

Organizing committee

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I General summary

Date: July 01-05 2019

Lieu : M'bour, AIMS center Senegal

Web site : [here](#)

Developing countries are in need of high-level research. In this work, we are focusing on french-speaking African young researchers. We have organized a summer school for master students and PhD candidates, to gather young researchers around a scientific event of high level in Statistics and Data Science.

The organizing committee is composed of members of the Young Statistician Section of the French Statistical Society (named SFdS) and members of AIMS Senegal. AIMS is a panafricain

network of excellence centers for post-university formation, research and public engagement in

mathematical science and applications. This structure houses a research center for the Ph.D. and post Ph.D. formation under the supervision of the prestigious Chair of Research in Mathematics and Applications.

We have proposed a summer school about Statistics and Data sciences.

These research fields are very promising on an international scale, particularly because of the

challenges represented by the analysis, management and processing of large volumes of data,

which are constantly growing throughout the world. Moreover, this is a full interest in developing

countries, where health problem may be analyzed through modern machine learning methods,

or agriculture may be improved by considering spatial statistics.

We have invited three renowned researchers to introduce high-level and modern research in statistics and data science: deep learning, targeted inference and spatial statistics. Three invited

researchers gave talks to have a good picture of the actual research.

We also propose to every participant to introduce themselves in a lightning talk, to facilitate the

networking among them.

Finally, a key point of this event is the free fees. This week was free of charges for the selected

participant, except for a part of the travel cost.

This week was a place of friendly and quality exchange between young researchers.

III Activity report

Courses and presentations

3 main courses:

- *Machine learning*, Thierry Artieres (Professor Laboratoire d'Informatique et Systemes (LIS), Ecole Centrale Marseille & Université d'Aix-Marseille, France)

Introduction to Deep Learning. Deep Learning is a field of Machine Learning that focuses on learning representations and learning neural network models. These models have enabled spectacular advances in the use of various structured data such as images, videos, sounds, texts and sequences.

The course first introduces classical neural architectures, multilayer perceptrons, conventional

networks and recurrent networks, and illustrates how these models work on classical datasets

using examples from classical architectures published in recent years. We show the role of depth in deep neural architectures and review the algorithmic and structural strategies used to

overcome the optimization problems posed by these models. The course focuses on supervised

learning, through classification tasks, and unsupervised learning, through adversarial learning

strategies. Finally, we cover recent themes explored in the field of deep learning, including explicability, domain adaptation and learning from limited data.

- *Introduction to targeted learning*, Antoine Chambaz (Professor Université Paris Des car tes, Laboratoire Mathématiques Appliquées Paris 5, France)

This course introduces the basics of targeted learning, at the intersection of machine learning and semi-parametric statistics. A dedicated R package helps to illustrate and support the theory, and facilitates the development of an intuition. Some basic R programming skills are therefore welcome, although not essential

- *Statistics for environmental data*, Sophie Dabo-Niang (Professor Laboratoire Lille Economie Management (LEM), Université Charles De Gaulle (Lille 3), France)

Spatial statistics is a group of statistical techniques that study phenomena observed on spatial ensembles. These phenomena are manifested in many fields such as epidemiology, environmental sciences and many others. Modelling this type of data is one of the most interesting research topics in dependent data analysis. This is motivated by the increasing number of situations from different domains where the data are spatial in nature.

In this course, we are interested in introducing the methodology and application of spatial statistical

models to young researchers and doctoral students. More specifically, the objective of this course is to provide an introduction to spatial statistics, to learn how to model and integrate spatial dependencies into spatial data analysis. The course covers topics such as:

- Exploratory analysis of spacial data
- Regression model and spacial prediction
- Estimation method
- Model selection

Presentations:

- *Statistical inference of extreme risk measures and applications*, El Hadji Deme (Université Gaston Berger, Saint-Louis, Sénégal)

- *Bayesian statistics for imaging*, Mame Diarra Fall (Institut Denis Poisson, Université d'Orléans, France)

- *Prevision of multivariate temporal series with neural network Prevision des series temporelles multivariees par des reseaux de neurones quasi-random*, Thierry Moudiki (Laboratoire SAF de l'école ISFA Lyon, France)