Offre n°2021-04122

Engineer F/H: Development of a Software Architecture for Automated discovery of self-organising patterns in complex systems

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

Type de contrat : CDD

Niveau de diplôme exigé : Bac + 5 ou équivalent

Fonction : Ingénieur scientifique contractuel

Niveau d'expérience souhaité : De 5 à 12 ans

A propos du centre ou de la direction fonctionnelle

The Inria Bordeaux Sud-Ouest centre is one of Inria's eight centres and has around twenty research teams. The Inria centre is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative SMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute...

Contexte et atouts du poste

In many complex dynamical systems, artificial or natural, one can observe self-organization of patterns emerging from local rules. However, findings of self-organized patterns in such systems have so far relied on manual tuning of parameters and initial states, and on the human eye to identify interesting patterns. In this project, we formulate the problem of automated discovery of diverse self-organized patterns in high-dimensional complex dynamical systems, as well as a framework for experimentation and evaluation. The aim is to study how intrinsically-motivated machine learning algorithms, initially developed for learning of inverse models in robotics, can be transposed and used in this novel application area, and be made interactive, enabling scientists users to interactively drive curiosity-driven exploration of novel patterns. These algorithms combine intrinsically-motivated goal exploration and unsupervised learning of goal space representations. Goal space representations describe the interesting features of patterns for which diverse variations should be discovered.

First steps of this project were made in (Reinke, Etcheverry and Oudeyer, 2020), where we studied the behaviour of these algorithms in a continuous game of life. Further steps will involve experiment dynamical patterns in similar numerical models, but also using the automated discovery system to explore novel patterns in real bio-chemistry systems, through collaborations with several organizations studying these systems.

Reinke, C., Etcheverry, M., & Oudeyer, P. Y. (2019). Intrinsically Motivated Discovery of Diverse Patterns in Self-Organizing Systems. ICLR 2020.

Etcheverry, M., Moulin-Frier, C., & Oudeyer, P. Y. (2020, December).Hierarchically Organized Latent Modules for Exploratory Search in Morphogenetic Systems. In *NeurIPS 2020-34th Conference on Neural Information Processing Systems*.

Mission confiée

This research engineer position will aim to implement an algorithmic and software framework enabling to study both the behaviour of interactive automated discovery algorithms, and to contribute to new discoveries of self-organizing patterns in various target complex systems. In particular, it will include the design of a modular software infrastructure enabling to study various combination of exploration and visualization algorithms with several target systems, and including a user-interface usable by target scientist users. This will involve implementing advanced machine learning algorithms, and collaborating with other members of the team to develop novel versions of the algorithms, and to test them in various scientific studies about target dynamical systems with end users (collaborations with other labs).

How to apply: send an email to clement.moulin-frier@inria.fr AND pierre-yves.oudeyer@inria.fr with a CV and letter of motivation (with [APPLICATION] included in subject of email), in addition to applying on the Inria web site.

Principales activités

- Implementation of exploration and representation learning algorithms
- Implementation of a modular software platform for connecting exploration algorithms, visualization algorithms, the dynamical systems, and an interface for users
- Participation to the design and study of novel interactive algorithms and their scientific study in experimentations
- Participation to experiments studying novel patterns through the use of the framework in various target systems
- Dissemination of the work through documentation, blog post and article writing

Compétences

Technical competences: software engineering, scientific programming, python, machine learning algorithms and framworks (pyTorch), computer visualization of data, user-centered design, design of interfaces.

Language: english

Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Possibility of teleworking 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

From 2632€ to 3240€ gross monthly depending on experience

Informations générales

- **Thème/Domaine :** Robotique et environnements intelligents
  Statistiques (Big data) (BAP E)
- **Ville :** Talence
- **Centre Inria :** Centre Inria de l'université de Bordeaux
- **Date de prise de fonction souhaitée :** 2022-03-01
- **Durée de contrat :** 1 an, 8 mois
- **Date limite pour postuler :** 2022-06-30

Contacts

- **Équipe Inria :** FLOWERS
- **Recruteur :**
  Romac Clément / clement.romac@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'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

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

Thank you to send:

- CV
- Cover letter
- Master Degree

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.