2021-03444 - Post-Doctoral Research Visit F/M [Campagne Postdoctorant 2021 - CRI Lille] Statistical inference on graphs

Type de contrat : CDD
Niveau de diplôme exigé : Thèse ou équivalent
Fonction : Post-Doctorant

A propos du centre ou de la direction fonctionnelle

The Inria Lille - Nord Europe Research Centre was founded in 2008 and employs a staff of 320, including 280 scientists working in fourteen research teams. Recognised for its outstanding contribution to the socio-economic development of the Hauts-De-France région, the Inria Lille - Nord Europe Research Centre undertakes research in the field of computer science in collaboration with a range of academic, institutional and industrial partners.

The strategy of the Centre is to develop an internationally renowned centre of excellence with a significant impact on the City of Lille and its surrounding area. It works to achieve this by pursuing a range of ambitious research projects in such fields of computer science as the intelligence of data and adaptive software systems. Building on the synergies between research and industry, Inria is a major contributor to skills and technology transfer in the field of computer science.

Contexte et atouts du poste

MODAL is a project-team working on modern complex data sets (mixed data, missing data, high dimensional data, networks etc.), for classical statistical targets (unsupervised learning, supervised learning, regression etc.) with approaches relying on a probabilistic framework. The latter can be tackled through both model-based methods (as mixture models for a generic tool) and model-free methods (as probabilistic bounds on empirical quantities). Furthermore, MODAL is connected to the real world by applications, typically biological ones, but many other applications are also considered since the application coverage of the MODAL methodology is very broad. From an academic point of view, MODAL can be seen as belonging simultaneously to both the statistical learning and machine learning communities, as attested by its publications. On a top level, it is an opportunity to make a bridge between these two stochastic communities around a common but large probabilistic framework. For further information, please see the MODAL webpage: https://modal.lille.inria.fr/

Mission confiée

A postdoc position is available in the MODAL team under the broad theme of ``Statistical inference on graphs''. Such problems are motivated by applications where we encounter pairwise information for a collection of n items (with n typically large) and the goal is to recover a global latent structure that is consistent with the information. This can typically be formulated as an inference problem on a graph, with the vertex set denoting the items, and the edge weights capturing the pairwise information. Popular instances of such problems are: clustering (recover a partition of the items into k disjoint clusters with similar items grouped within a cluster) and ranking (recover a global ranking of the items from pairwise comparisons), with numerous applications in time series analysis, sociological behavior analysis, gene expressions, recommender systems, ad placement etc.

The postdoc will do foundational work on problems related to the above research theme and contribute by developing novel algorithms which come with theoretical performance guarantees, and also (ideally) improve on the existing state of art methods in terms of empirical performance. The precise choice of the problem is flexible depending on mutual interests; however, the ideal candidate is expected to be able to work independently and to chart a research plan outlining the research directions that he/she would like to pursue. If desired, there is also a possibility to help with the supervision of master's students. The ideal candidate will have a strong background in theory and should be comfortable with concepts in linear algebra (esp. perturbation bounds for eigenvalues, eigenspaces etc.), probability theory (esp. concentration of measure, deviation inequalities etc.) and optimization theory. In particular, the candidate should have the capacity to understand (and be comfortable with) the methodology and proof techniques involved in the papers [1], [2].

[1] A. d'Aspremont, M. Cucuringu, and H. Tyagi, Ranking and synchronization from pairwise measurements via SVD, JMLR, 22(19):1−63, 2021.

[2] M. Cucuringu, A.V Singh, D. Sulem, and H. Tyagi, Regularized spectral methods for clustering signed networks, arxiv e-print: arXiv:2011.01737v1

Principales activités

- Design and theoretical analysis of new algorithms for statistical inference problems on graphs (such as clustering, ranking etc.).
- Implementing the algorithms in MATLAB/R/Python (or similar languages) with proper benchmarking.

Compétences

Informations générales

- **Thème/Domaine :** Optimisation, apprentissage et méthodes statistiques
  Statistiques (Big data) (BAP E)
- **Ville :** Villeneuve d'Ascq
- **Centre Inria :** CRI Lille - Nord Europe
- **Date de prise de fonction souhaitée :** 2021-10-01
- **Durée de contrat :** 1 an, 6 mois
- **Date limite pour postuler :** 2021-04-25

Contacts

- **Equipe Inria :** MODAL
- **Recruteur :**
  Tyagi Hemant / hemant.tyagi@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 200 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3500 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 180 start-up. L'institut s'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

Consignes pour postuler

CV + application letter + recommendation letters + List of publications

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.

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.

- PhD in Mathematics/Computer Science/Statistics (or related fields).
- Background and interest in theory with experience in writing proofs.
- Strong knowledge of linear algebra (esp. perturbation bounds for eigenvalues, eigenspaces etc.), probability theory (esp. concentration of measure and deviation inequalities) and optimization.
- Knowledge of at least one of: MATLAB, R, Python or similar languages.
- Some prior experience with problems related to the aforementioned research theme would be a plus but is not necessary.
- Comfortable with English (written and oral) and in writing research papers.

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
- Social security coverage

Rémunération

Gross monthly salary (before taxes) : 2 653 €