Offer #2025-08676

Low rank matrix approximation and optimization applied to a diffusion MRI inverse problem in neurons

Level of qualifications required : Master's or equivalent

Other valued qualifications : First or second year Master student or Fourth year Bachelor

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

This internship is part of a new collaboration between Idefix Team (Inria Saclay) and UCLouvain (Belgium). The intern will be based in the Idefix Team at Saclay, France. There will be some travel between Saclay and Louvain, Belgium financed by grant.

There will be regular meetings by video-conference with supervisers. Shared code development will be on GitHub.

Assignment

The intern will work under the supervision of Jing-Rebecca Li and collaborators at UCLouvain and Inria Saclay to apply numerical linear algebra and optimization techniques to a PDE model of the diffusion MRI signal in realistic brain cells.

The intern will solve an optimization problem to find a good low rank approximation to the forward model and then obtain statistical information about the neuron geometry.

The intern will contribute to preparing a scientific article on the results;

The forward model to compute diffusion MRI signals from realistic neurons using matrices related to the Laplace operator can be found here :

https://perso.ensta-paris.fr/~jing-rebecca.li/papers/1911.07165.pdf

The internship concerns finding a low rank approximation to the forward problem and using it to solve the inverse problem.

Main activities

Analyze large-scale matrices;

Solve an optimization problem;

Code in Matlab or Python;

Write up results in Latex;

Skills

Profile sought:

Having completed coursework in Numerical Linear Algebra, Optimization, Machine Learning;

Be able to program in Matlab and Python and use GitHub;

Be able to speak and write fluently in English;

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 (after 6 months of employment) 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

Gratification

General Information

- **Theme/Domain :** Numerical schemes and simulations
  Scientific computing (BAP E)
- **Town/city :** Palaiseau
- **Inria Center :** Centre Inria de Saclay
- **Starting date :** 2025-05-01
- **Duration of contract :** 6 months
- **Deadline to apply :** 2025-04-30

Contacts

- **Inria Team :** IDEFIX
- **Recruiter :**
  Li-schlittgen Jing-rebecca / jing-rebecca.li@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.

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.