



Offer #2024-07828

Master Internship in Optimization

Contract type : Internship

Level of qualifications required : Master's or equivalent

Fonction : Internship Research

Level of experience : Recently graduated

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**.

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.

Context

In the context of the **ERC STG MAJORIS European project**, our aim in this internship, is to investigate majorization-minimization (MM) algorithms and their convergence analysis. We will focus on the design, and convergence study of MM algorithm that are processing data on-the-fly, using either incremental or mini-batch approach, building upon the works [1,3]. We will investigate the incorporation of constraints in such formulations, and the applicability to on the fly image reconstruction, for instance as in [2].

[1] E. Chouzenoux and J.-C. Pesquet. A Stochastic Majorize-Minimize Subspace Algorithm for Online Penalized Least Squares Estimation. *IEEE Transactions on Signal Processing*, Vol. 65, No. 18, pages 4770-4783, 2017.

[2] L. El Gueddari, E. Chouzenoux, J.C. Pesquet, A. Vignaud and P. Ciuciu. Online compressed sensing MR image reconstruction for high resolution T2* imaging. In *Proceedings of the 27th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM 2019)*, Montreal, Canada, 11-16 May 2019.

[3] Antonin Chambolle, Claire Delplancke, Matthias J Ehrhardt, Carola-Bibiane Schönlieb, Junqi Tang. Stochastic Primal-Dual Hybrid Gradient Algorithm with Adaptive Step Sizes. *Journal of Mathematical Imaging and Vision*, 2024.

Assignment

Missions : The recruited student will investigate new optimization schemes, and their convergence analysis. The main challenges are algorithm design, and practical implementation in Matlab or Python.

Environment : The intern will be supervised by Emilie Chouzenoux (Inria Saclay, PI of the ERC project MAJORIS). The intern student will join the Inria Saclay team OPIS (<https://opis-inria.eu/>). He/she will be located in the Centre de la Vision Numérique, in CentraleSupélec campus, Saclay, France. He/she will enjoy an international and creative environment where research seminars and reading groups take place very often. Informatic material expenses will be covered within the limits of the scale in force.

Organization : The proposed offer is dedicated to internship of Master 1 or 2 students. Students looking for a "stage de césure" are also encouraged to apply. The starting/end dates are flexible, with a minimum duration of 4 months.

Main activities

Main activities :

Bibliographic study

Mathematical developments
Scientific meetings
Implementation of the methods
Validation on numerical examples
Writing of scientific reports

Skills

Languages : The candidate must be fluent in english and/or french languages.

Benefits package

- 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.)
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities

Remuneration

Gratification

General Information

- **Theme/Domain :** Optimization, machine learning and statistical methods
Statistics (Big data) (BAP E)
- **Town/city :** Gif sur Yvette
- **Inria Center :** [Centre Inria de Saclay](#)
- **Starting date :** 2024-10-01
- **Duration of contract :** 5 months
- **Deadline to apply :** 2024-09-15

Contacts

- **Inria Team :** [OPIS](#)
- **Recruiter :**
Chouzenoux Emilie / emilie.chouzenoux@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 for a talented candidate in Master 1 or 2 studies, with a solid background in applied mathematics (functional analysis, continuous optimization, numerical integration). Experience in Matlab or Python programming is necessary.

The candidates are requested to send a CV and a motivation letter to apply for this position.

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.

