PhD Position F/M Sharing FAIR protocols and workflows to better understand analytical variability in neuroimaging

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 eight 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

Applications are invited for a PhD fellowship under the supervision of Dr. Camille Maumet and Dr. Elise Bannier. This position is part of the PEPR Santé numérique ShareFAIR.

10 years ago, a series of publications pointed to the difficulty of reproducing scientific findings (Open Science Collaboration, 2015). This reproducibility crisis was a wake-up call for scientific communities to rethink how we practice research, and an important driver towards greater transparency and robust results. Ever since, biomedical imaging undertook various efforts to overcome reproducibility issues: From increasing sample sizes for higher statistical power, to data sharing and increased collaborations to acquire such samples, and promoting detailed reporting practices and code sharing to ease computational reproducibility. In particular, the FAIR principles, which stand for “Findable Accessible Interoperable and Reusable” (Wilkinson et al., 2016) have increasingly been used to describe and share open data. But for shared data to be truly reusable they must be accompanied by metadata that provide a complete description of the workflows that led to their creation.

As an illustration, in the field of brain imaging (like in many other data-intense fields of research), the tools and approaches to analyse a dataset have multiplied. Those tools are very valuable to practitioners and have brought the capacity to process more data more reliably and efficiently. But – each approach provides its own version of the results – and overall approach multiplicity leads to a very large space of possible results leaving practitioners at a loss to find the right answer to their research question. Until recently, this analytical variability induced by different protocols and pipelines/workflows on the results was typically ignored, considering it as negligible compared to other sources of variability (induced by participant samples, test-retest, etc.). In 2020 a landmark paper (Botvinik-Nezer et al., 2020) challenged this status-quo in neuroimaging: 70 teams were given the same dataset and asked to answer the same yes/no research questions. Each team chose a given approach leading to heterogeneous and sometimes contradictory findings. Modelling properly such approaches and sharing them as FAIR protocols and workflows following the ShareFAIR framework will make it possible to better understand the causes of analytical variability and their practical impact on neuroimaging use-cases.

The goal of this PhD fellowship will be to improve the description of neuroimaging protocols (high-level descriptions of the main acquisition and processing steps and parameters) and workflows (pipeline, finer-grained description representing a concrete implementation) using the FAIR principles. This will make it possible to list, query and compare workflows in neuroimaging and therefore answer important open questions such as: amongst the whole set of tools, algorithms and parameters available to brain imaging practitioners: which are the most used in the community? Are there specific sets of algorithms and parameters that are always excluded? Etc.

ShareFAIR belongs to the Program 2 of the PEPR “Tackling the challenges of the uses of multi-scale personalized health data” and focuses on the axis 5 of this program to help understand and interpret correctly datasets obtained.

Assignment

Research themes: Knowledge representation, open workflows, open data, brain imaging, Neuroinformatics, Reproducibility
Keywords: Analytical variability, FAIR data, data processing, open science, reproducibility, brain

The selected fellow will: 1/ Identify protocols and workflows associated with large open neuroimaging datasets (see below for an initial list of datasets to be considered), 2/ share workflows and protocols using the standard and best practices developed in ShareFAIR, 3/ Explore neuroimaging workflows and protocols to identify patterns of interest (e.g. which pipelines are most-widely used by the community).

This approach will be applied to existing large-scale real datasets such as NARPS (Botvinik-Nezer et al., 2020), the Human Connectome Project (Van Essen et al., 2013) and the International Neuroimaging Data-sharing Initiative (Mennes et al., 2013; Milham et al., 2018).

Main activities

Skills

Required skills

- Masters in computer science or any field related to data science or biomedical engineering.
- Strong interest in medical imaging
- Excellent programming and software engineering skills (including ability to use version control)
- Very good understanding of English
- Ability to work well in a team and exchange and share ideas with other members
- Well-organised with project-management skills

Desirable

- Prior experience with processing of neuroimaging data
- Experience in programming in Python

For more information

Informal inquiries can be sent to Dr. Camille Maumet and Dr. Elise Bannier (see above). General information on INRIA and on the Empenn team are available on the respective websites (see above).

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 2082 euros for the first and second years and 2190 euros for the third year

General Information

- Theme/Domain: Computational Neuroscience and Medicine
- Town/city: Rennes
- Inria Center: Centre Inria de l'Université de Rennes
- Starting date: 2024-09-01
- Duration of contract: 3 years
- Deadline to apply: 2023-11-19

Contacts

- Inria Team: EMPENN
- PhD Supervisor: Maumet Camille / camille.maumet@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**

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.