Réunion MULTIRISK

Université Lyon 1, Campus de la Doua
salle 112, Bâtiment Jean Braconnier

25 février 2014

Matin :

- 10h00 (30' + 5' questions) Anne-Laure **Fougères** (ICJ, Lyon)
  Titre : Données environnementales : la théorie multivariée des valeurs extrêmes en pratique (avec J. J. Cai et Cécile Mercadier).
  Résumé : L'objectif de mon exposé est de vous présenter l'étude ralisée avec J. J. Cai et C. Mercadier dans le cadre d'une collaboration avec EDF sur l'évaluation de probabilités de défaillance, publiée dans le journal de la SFdS [1] Nous nous intéressons au cas où deux variables quantitatives sont mesurées au cours du temps, formant ainsi une série temporelle bivariée (X_t, Y_t) supposée stationnaire. Nous considérons le problème de l'estimation d'une probabilité de la forme $\mathbb{P}(X_t > x, Y_t > y)$, où x et y sont deux valeurs extrêmes. Nous avons mis en œuvre plusieurs méthodes d'estimation, fondées sur des approches introduites par Draisma et al. (2004) dune part, et par Heffernan & Tawn (2004) d'autre part. Une mise en concurrence des estimateurs déduits sur des simulations dans un premier temps, puis sur des données climatiques, a été réalisée, et je vous en présenterai les grandes lignes.

- 10h35 (30' + 5' questions) Patricia **Tencaliec** (LJK, Grenoble)
  Titre : Management of extreme multivariate risk: analysis of discharge data for the Durance river watershed (France).
  Résumé : This presentation is linked to my PhD thesis work where I study, analyze and model hydrological extreme events. It is very important to determine the risk related to such events in order, for example, to reduce the consequences of natural disasters. Our method for assessing risk is a stochastic approach, which includes the modeling of multivariate extremes, taking into account spatial dependence and potential non stationarities, the definition of appropriate risk measures and the development of inference tools for these measures. The methodology will be applied and tested with discharge data at different locations for the Durance watershed situated in the South-East part of France.
  The main steps expected for this thesis are the following:

  1. Carry on in depth exploratory statistical analysis of annual maximum flows from these series, both from the point of view of stationarity and spatial dependence. Moreover, special attention will be paid to the modeling of spatial dependence, in particular in the tail.

  2. Once the model has been validated, multivariate risk measures appropriate to our data type (spatial data, (non-) stationary, (in) dependent), will be developed.

[1] J. J. Cai, A.-L. Fougères, C. Mercadier. Environmental data: multivariate Extreme Value Theory in practice. Journal de la Société Statistique Française. Vol 154(2), pages 178-199, 2013.

3. In a further step, we will focus on the development of estimates for these measures.

4. Finally, a sensitivity analysis (SA) of the risk measure previously developed will be performed. Various natural parameters and the level of risk will be considered.

At the moment, we are working on Step 1, so this talk will be focused on concepts and results of the statistical analysis for the Durance discharge data namely dependence, stationarity, data modeling and imputation of missing data.

- 11h10-11h30 (pause)

- 11h30 (30' + 5' questions) Elena **Di Bernardino** (CNAM, Paris).
  Titre : On certain transformations of Archimedean copulas: Application to the non-parametric estimation of their generators.
  Résumé : We study the impact of certain transformations within the class of Archimedean copulas. We give some admissibility conditions for these transformations, and define some equivalence classes for both transformations and generators of Archimedean copulas. We extend the r-fold composition of the diagonal section of a copula, from r in N to r in R. This extension, coupled with results on equivalence classes, gives us new expressions of transformations and generators. Estimators deriving directly from these expressions are proposed and their convergence is investigated. We provide confidence bands for the estimated generators. Numerical illustrations show the empirical performance of these estimators. Applications for multivariate hydrological data are also presented.

- 12h05 (30' + 5' questions) Pierre **Ribereau** (ICJ, Lyon)
  Titre : Estimation pour les processus max-stables par vraisemblance simulée (avec Christian Robert et Erwan Koch).
  Résumé : Max-stable processes are very appropriate for the statistical modeling of spatial extremes. Nevertheless their inference is difficult. Indeed the multivariate density function is not available and thus standard likelihood-based estimation methods cannot be applied. The commonly used method - based on composite likelihood - is flexible and requires a relatively low computational cost. However, it leads to non efficient estimators. In this study an approach based on nonparametric simulated maximum likelihood is developed. We indeed take advantage of the possibility of simulating many max-stable models and propose to approximate the multivariate density (in space) using kernel methods. Our estimator is efficient when both the temporal dimension and the number of simulation draws tend towards infinity. This approach can be used for many subclasses of max-stable processes and provides better results than composite-based methods, especially in the case where only a few temporal observations of the process are available and the spatial dependence is high. However, due to the curse of dimensionality, the obervation sites have to be separated into subgroups when they are too numerous. Finally, the methodology is examined on simulated data.