



**Offer #2024-07995**

## **Post-Doctoral Research Visit F/M Faster Bilevel Optimization to Accelerate Machine Learning**

**Contract type** : Fixed-term contract

**Renewable contract** : Yes

**Level of qualifications required** : PhD or equivalent

**Fonction** : Post-Doctoral Research Visit

### **About the research centre or Inria department**

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 since 2021.

The centre has 39 project teams, 27 of which operate jointly with Paris-Saclay University and the Institut Polytechnique de Paris. Its activities occupy over 600 scientists and research and innovation support staff, including 54 different nationalities.

### **Context**

**Environment.** The postdoc will take place in Inria Saclay, in the MIND team. This is a large team working focused on mathematical methods for statistical modeling of brain function using neuroimaging data (fMRI, MEG, EEG). Particular topics of interest include machine learning techniques, numerical and parallel optimization, applications to human cognitive neuroscience, event detection, and scientific software development. A particular emphasis is put on interdisciplinary projects.

### **Assignment**

Bilevel optimization, the problem of minimizing a function that depends on the minimum of another function, is a problem that appears in many areas of machine learning, like data reweighting, implicit deep learning, or neural architecture search.

While many important and timely machine learning problems are framed as bilevel optimization, how to solve these problems efficiently is still an open problem for the community. As a result, developing better bilevel optimization algorithms has a ripple effect by accelerating research in all areas based on bilevel formulations. The general goal of this project is to develop new algorithms for bilevel optimization that are faster, easier to use, and more scalable. These new algorithms will then be applied to advance the relevant applications of bilevel optimization in machine learning.

The postdocs supervisors Thomas Moreau and Pierre Ablin both have extensive experience delivering high-impact research on this topic [1,2,3,4,5] and have collaborated numerous times fruitfully. The intended outcome of this project is purely academic: we aim at publishing 2-3 open research papers at top ML conferences (Neurips, ICML, ICLR, Aistats, etc.) as well as open-source code for the proposed algorithms.

### **Main activities**

**Main activities :**

- Read papers and state of the art
- Benchmark existing algorithms
- Write problem formulation and proofs of convergence.
- Adapt the formulation to the target scenario.
- Propose a new dedicated algorithm.
- Program, run, and analyze simulation results.

**Complementary activities**

- Participate to the teams activities : scientific meetings, seminars, scientific presentations.

### **Skills**

- Strong mathematical background. Knowledge in optimization is a plus.
- Good programming skills in Python. Knowledge of a deep learning framework is a plus.
- The candidate should be proficient in English. Knowing French is not necessary, as daily communication in the team is mostly in English due to the strong international environment.

## 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

2788 € gross/month

## General Information

- **Theme/Domain** : Optimization, machine learning and statistical methods  
Statistics (Big data) (BAP E)
- **Town/city** : Palaiseau
- **Inria Center** : [Centre Inria de Saclay](#)
- **Starting date** : 2024-09-02
- **Duration of contract** : 1 year, 6 months
- **Deadline to apply** : 2024-08-31

## Contacts

- **Inria Team** : [MIND](#)
- **Recruiter** :  
Moreau Thomas / [thomas.moreau@inria.fr](mailto:thomas.moreau@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

We seek candidates strongly motivated by challenging research topics in machine learning for science. Applicants should have a strong mathematical background with knowledge of numerical optimization and machine learning. With regards to software engineering, proficiency in Python is expected and experience in applying ML to large-scale data is a plus.

**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.