Offre n°2025-08742

Post-Doctoral Research Visit F/M Deep algorithmic models for causal discovery from individual observations

Le descriptif de l'offre ci-dessous est en Anglais

Type de contrat : CDD

Niveau de diplôme exigé : Thèse ou équivalent

Fonction : Post-Doctorant

A propos du centre ou de la direction fonctionnelle

The Centre Inria de l'Université de Grenoble groups together almost 600 people in 23 research teams and 9 research support departments.

Staff is present on three campuses in Grenoble, in close collaboration with other research and higher education institutions (Université Grenoble Alpes, CNRS, CEA, INRAE, …), but also with key economic players in the area.

The Centre Inria de l'Université Grenoble Alpes is active in the fields of high-performance computing, verification and embedded systems, modeling of the environment at multiple levels, and data science and artificial intelligence. The center is a top-level scientific institute with an extensive network of international collaborations in Europe and the rest of the world.

Contexte et atouts du poste

The work will take place in the Grenoble Computer Science Laboratory, located in Saint Martin d'Hères, France.

Mission confiée

Context
Networks such as modern telecommunications networks or distributed embedded systems are permanently monitored to allow identification of failure situations; thousands of new data points reflecting the system state changes are generated every minute. Even if faults are rare events, they can easily propagate driven by local and remote dependencies, which makes it challenging to distinguish causes from effects among the thousands of highly correlated alerts. It is nevertheless crucial to infer causal relations in the form of a causal graph if one wants to timely automate the identification and analyze the root cause of the performance problems. The discovery of causal graphs in such networks is however made difficult by the fact that the data collected, typically in the form of vectors or strings
representing event logs, represent single data points; thus, in the absence of prior knowledge, about, e.g., distributions of events, well-known statistical inference approaches are not applicable.

Goal and approach
The objective of this project is to develop new methods, potentially combining approaches from deep learning and algorithmic decision theory, to infer a causal graph that represents the dependencies between components (or nodes) of the network, given a set of event logs and possibly sampled KPIs of these components. Deep neural networks, and in particular Large Language Models (LLMs), have recently been used for causal discovery and causal reasoning tasks [1][2]. If their capacity regarding causality is limited, they nevertheless provide a general framework that can be leveraged for discovering causal graphs. Along this line, we are currently studying a neural network aiming to mimic the ranking provided by the conditional Kolmogorov complexity for sequences of characters, from which one could infer causal relations following [3].
Learning such a network however requires training data which may not be well aligned with the single observation, event logs we want to analyze. One simple (and naïve) approach to solve this problem consists in leveraging the predictive power of LLMs, in, e.g., a zero-shot setting, using the context to assess conditional probabilities and complexities. It is however very likely that this approach will fail to
identify many causal relations and more complex approaches, including fine-tuning and the use of additional neural networks and/or algorithmic decision tools, will have to be explored in the framework of this post-doc.
The selected candidate will benefit from a large degree of autonomy for conducting her/his research and will collaborate with researchers from Nokia Bell Labs and Inria/MIAI Cluster.

Principales activités

cf. above

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 (90 days / year) and flexible organization of working hours
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage under conditions

Rémunération

2788 € gross salary / month

Informations générales

- **Thème/Domaine :** Systèmes embarqués et temps réel
  Statistiques (Big data) (BAP E)
- **Ville :** Saint Martin d'Hères
- **Centre Inria :** Centre Inria de l'Université Grenoble Alpes
- **Date de prise de fonction souhaitée :** 2025-12-01
- **Durée de contrat :** 12 mois
- **Date limite pour postuler :** 2025-04-17

Contacts

- **Équipe Inria :** SPADES
- **Recruteur :**
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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

Candidates should be pursuing internationally recognized research in ML/AI, or Information Theory with a strong interest in causal inference and causal reasoning.

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

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.