Univ. Grenoble Alpes
Université de l'innovation

FICHE NAVETTE: DOCTORANTS IDEX

SECTOR **:** Higher Education Institution

LOCATION: France, Grenoble

RESEARCH FIELD: **RISK MODELLING, ASSESSMENT AND MANAGEMENT, STATISTICS, INSURANCE**

RESEARCHER PROFILE:

□ *First stage researcher (Master Degree level required)*

INSTITUTION: Univ. Grenoble Alpes, University of Innovation

One of the major research-intensive French universities, Univ. Grenoble Alpes[1] enjoys an international reputation in many scientific fields, as confirmed by international rankings. It benefits from the implementation of major European instruments (ESRF, ILL, EMBL, IRAM, EMFL[2]). The vibring ecosystem, grounded on a close interaction between research, education and companies, has earned Grenoble to be ranked as the 5th most innovative city in the world. Surrounded by mountains, the campus benefits from a natural environment and a high quality of life and work environment. With 7000 foreign students and the annual visit of more than 8000 researchers from all over the world, Univ. Grenoble Alpes is an internationally engaged university.

A personalized Welcome Center for international students, PhDs and researchers facilitates your arrival and installation.

In 2016, Univ. Grenoble Alpes was labeled “Initiative of Excellence". This label aims at the emergence of around ten French world class research universities. By joining Univ. Grenoble Alpes, you have the opportunity to conduct world-class research, and to contribute to the social and economic challenges of the 21st century ("sustainable planet and society", "health, well-being and technology", "understanding and supporting innovation: culture, technology, organizations", "Digital technology").

Key figures:

- + 50,000 students including 7,000 international students
- 3,700 PhD students, 45% international
- 5,500 faculty members
- 180 different nationalities
- 1st city in France where it feels good to study and 5th city where it feels good to work
- ISSO: International Students & Scholars Office affiliated to EURAXESS

[1] Univ. Grenoble Alpes

[2] ESRF (European Synchrotron Radiation Facility), ILL (Institut Laue-Langevin), IRAM (International Institute for Radio Astronomy), EMBL (European Molecular Biology Laboratory), EMFL (European Magnetic Field Laboratory)

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MANDATORY REFERENCES:

CDP TITLE: **RISK@Univ. Grenoble Alpes**
SUBJECT TITLE: Bayesian estimation of extreme risk measures. Application to the insurance of natural disasters.
PRIMARY SCIENTIFIC DEPARTMENT (LABORATORY'S NAME): LJK
SECONDARY SCIENTIFIC DEPARTMENT (LABORATORY'S NAME): CERAG
PRIMARY DOCTORAL SCHOOL (where the candidate will be registered): MSTII
SECONDARY DOCTORAL SCHOOL: SG
SUPERVISOR NAME(S)*: Stéphane Girard & Geoffroy Enjolras*

SUBJECT DESCRIPTION:
Extreme-value theory is a branch of statistics dealing with the extreme deviations from the bulk of probability distributions. More specifically, it focuses on the limiting distributions for the minimum or the maximum of a large collection of random observations from the same arbitrary (unknown) distribution. In extreme-value statistics, the main problems are the estimation of the tail index and extreme quantiles associated to a random variable of interest X. The tail index drives the distribution tail heaviness of the considered random variable distribution.

In a risk analysis perspective, the extreme quantile associated with X is referred to as the Value at Risk and has been extensively studied. Recently, many efforts have been done to define alternative extreme risk measures based either on expectiles, L_p- quantiles, or extensions of the Expected Shortfall. However, since these methods are extreme-value based, their applicability is restricted to large sample sizes.

The goal of this PhD work is to contribute to the development of Bayesian methods for the estimation of extreme risk measures. We propose in this PhD work to investigate how introducing prior information on the distribution of X can improve the estimation of extreme risk measures on small samples. However, extreme quantile estimation and alternative extreme risk measures as mentioned above have not been the object of many developments. This innovative direction is promising as providing prior information to the model may allow for a sharpening of the estimators (variance reduction).

The application of this study is the insurance in the agricultural sector whose yields and prices are directly exposed to natural hazards. Data will be provided for empirical applications.

REFERENCES:
[1] Swiss Re (2017). Catastrophes naturelles et techniques en 2016 : Une année de dommages tous azimuts.
[2] H. Kunreuther. (2016). Reducing losses from catastrophes: Role of insurance and other policy tools, *Environment: Science and Policy for Sustainable Development*, 58, 30-37.
[3] V. Chavez-Demoulin, P. Embrechts, & M. Hofert (2016). An extreme value approach for modeling operational risk depending on covariates, J*ournal of Risk and Insurance*, 83, 735-776.
[4] C.L.E. Franzk. (2017). Impacts of a Changing Climate on Economic Damages and Insurance, *Economics of Disasters and Climate Change*, 1, 95-110.
[5] L. de Haan & A. Ferreira. (2006). *Extreme Value Theory: An Introduction*, Springer-Verlag, New York.
[6] A. Daouia, S. Girard & G. Stupfler. (2018). Estimation of tail risk based on extreme expectiles, J*ournal of the Royal Statistical Society series B*, 80, 262–292.
[7] A. Wirtz, W. Kron, P. Löw, & M. Steuer (2014). The need for data: natural disasters and the challenges of database management, *Natural Hazards*, 70, 135–157.

ELIGIBILITY CRITERIA
Applicants:

- must hold a Master's degree in Applied Mathematics (or be about to earn one) or have a university degree equivalent to a European Master's (5-year duration),

REQUIRED SKILLS

- *Theoretical/Methodological skills*: We look for candidates strongly motivated by challenging research with application to real world data. The applicant should have strong background in mathematics and probability/statistics. The required knowledge includes ideally Bayesian methods and extreme-value analysis. Programming skills with C/C++, Matlab, Python or R are desired.
- *Language*: A good level in French and English is an asset

APPLICATION PROCEDURE
Applicants will attach a file including:
- Their CV
- A cover letter / letter of motivation
- A summary of previous work done/publications in Master 1 and Master 2
- A record of the grades of Master 1 and Master 2
- A copy of their last diploma

Address to send their application: Stephane.Girard@inria.fr and geoffroy.enjolras@grenoble-iae.fr

SELECTION PROCESS
Application deadline: **May 31, 2018** at 17:00 (CET)
Applications will be evaluated through a three-step process:

1. Eligibility check of applications on **June 7, 2018**
2. Selection: the applications will be evaluated by a Review Board in June 2018
3. Results will be given by **July 12, 2018**.

TYPE of CONTRACT: temporary-3 years of doctoral contract
JOB STATUS: Full time
HOURS PER WEEK: 35
CONTRACT STARTING DATE: **October 1, 2018**
APPLICATION DEADLINE: **May 31, 2018**
Salary: 1768.55 € gross per month