Offer #2024-08123

Research Engineer in AI

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : Temporary scientific engineer

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

The engineer will be part of the OPIS project team, reporting to team leader Emilie Chouzenoux.

The project will be carried out in collaboration with E. Chouzenoux and J.-C. Pesquet (OPIS), and C. Lefort, CNRS research scientist at XLIM, Limoges.

Assignment

CARS microscopy (Coherent Anti-Stokes Raman Scattering) is an advanced nonlinear optical imaging technique that provides vibrational information about biomedical samples. The key advantage of CARS microscopy is its ability to deliver label-free spectroscopic information. The use of broad-spectrum laser sources, known as "supercontinuum," has been introduced to explore the full range of sample vibrations. This is referred to as M-CARS, or Multiplexed CARS. Additionally, the spectral detection capability of the dedicated instrument enables hyperspectral M-CARS imaging, allowing the collection and analysis of a wide light spectrum for each pixel in an image. Each pixel, therefore, contains a broad spectrum (1024 points), providing insights into the composition of substances in the scene.

Through this innovative hyperspectral M-CARS technique, we recently demonstrated that the "silent zone" of an M-CARS spectrum actually provides discriminative information about the sample—an area yet unexplored in the biomedical field. However, the current data processing method is cumbersome and prone to several challenges in data exploitation.

The hyperspectral images produced by the M-CARS solution generate a large volume of data due to the number of pixels in an image (a minimum of 10 × 10 pixels, typically 50 × 50, and up to 1024 × 1024), with each pixel containing 1024 spectral points.

The recruited engineer will be tasked with investigating artificial intelligence (AI) solutions to efficiently process these data and extract the discriminative information they contain. A hyperspectral M-CARS database recorded from muscle tissue will be used, where the myosin network is clearly identified by SHG, a well-known contrast method.

Between the myosin striations are actin striations, a protein that shows no SHG or vibrational signature. However, a discriminative signature has been observed in the "silent zone" of the M-CARS spectra, and intensity-level discrimination has been highlighted. The goal is to identify the spectroscopic signature using hyperspectral M-CARS and AI solutions. The mission involves developing an AI strategy to retrieve this discriminative information.

Subsequently, the task will extend to testing other biomedical samples, such as neurons, plants, or bacteria, to discriminate between different populations using the implemented AI method.

Main activities

- Understand the image processing problem
- Analyze the database
- Deploy a supervised AI approach to solve the problem
- Write scientific reports

- Participate in scientific meetings with collaborators

Skills

- Proficiency in the Python programming language and the PyTorch or TensorFlow environment is required.
- Experience in machine learning / neural networks is strongly recommended.

Benefits package

- Canteen and cafeteria;
- Sports equipment;
- Transport reimbursement

Remuneration

Regarding professional experience

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 :** 2025-01-06
- **Duration of contract :** 6 months
- **Deadline to apply :** 2024-12-02

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 are looking for a motivated and talented student with an engineering degree or Master's 2 specializing in data science / artificial intelligence / image processing / computer vision.

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.