Offer #2025-09128

PhD Position F/M An international multi-registry approach to identify pre-clinical markers of neurodegenerative disease

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : PhD Position

Level of experience : Recently graduated

Context

Within the framework of the PRAIRIE-PSAI initiative, we are looking for a PhD candidate to identify preclinical markers of neurodegenerative diseases using large databases of electronic health records.

Through collaboration between the Paris Brain Institute (France), the Karolinska Institute (Sweden), and the University of Queensland (Australia), we propose to use electronic health records (EHR) to identify biomedical risk factors by studying prior diagnoses (pre-clinical comorbidities), drug prescriptions, healthcare utilization, and biological test results. This analysis will leverage longitudinal EHR data from millions of patients, each followed for at least 10 years before diagnosis, across four healthcare systems: Australia, France, the UK, and Sweden, focusing on four neurodegenerative diseases: Alzheimer's disease (AD), Parkinson's disease (PD), dementia with Lewy bodies (LBD), and motor neuron diseases (MND). The goal is to identify both common and differentiating biomedical risk factors for these conditions.

Within the Inria ARAMIS team at the Paris Brain Institute (ICM), we have begun analyzing the SNDS database, which contains medical records covering 98% of the French population, to study the prodrome of neurodegenerative diseases. Similar to genome-wide analyses, phenome-wide analyses require a very large sample size due to the number of tested associations and the potentially small effect sizes of each. By integrating transnational, population-based data from four countries, we are uniquely positioned to overcome two key challenges in real-world data analysis: the typical lack of statistical power and the need to control for biases.

Assignment

The PhD student will perform association testing in collaboration with consortium members to identify preclinical markers associated with the risk of neurodegenerative diseases. They will examine relationships between clinical diagnoses, prescription drug use, healthcare utilization, and biological test results. These analyses will encompass disease-specific investigations (AD/PD/MS/MND) as well as cross-disorder studies, adjusting for factors such as age, sex, socioeconomic status, and disease susceptibility (e.g., family history) when possible. Given the recent emergence of large real-world databases, the PhD student will develop new statistical methods to leverage these resources effectively. Causality methods will also be developed to clarify the different relationships identified by preliminary statistical studies.

Examples of papers from the consortium:

[1] Wei D., Guinebrétièr. O. ,Fang F., Nedelec T., Ten years preceding a diagnosis of neurodegenerative disease in Europe and Australia, *eBioMedicine*, 2025

[2] Nedelec T., Couvy-Duchesne B., ... & Corvol J.C.. A comparison between early presentation of dementia with Lewy Bodies, Alzheimer's disease and Parkinson's disease: evidence from routine primary care and UK Biobank data., *Annals of Neurology*, 2023.

[3] Nedelec T, Couvy-Duchesne B, Monnet F, et al. Identifying health conditions associated with Alzheimer's disease up to 15 years before diagnosis: an agnostic study of French and British health records. *Lancet Digital Health* 2021;

[4] Nabais MF, Laws SM, Lin T, … & McRae AF. (2021) Meta-analysis of genome-wide DNA methylation identifies shared associations across neurodegenerative disorders. *Genome Biology* 22:90 https://doi.org/10.1186/s13059-021-02275-5

[5] Yazdani S, Mariosa D, Hammar N, Andersson J, Ingre C, Walldius G, Fang F. Peripheral immune biomarkers and neurodegenerative diseases: A prospective cohort study with 20 years of follow-up. Ann Neurol. 2019;86:913-926.

Main activities

Main activities:

- bibliographical work
- data management of large data sets of medical records
- design, implementation and conduct of complex analysis plans
- critical analysis results in light of the current literature
- present results at scientific conferences and in peer-reviewed scientific journals.

Skills

Required:

- advanced statistics (master level)
- scientific computing including data management in Python (master level)
- able to propose and implement complex data analysis plans

Understanding the key challenges of real-world data analysis would be a plus.

Languages : fluent in scientific english (oral and written)

Relational skills : able to work in multidisciplinary teams at the interface between statistics, medicine and epidemiology.

Other valued appreciated : interest in neurodegenerative diseases

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 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

General Information

- **Theme/Domain :** Computational Neuroscience and Medicine
  Biologie et santé, Sciences de la vie et de la terre (BAP A)
- **Town/city :** Paris
- **Inria Center :** Centre Inria de Paris
- **Starting date :** 2025-10-01
- **Duration of contract :** 3 years
- **Deadline to apply :** 2025-08-06

Contacts

- **Inria Team :** ARAMIS
- **PhD Supervisor :**
  Durrleman Stanley / Stanley.Durrleman@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

The candidate should have the motivation to conduct a PhD in a interdisciplinary environment. Eager to learn by themselves under the guidance of the supervisors, curious about the research conducted by the peers, motivated to make scientific contributions to the field.

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.