



Offer #2024-07540

PhD Position F/M Multimodal Segmentation of Chronic Stroke Lesions

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : PhD Position

About the research centre or Inria department

The Inria Centre at Rennes University is one of Inria's nine centres and has more than thirty research teams. The Inria Centre is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

Context

- Co-director : Elise Bannier, IR UR, Empenn
- Co-director : Elisa Fromont, PR UR, Lacodam
- Co-supervisor : Francesca Galassi, MCF UR, Empenn
- Co-supervisor : Stéphanie Leplaideur, Medical Doctor, Centre de KERPAPE

The selected PhD candidate will have the opportunity to join the research lab Empenn at Inria-Irisa, located in Rennes, France. Empenn is affiliated with Inria, Inserm, CNRS, and the University of Rennes. Our team operates the Neurinfo imaging facility in partnership with the University Hospital of Rennes, Inria, CNRS, and the Cancer Research Center. Additionally, Empenn benefits from access to various computing facilities such as Grid5000 and collaborates with other Inria/Irisa research teams, particularly in machine learning, such as Lacodam.

Comprising over 30 dedicated individuals, including researchers, faculty members, PhD students, engineers, and interns, our research lab focuses on neuroimaging. Our primary goal is to identify and develop imaging biomarkers for various brain diseases, with a strong commitment to translating our techniques and findings into practical applications within clinical neurosciences.

The selected candidate will work closely with our interdisciplinary team, collaborating with engineers, researchers, and clinicians. Collaboration extends to the Lacodam team, specializing in computer science, facilitated by co-direction from Elisa Fromont.

Assignment

Research motivation. Stroke, a leading global cause of morbidity and mortality, results from the sudden disruption of blood supply to the brain, causing severe neurological impairments. In both acute and chronic stroke evaluation phases, MRI plays a crucial role. Integrating chronic stroke lesion segmentation into clinical practice has the potential to significantly enhance rehabilitation management, offering a deeper understanding of brain function impact and aiding clinicians in formulating effective treatment plans. Our goal is to leverage deep learning and available data to develop an accurate and robust automated chronic stroke lesion identification and segmentation system, assisting clinicians in planning more effective rehabilitation strategies.

Objectives. The selected PhD candidate will delve into research at the intersection of multimodal imaging and deep learning, specifically focusing on the segmentation of chronic stroke lesions. The methodological investigation will concern the following challenges:

i. Multimodal Integration. The primary objective is to improve segmentation by combining information from different MRI modalities.

ii. Labeled, Partially Labeled, and Unlabeled Data. The focus is to develop methodologies capable of handling varying levels of annotation.

iii. Addressing Missing Modality. The objective is to formulate an approach capable of handling situations where specific imaging information is absent.

Responsibilities. The appointed person will be responsible for the development and implementation of innovative methodologies for automatic segmentation of chronic stroke lesions. Additionally, she/he will be expected to take initiatives to refine existing approaches and explore novel techniques to address

the challenges posed by multimodal imaging and incomplete datasets.

Main activities

The PhD candidate will:

- Stay updated on the latest advancements in deep learning for medical image segmentation, particularly in stroke lesion segmentation, through literature reviews.
- Develop deep learning models for automatically segmenting chronic stroke lesions from multimodal MRI data, prioritizing accuracy and reliability.
- Explore attention mechanisms and feature fusion techniques to integrate different MRI modalities, for improved lesion segmentation.
- Investigate semi-supervised learning methods to effectively employ labeled, partially labeled, and unlabeled datasets during model training.
- Address the challenge of missing MRI modalities during testing, ensuring the segmentation model's adaptability to various imaging protocols.

Additionally, she/he will contribute to scientific publications summarizing their research findings and methodologies.

Skills

Technical skills and level required:

Languages: Proficiency in Python programming is essential.

Relational skills: Strong communication and collaboration skills to work effectively with interdisciplinary teams.

Other valued appreciated: Hands-on experience in image processing, data analysis, and deep learning. Familiarity with medical imaging data management is highly desirable. Adaptability, a commitment to continuous learning, and a genuine interest in the medical domain are highly valued.

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Possibility of teleworking (90 days per year) and flexible organization of working hours
- Partial payment of insurance costs

Remuneration

Monthly gross salary amounting to 2100 euros for the first and second years and 2190 euros for the third year

General Information

- **Theme/Domain** : Computational Neuroscience and Medicine
Information system (BAP E)
- **Town/city** : Rennes
- **Inria Center** : [Centre Inria de l'Université de Rennes](#)
- **Starting date** : 2024-10-01
- **Duration of contract** : 3 years
- **Deadline to apply** : 2024-05-31

Contacts

- **Inria Team** : [EMPENN](#)
- **PhD Supervisor** :
Galassi Francesca / francesca.galassi@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

Essential qualities for this role include:

- Comfort in an environment of scientific dynamism: The candidate should thrive in a dynamic research environment and be eager to contribute to ongoing scientific advancements.
- Eagerness to learn and listen: A genuine desire to continuously learn and adapt to new challenges is essential for success in this role. The candidate should also be open to listening to diverse perspectives and collaborating effectively with team members from various disciplines.

In addition, the ideal candidate might have:

- Passion for innovation: A strong enthusiasm for innovation and a drive to push the boundaries of knowledge and technology forward.
- Expertise in image processing and deep learning: Demonstrated proficiency in image processing techniques and deep learning methodologies, with a focus on medical imaging applications.
- Strong influencing skills: The ability to effectively communicate ideas and drive projects forward.
- Cross-disciplinary knowledge: A background or interest in multiple disciplines, such as computer science, medical imaging, and data analysis.

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

Please submit online : your resume, cover letter and letters of recommendation eventually

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.