Offre n°2025-09109

PhD Position F/M INFERENCE FOR EXTREME DATA IN A UNIVARIATE DEPENDENT SETTING

Niveau de diplôme exigé : Graduate degree or equivalent

Fonction : PhD Position

A propos du centre ou de la direction fonctionnelle

The Inria center at Université Côte d'Azur includes 42 research teams and 9 support services. The center's staff (about 500 people) is made up of scientists of di?erent nationalities, engineers, technicians and administrative staff. The teams are mainly located on the university campuses of Sophia Antipolis and Nice as well as Montpellier, in close collaboration with research and higher education laboratories and establishments (Université Côte d'Azur, CNRS, INRAE, INSERM ...), but also with the regional economic players.

With a presence in the fields of computational neuroscience and biology, data science and modeling, software engineering and certification, as well as collaborative robotics, the Inria Centre at Université Côte d'Azur is a major player in terms of scientific excellence through its results and collaborations at both European and international levels.

Contexte et atouts du poste

This PhD position is part of the "Thèses Tandem" program, a joint initiative between the Université de Montpellier (France) and the Université de Sherbrooke (Canada).

Two complementary PhD projects are offered through this collaboration, each focusing on a different yet interconnected aspect of univariate extreme value modeling
under dependence. The selected candidates will benefit from shared supervision, close collaboration between the two universities, and regular research exchanges. The program includes funding for a work computer, travel to national and
international conferences, and several research stays at Université de Sherbrooke, in Québec, Canada.

The aim of this thesis project is to develop frequentist and Bayesian inference techniques for estimating the limit distribution of themaximum under dependency assumptions. Bayesian methods are particularly suited to situations where information is scarce oruncertain - which is typically the case in the analysis of extremes

Mission confiée

Univariate extreme value theory (EVT) states that the maximum of a sequence of independent, identically distributed random variables converges to a Generalized
Extreme Value (GEV) distribution. However, the assumption of independence is often unrealistic in real-world applications, where data are typically temporally or spatially correlated - e.g., wave heights, temperature records, pollution levels, or financial returns.
Pioneering work by Leadbetter (1974, 1983) relaxed the independence assumption by introducing asymptotic dependence conditions, allowing a form of "quasiindependence"
between extreme events. More recently, copula-based approaches have enabled the separate modeling of marginal behavior and dependence structure (Sklar, 1959), significantly advancing the field, especially in multivariate settings.
We refer to Nelsen (2006), Joe (2015), or Durante and Sempi (2015) for textbook introductions.
A different point-of-view was proposed by Herrmann, Hofert, and Nešlehová (2024), who established convergence conditions for the maximum in a dependent univariate setting using copulas. This generalizes the Fisher-Tippett-Gnedenko theorem to sequences of dependent variables.

Principales activités

Supervision team : Gwladys Toulemonde (IMAG, Université de Montpellier and Inria LEMON) and Nicolas Meyer (IMAG, Université de Montpellier and Inria LEMON)
with Klaus Herrmann and Eric Marchand (Equipe de statistique, Université de Sherbrooke)

The aim of this thesis project is to develop frequentist and Bayesian inference techniques for estimating the limit distribution of the maximum under dependency assumptions. Bayesian methods are particularly suited to situations where information is scarce or uncertain - which is typically the case in the analysis of extremes, see Beirlant et al. (2004, Chapter 11) or Bousquet & Bernardara (2021, Chapter 11). By introducing flexible prior distributions on the parameters, we can obtain :
— credibility intervals (rather than simple confidence intervals),
— density prediction for extreme observations,
— better consideration of dependency structure, particularly in exchangeable models, such as those discussed in Herrmann, Hofert & Nešlehová (2024).

The thesis will thus aim to develop and study estimators and evaluate their performance

on simulated and real data, for example meteorological or financial data.

Compétences

M2 or engineering degree in statistics.
Strong background in mathematics, particularly statistics and probability theory, proficiency in R and/or Python programming

Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Contribution to mutual insurance (subject to conditions)

Rémunération

Duration: 36 months
Location: Sophia Antipolis, France
Gross Salary per month: 2200€ (2025).

Informations générales

- **Thème/Domaine :** Stochastic approaches
  Statistics (Big data) (BAP E)
- **Ville :** Montpellier
- **Centre Inria :** Centre Inria d'Université Côte d'Azur
- **Date de prise de fonction souhaitée :** 2025-10-01
- **Durée de contrat :** 3 years
- **Date limite pour postuler :** 2025-08-31

Contacts

- **Équipe Inria :** LEMON
- **Directeur de thèse :**
  Toulemonde Gwladys / gwladys.toulemonde@inria.fr

A propos d'Inria

Inria est l’institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 scientifiques pour relever les défis du numérique, souvent à l’interface d’autres disciplines. L’institut fait appel à de nombreux talents dans plus d’une quarantaine de métiers différents. 900 personnels d’appui à la recherche et à l’innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 200 start-up. L'institut s'e?orce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

L'essentiel pour réussir

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.

Consignes pour postuler

Applications must be submitted online on the Inria website. Collecting applications by other channels is not guaranteed.

Sécurité défense :
Ce poste est susceptible d’être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L’autorisation d’accès à une zone est délivrée par le chef d’établissement, après avis ministériel favorable, tel que défini dans l’arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l’annulation du recrutement.

Politique de recrutement :
Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.