Offre n°2025-09225

Post-Doctoral Research Visit F/M Development of Deep Learning-based predictive systems for clinical and cognitive neuroscience

Type de contrat : Fixed-term contract

Contrat renouvelable : Oui

Niveau de diplôme exigé : PhD or equivalent

Fonction : Post-Doctoral Research Visit

A propos du centre ou de la direction fonctionnelle

The Inria Saclay-Île-de-France Research Centre was established in 2008. It has developed as part of the Saclay site in partnership with ***Paris-Saclay University*** *and with the* ***Institut Polytechnique de Paris*** *.*

The centre has ***40 project teams*** *, 32 of which operate jointly with Paris-Saclay University and the Institut Polytechnique de Paris; Its activities occupy over 600 people, scientists and research and innovation support staff, including 44 different nationalities.*

Contexte et atouts du poste

Within the framework of a partnership (you can choose between)

- public with French National Research Agency (ANR)
- collaboration MIND Inria team, the Lariboisiere Hospital, and Oxford University

The recruited candidate is expected to develop a mathematical model and a software prototype for the application of contrastive learning to linking cognition and neuroimaging data.

Specifically

Introduction

The link between the human brain function, anatomy, and cognition remains uncharted territory. Brain imaging techniques, such as functional magnetic resonance imaging (fMRI) and diffusion magnetic resonance imaging (dMRI), provide in vivo information about neural activity and structural connectivity. However, linking these imaging modalities to cognitive functions poses a significant challenge. Specifically, current efforts for linking multivariate cognition measurements with neuroimaging are based on Partial Least Squares and Canonical Correlation Analysis techniques with poor out-of-sample generalization.

Deep Learning and Contrastive Learning

Within the deep learning field, contrastive learning, an emerging deep learning paradigm, has demonstrated remarkable success in unsupervised representation learning, particularly in the realm of natural language processing and computer vision.

Contrastive Learning Regression: An Open Field

While contrastive learning has garnered significant attention for its impressive performance in classification tasks, its application to regression problems remains unsolved. This presents an opportunity to expand the capabilities of contrastive learning and harness its potential in domains that demand continuous prediction, such as neuroimaging analysis.

Linking Brain Imaging and Cognition with Contrastive Learning Regression

The project will explore developing and applying contrastive learning regression frameworks to link fMRI and dMRI data with cognitive measures.

Mission confiée

Assignments :
With the help of D. Wassermann the recruited person will be taken to produce a deep-learning based system for the prediction of cognitive abilities from neuroimaging data.

The primary assignemnts for this project are:

1. To evaluate current and develop novel contrastive learning regression frameworks for linking brain imaging data to cognitive measures and characterize their limitations.

2. To evaluate the performance of these frameworks on benchmark datasets, comparing their effectiveness to traditional regression approaches.

3. To investigate the interpretability of the learned representations and identify brain regions and structural connections associated with specific cognitive functions.

4. Co-coordinate PhD students and Interns with Demian Wassermann

5. Drive collaborations with the Laribosiere Hospital and Oxford University

Principales activités

Main activities (5 maximum) :

- Analyse the requirements of the neuroimaging and neurosurgical applications
- Develop pipelines for the application of contrastive learning-based models to the neuroimaging and neurosurgical cases
- Design an experimental platform for the implementation of the above pipelines
- Validate the advancements and write scientific literature on them

Compétences

Technical skills and level required :

- Good master of python programming, pytorch, scikit-learn and similar systems
- Comfortable with math formalisms and the formal background of machine learning and AI
- Skills in development deep learning models are desirable

Languages :

- The candidate is expected to be able to communicate profficiently in English

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 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

2788€ gross/month

Informations générales

- **Thème/Domaine :** Computational Neuroscience and Medicine
  Statistics (Big data) (BAP E)
- **Ville :** Palaiseau
- **Centre Inria :** Centre Inria de Saclay
- **Date de prise de fonction souhaitée :** 2025-11-01
- **Durée de contrat :** 6 months
- **Date limite pour postuler :** 2025-09-30

Contacts

- **Équipe Inria :** MIND
- **Recruteur :**
  Wassermann Demian / demian.wassermann@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

The succesful candidates will have :

- a taste for collaborative work
- good communication skills
- an independent self-driven personality
- an appetite for cross-disciplinary work

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.