Workshop "Intensity and Hazard rate"
30 mars 2017

Scientific Program

1 Tentative schedule

8h45-9h10	Accueil
9h10-9h15	Mot d'accueil
9h15-10h	**Elodie Brunel** *Nonparametric hazard rate estimation : an overview for different sampling schemes*
10h-10h45	**Wenceslao González Manteiga** *Nonparametric first-order analysis of spatial and spatio-temporal point processes. Application to wildfire patterns*
10h45-11h15	Pause café
11h15-12h	**Agathe Guilloux** *Stratégies pour l'estimation de l'intensité de processus de comptage en présence de covariables de grande dimension*
12h-12h45	**Martin Kroll** *Nonparametric intensity estimation for a Poisson point process in a circular model from direct or indirect observations*
12h45-14h15	Buffet
14h15-15h	**Alexandre Boumezoued** *How to build mortality tables ?*
15h-15h45	**Eva Löcherbach** *On oscillating systems of interacting neurons*
15h45-16h	Pause café
16h-16h45	**Olivier Lopez** *Censored copula modeling for micro-level reserving in non life insurance*

2 Abstracts

Alexandre Boumezoued. (Milliman R&D, Paris) : *"How to build mortality tables ?"*

Abstract : National mortality tables are crucial inputs for demographic studies and the quantification of mortality and longevity risks in the insurance market worldwide. Since the first mortality table built by John Graunt in 1662, the work by Lexis (1875) and his contemporaries has offered innovative graphics still helping us to understand two major characteristics of mortality tables : 1) The structure of mortality around two dimensions, age and time, and 2) The dynamic nature of the evolution of the population beyond simple aging, especially removals by deaths and renewal by births. These two characteristics lead to theoretical and practical difficulties still unresolved today ; thus, there is no methodological consensus regarding the construction of mortality tables based on the observation of a population at periodic but isolated points in time. As major concern, it appeared recently that observations from censuses lead to major problems of reliability in estimates of general population mortality rates as implemented in practice, leading to mis-interpretation of the key mortality characteristics in the past decades, including false "cohort effects".

In this context, we will detail ongoing work related to new possible solutions regarding the construction of mortality tables. From a statistical perspective, we will describe the inference problem of a death rate in an aged structured and time inhomogeneous birth-death population process. From a practical point of view, we will propose new possible formulas for the computation of mortality rates based on census estimates. Finally, we will highlight the main characteristics of the proposed new mortality tables as well as the remaining open questions regarding their statistical analysis.*(Joint work with Marc Hoffmann and Paulien Jeunesse, Paris-Dauphine.)*

Elodie Brunel. (Université Montpellier) : *"Nonparametric hazard rate estimation : an overview for different sampling schemes"*

Abstract : Time to event data arises in a number of applied fields, such as medicine, epidemiology, engineering or economics. A common characteristic of these data sets is they contain incomplete observations. In this talk, we consider the problem of nonparametric hazard rate estimation for time to event data. It has received full attention in the last decade taking advantage of the well-known model selection tools inspired by the pioneer Barron, Birgé and Massart's works. I give an overview of these methods and show how to build estimators like these in various sampling schemes such as right-censored, truncated or biased data. Of course, this kind of estimators are of interest to challenge parametric approaches since they are model assumption free. Besides, we are able to give nonasymptotic oracle inequalities, to propose adaptive procedures by penalization criterion resulting in optimal rates from the minimax point of view. Finally, I will also briefly discuss how to take into account covariates.

Wenceslao González Manteiga. (University de Santiago de Compostela) : *"Nonparametric first-order analysis of spatial and spatio-temporal point processes. Application to wildfire patterns"*

Abstract : Spatial point patterns arise in a wide variety of scientific contexts, including seismology, forestry, geography and epidemiology. Wildfire is the most ubiquitous natural disturbance in the world and represents a problem of considerable social and environmental importance ; particularly, in Galicia (NW Spain) arson fires are the main cause of forest destruction. Knowing the spatial distribution of forest fires would be a key factor for future development of fire prevention and fire fighting plans. Nonparametric estimation and bootstrap techniques play an important role in many areas of Statistics. In the point process framework, kernel intensity estimation has been limited to exploratory analysis due to its lack of consistency. This work addresses different procedures to obtain a consistent estimator of the first order intensity such as kernel estimation of the density of event locations and kernel intensity estimation based on covariates. We propose a smooth bootstrap procedure for inhomogeneous point processes in order to develop effective bandwidth selectors for kernel intensity estimation. The consistent estimators introduced above, are used to estimate the first order intensity of the wildfires registered in Galicia during the period 1999-2008. Finally this kind of estimators is used for two problems of interest :

a) The nonparametric comparison of first-order intensity functions and

b) One separability test for spatio-temporal point process.

Keywords : bandwidth selection ; first order intensity ; inhomogeneous point processes ; wildfires, separability test.

Agathe Guilloux. (Université d'Evry) : *"Strategies pour l'estimation de l'intensité de processus de comptage en présence de covariables de grande dimension"*

Abstract : Nous considérons des processus de comptage dont l'intensité dépend, semi-paramétriquement, de covariables en grandes dimension. Pour estimer cette intensité, nous proposons deux stratégies. La première est basée sur la maximisation de la vraisemblance complète pénalisée. L'autre, adaptée au modèle de Cox, est en deux temps : maximisation de la vraisemblance partielle pénalisée puis estimation de la part non-paramétrique de l'intensité (par méthode à noyau avec choix de la fenêtre adaptatif). Dans les deux, nous prouvons des inégalités oracle et mettons en évidence dans les vitesses de convergence la part due à la grande dimension et celle due à l'estimation non-paramétrique.

Martin Kroll. (Universität Mannheim) : *"Nonparametric intensity estimation for a Poisson point process in a circular model from direct or indirect observations"*

Abstract : We consider the nonparametric estimation of the intensity function of a Poisson point process in a circular model from direct or indirect observations. In the first part of the talk, we approach this estimation problem from a minimax point of view. We state lower bounds

and propose an orthonormal series estimator attaining this rate. Since our optimal estimator in the minimax framework depends crucially on some prior knowledge concerning the intensity and the error density, it is not completely data-driven. This drawback is tackled in the second part of the talk, where we propose an adaptive estimation procedure. Following the well-known model selection paradigm, the dimension parameter of the series estimator is chosen as the minimizer of a penalized contrast criterion. The resulting adaptive estimator attains optimal rates in a variety of scenarios.

Eva Löcherbach. (Université de Cergy-Pontoise) : *"On oscillating systems of interacting neurons"*

Abstract : We consider multi class systems of interacting nonlinear Hawkes processes, modeling for example several large families of neurons. We prove propagation of chaos for such systems and discuss situations in which the limit system exhibits oscillatory behavior. We show how these results can be related to certain PDMP's (piecewise deterministic Markov processes) and the study of their longtime behavior. Finally, we will discuss some statistical challenges related to the model.

Olivier Lopez. (Université Pierre et Marie Curie) : *"Censored copula modeling for micro-level reserving in non life insurance"*

Abstract : In non life insurance, two main strategies exist to evaluate the amount of reserves required to cover the claims of the customers. Chain-Ladder approaches use aggregated information to forecast the amount to be paid, but they miss some important of the information one has on the claims. On the other-hand, micro-level reserving aims to use each available information on the claim to produce individualized predictions of its final amount. Nevertheless, this second class of methods usually fails to achieve a reasonable performance for guarantees with potential large duration between the occurrence of the claim and the final payment ($\ll$ lifetime $\gg$ of the claim). In this work, we present a general method to address this issue, by modeling separately the hazard rate of the lifetime of the claim, and its amount, using a censored copula methodology to capture the dependence structure of these two variables.
