give an interval estimate of Vaccine Efficacy. As an example, we reconsider the statistical methodology of the BioNTech/Pfizer protocol, which in 2020 led to the first approved anti-Covid-19 vaccine.

Amir Khorrami Chokami
University of Turin, Italy
Joint asymptotic behavior of maxima over subsets of concomitants in the extremal dependence framework

The study of concomitants has recently met a renewed interest due to its applications in selection procedures. For instance, concomitants are used in ranked-set sampling, to achieve efficiency and reduce cost when compared to simple random sampling. In parallel, the search for new methods to provide a rich description of extremal dependence among multiple time series has rapidly grown, due also to its numerous practical implications and the lack of suitable models to assess it. The aim is to investigate extremal dependence when choosing the concomitants approach. We show how the extremal dependence of a vector (X,Y) impacts the asymptotic behavior of the maxima over subsets of concomitants. Discussing the various conditions and results, we point out the fundamental role played by the marginal distributions of X and Y.

Gianluca Mastrantonio
Politecnico di Torino, Italy
Bayesian Size-and-Shape regression modelling

Geometrical information known as Size-and-Shape encompasses the essential attributes of an object, independent of its location and rotational effects. The modeling of Size-and-Shape data has garnered significant attention in various research domains. While some descriptive and basic inference tools have been introduced in existing literature, the number of proposed modeling methodologies remains limited. This paper introduces a Bayesian regression model, building upon a frequentist regression model, designed specifically for size-and-shape response variables featuring Gaussian landmarks.

Papa Ngom
Université Cheikh Anta DIOP, Dakar, Sénégal
Variable selection with group LASSO approach: Application to Cox regression with frailty model

In analysis of survival outcomes supplemented with both clinical information and high-dimensional gene expression data, use of the traditional Cox proportional hazards model fails to meet some emerging needs in biomedical research. First, the number of covariates is generally much larger the sample size. Secondly, predicting an outcome based on individual gene expression is inadequate because multiple biological processes and functional pathways regulate phenotypic expression. Another challenge is that the Cox model assumes that populations are homogenous, implying that all individuals have the same risk of death, which is rarely true due to unmeasured risk factors among populations.
We propose group LASSO with gamma-distributed frailty for variable selection in Cox regression by extending previous scholarship to account for heterogeneity among group structures related to exposure and susceptibility.