



Offer #2024-08493

M2 research internship: Weak metrics for gradient descent in seismic imaging by 1D full waveform inversion (M/F)

Contract type : Internship

Level of qualifications required : Master's or equivalent

Fonction : Internship Research

About the research centre or Inria department

Created in 2008, the Inria center at the University of Lille employs 360 people, including 305 scientists in 15 research teams. Recognized for its strong involvement in the socio-economic development of the Hauts-De-France region, the Inria center at the University of Lille maintains a close relationship with large companies and SMEs. By fostering synergies between researchers and industry, Inria contributes to the transfer of skills and expertise in the field of digital technologies, and provides access to the best of European and international research for the benefit of innovation and businesses, particularly in the region.

For over 10 years, the Inria center at the University of Lille has been 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

As part of a collaboration between the project team RAPSODI (Inria at University of Lille) and ISTerre (CNRS, Université Grenoble Alpes), the aim of the research internship is to test the use of weak metrics in gradient descent algorithms for waveform inversion seismic imaging in a 1D prototype code.

This internship will be co-supervised by Clément Cancès (Inria RAPSODI) and Ludovic Métivier (CNRS, Université Grenoble Alpes). Travel will be required and expenses will be covered in accordance with current rates.

Assignment

Tasks:

With the help of his/her supervisors Clément Cancès and Ludovic Métivier, the person recruited will be required to develop a one-dimensional prototype code for the wave equation, and to test various so-called weak metrics for the gradient descent algorithms used in solving the inverse problem consisting of reconstructing the characteristics of the subsurface as a function of reflected waves measured at the surface.

For more information on the proposed research topic:

http://chercheurs.lille.inria.fr/ccances/Documents/2025_MATHSOUT_MASTER.pdf

Collaboration:

The person recruited will be in contact with the members of the Inria RAPSODI project team:

<https://team.inria.fr/rapsodi/>

Main activities

Main activities :

- Reading scientific articles (mathematics and numerical geosciences)
- Development of a one-dimensional calculation code for waveform inversion in seismic inversion
- Tests on the use of weak metrics (typically negative Sobolev norms) during gradient descent linked to solving the inverse problem
- Formatting the results for discussion with the course supervisors
- Write an internship report

Additional activities :

- Taking part in the ANEDP team seminar at the Paul Painlevé Laboratory (University of Lille & CNRS)

- Exchanges with internship supervisors (with travel to Grenoble)

Skills

Technical skills and level required :

- Mathematical and numerical analysis of partial differential equations
- Numerical optimisation
- Scientific programming (Python, Matlab, FORTRAN, etc.)

Languages : French or English

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: the number of days off depends on the number of days the intern is actually present at the center
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)

Remuneration

According to legal scale: 4.35€ / hour

General Information

- **Theme/Domain** : Numerical schemes and simulations
Scientific computing (BAP E)
- **Town/city** : Villeneuve d'Ascq
- **Inria Center** : [Centre Inria de l'Université de Lille](#)
- **Starting date** : 2024-04-01
- **Duration of contract** : 6 months
- **Deadline to apply** : 2025-01-31

Contacts

- **Inria Team** : [RAPSODI](#)
- **Recruiter** :
Cances Clément / Clement.Cances@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

CV + cover letter

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.