Offer #2023-06559

Post-Doctoral Research Visit F/M Postdoctoral position Reinforcement Learning for Collaborative Annotation

Contract type : Fixed-term contract

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

About the research centre or Inria department

The Inria University of Lille centre, created in 2008, employs 360 people including 305 scientists in 15 research teams. Recognised for its strong involvement in the socio-economic development of the Hauts-De-France region, the Inria University of Lille centre pursues a close relationship with large companies and SMEs. By promoting synergies between researchers and industrialists, Inria participates in the transfer of skills and expertise in digital technologies and provides access to the best European and international research for the benefit of innovation and companies, particularly in the region.For more than 10 years, the Inria University of Lille centre has been located at the heart of Lille's university and scientific ecosystem, as well as at the heart of Frenchtech, with a technology showroom based on Avenue de Bretagne in Lille, on the EuraTechnologies site of economic excellence dedicated to information and communication technologies (ICT).

Context

This **postdoctoral** position is part of the national PEPR (Programme et Equipement Prioritaire de Recherche) **PlantAgroEco** project, coordinated by Alexis Joly. The PEPR involves several teams from various institutes (Inria ZENITH, CIRAD AMAP, CIRAD PHIM, CIRAD PBVMT,INRAE ePhytia, INRAE IGEPP, INRAE LISAH, IRD EGCE, IRD IEES, Univ. Paris Saclay, TelaBotanica). The position is funded for 18 months, and will be conducted a Inria Lille - Nord Europe under the supervision of Odalric-Ambrym Maillard. This is a postdoctoral position in Machine Learning, more specifically in Reinforcement Learning.

The starting date is flexible, it could start earlier than Feb. 1st, 2024.

Odalric-Ambrym Maillard is a researcher at Inria. He has worked for over a decade on advancing the theoretical foundations of reinforcement learning,
using a combination of tools from statistics, optimization and control, in order to build more efficient algorithms able to better estimate uncertainty, exploit structures, or adapt to some non-stationary context.
He was the PI of the ANR-JCJC project BADASS (BAnDits Against non-Stationarity and Structure) until Oct. 2021. He is also leading the Inria Action Exploratoire SR4SG (Sequential Recommendation for Sustainable Gardening) and the Inria-Japan associate team RELIANT (Reliable multi-armed bandits), and is involved in a series of other projects, from more applied to more theoretical ones all related to the grand-challenge of reinforcement learning that is to make it applicable in real-life situations.
See \texttt{http://odalricambrymmaillard.neowordpress.fr} for further details.

Scool (Sequential COntinual and Online Learning) is an Inria team-project. It was created on November 1st, 2020 as the follow-up of the team SequeL. In a nutshell, the research topic of Scool is the study of the sequential decision making problem under uncertainty. Most of our activities are related to either bandit problems, or reinforcement learning problems. Through collaborations, we are working on their application in various fields, mainly: health, agriculture and ecology, sustainable development. See our \href{https://team.inria.fr/scool/projects/}{Projects page} for more information.

Topic. Making reinforcement learning techniques applicable to real-life applications (such as the recommendation of agroecological practices in agriculture) requires overcoming several scientific bottlenecks. Within the scope of the PEPR PlantAgroEco project, this 18m postdoc will focus on providing novel reinforcement learning strategies in order to improve the collaborative annotation process of the \href{https://plantnet.org}{PlantNet} data acquisition platform, both from a theoretical and applied perspective. This project makes appear appealing challenges around contextual multi-armed bandits relevant to collaborative decision making and recommendation at large, with a unique opportunity to interact with a real data platform used by millions. Solving the different challenges in a sound and effective way requires special attention from both mathematical and computational standpoints.

Assignment

The project is organized around three high-level tasks and research questions:

1. The first task is about the user annotation-expertise profile (which
may vary with features and plants): Here the goal is to
estimate it, track its evolution, and improve it.,
Regarding methods, estimation could be done actively adapting contextual bandit strategies using a
form of information-driven intrinsic reward, while change-point detection and expert methods are
natural to help tracking. Finally, active improvement could be done via minimal interaction, active
hypothesis testing
and personalized content/task recommendation.

2. The second task is to assist the users in performing rapid annotation,
using sequential hypothesis testing personalized to their (estimated) expertise.
Here pone challenge is to get rapid annotation in a possibly non-parametric context, by adapting sample
efficient hypothesis testing and best-arm identification and finite-time analysis techniques.
The short number of interactions available also suggests considering a satisficing instead of optimal
regret objective. Another challenge is to personalize assistance to each user expertise, which involves
contextual bandit but also contextual hypothesis testing (charting) techniques.

3. A last task is to adapt query strategies of complementary experts based for the collective labeling of
existing and unknown items.
One of the challenge is to handle uncertainty of experts, building adaptive confidence sets as well as
sequential tests, both parametric and non-parametric, in order to perform adaptive stopping (decide
when enough labeling information has been collected) in a reliable way.
Further, experts can be complementary or disagree, which wields the challenges of enforcing diversity in
the pool of experts and ensuring sound collective labeling adapting majority voting systems. Last, one
may consider fairness constraints on the pool of experts to avoid a large load unbalance between
experts.

These tasks can be explored in various ways and lead to other challenges but should be considered the
backbone of the project. The research, though focused on the PlantNet example, should be considered
from a broader perspective, and be beneficial to recommender systems at large.

Main activities

The postdoctoral position requires a solid capacity to code, conduct relevant numerical experiments and
strong analytical skills, as well as a solid background in statistics, probability, Markov chains,
concentration of measure and confidence regions, a good knowledge of multi-armed bandits, especially
contextual bandits, active sampling and recommender systems processes methods, and be at ease with
theoretical guarantees of the considered strategies.
The successful candidate will interact both with the Scool team at Inria Lille (specialized in bandits) and
the Zenith team (hosting the PlantNet application) at Inria Montpellier and more generally with the
members of the PEPR project, to produce both novel publications and modules for PlantNet (with the
help of the engineers from PlantNet). A good balance between theory and application is expected
throughout the project.

Skills

A PhD in machine learning or statistics, possibly related to multi-armed bandits or recommender
systems.

Language: fluency in English.

Relational skills: ability to work within a group of people, listen to others, present one's work, discuss it
and be able to learn from others.

While performing the assigned tasks, a certain amount of autonomy is welcome, if not necessary.

Benefits package

- 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

Remuneration

Gross monthly salary (before taxes) : 2 788€

General Information

- **Theme/Domain :** Optimization, machine learning and statistical methods

Information system (BAP E)
- **Town/city :** Villeneuve d'Ascq
- **Inria Center :** [Centre Inria de l'Université de Lille](#)
- **Starting date :** 2024-07-01
- **Duration of contract :** 1 year, 6 months
- **Deadline to apply :** 2024-06-30

Contacts

- **Inria Team :** [SCOOL](#)
- **Recruiter :**
  Maillard Odalric-ambrym / Odalric.Maillard@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

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The person being recruited will work in a research group, that is an environment in which knwoledge is being built, questions are much more numerous than clear answers. The recruitee will bring her skills to this construction process, supporting other researchers from the project. The recuitee should be curious, reactive, open minded to ideas and others. The recruitee should feel at ease in a dynamic scientific environment; love of learning, and listening to others are key qualities to succeed in this mission. Good code development and maintenance skills are welcomed.

> **Warning** : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Instruction to apply

Defence Security :
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST).Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :
As part of its diversity policy, all Inria positions are accessible to people with disabilities.