



Offer #2023-06322

Post-Doctoral Research Visit F/M Reproducible Science and Software Variability

Contract type : Fixed-term contract

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

About the research centre or Inria department

The Inria Rennes - Bretagne Atlantique Centre is one of Inria's eight centres and has more than thirty research teams. The Inria Center 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

The work will be realized in the context of the RESIST_EA associate team, which gathers the DiverSE Inria research team together with the VIAS and COMPLEX Departments of Simula Research Laboratory (Norway). The DiverSE team is located in Rennes, Brittany, France at the Inria research center (Centre Inria de l'Université de Rennes). DiverSE's research is in the area of software engineering and variability, while VIAS is dedicated to the validation of autonomous systems. The candidate will be employed by Inria and will work under the co-supervision of Prof. Mathieu Acher (INSA Rennes, DiverSE team), Assoc. Prof. Paul Temple (Univ Rennes, DiverSE team), Research Prof. Arnaud Gotlieb (Simula Research Laboratory, Norway) and Research Scientist Helge Spieker (Simula Research Laboratory).

Every year Inria International Relations Department has a few postdoctoral positions in order to support Inria international collaborations. Hence, the post-doc is part of DRI campaign. This year, postdoctoral positions within the frame of Inria London, Inria Brasil and Inria Chile programs and to strengthen partnerships with Simula (Norway), University of Waterloo (Canada) and KAIST and ETRI (South Korea) are eligible.

The postdoc contract will have a duration of 24 months. The default start date is November 1st, 2023 and not later than January, 1st 2024. The postdoctoral fellow will be recruited by one of the Inria Centers in France but it is recommended that the time is shared between France and the partner's country (please note that the postdoctoral fellow has to start his/her contract being in France and that the visits have to respect Inria rules for missions).

Assignment

Software resilience is about studying the varying conditions under which software systems can resist to failures.

Thus, in order to ensure resilience, it is crucial to demonstrate that results produced by systems can be safely and accurately reproduced. Usual experimental sciences like biology, medicine, chemistry and physics have built strong procedures for such purposes, but still, as they are more and more guided by data processing and analyses, there is a pressing need to revise such procedures to ensure better software reproducibility. For instance, studies about climate change require the design of mathematical models, the mining and analysis of data, execution of large simulations which involve computational tasks with specific software configurations and, unfortunately, different configurations can lead to different and inconsistent results., It is not an

overstatement to say that computational science depends on software and its engineering. The quest for reproducibility takes different forms and requires to make all data and code available in such a way that the computations can be executed again with identical results. For achieving reproducible science, there are several challenges ahead involving multi-disciplinary collaboration and socio-technical innovation within software development.

The software reproducibility problem can be captured by software variability modelling: many factors (operating system, third-party libraries, versions, workloads, compile-time options and flags, etc) themselves subject to variability can alter the results, up to the point it can dramatically change the conclusions of some scientific studies. **The goal of this post-doc is to make reproducible science more resilient through the management of software variability.**

There are two grand directions to consider. First, software variability can be accidental: a change in some software parameters or libraries versions may incidentally change the conclusions. From this perspective, methods and techniques should be developed to control that the result can still be computed and is still functionally valid and coherent with regard to the original result. Second, software variability can also be an opportunity to generate and explore new hypotheses of a scientific study or rely on different methods or process different input data. From this perspective, methods and techniques should be developed to automatically synthesize some diversity that is both coherent wrt software and expert knowledge while covering a wide range of possibilities. This diversity should either exhibit new results that contradict original results or make more robust the original studies.

We plan to consider at least the following case studies, spanning different fields and research expertise of DiverSE and Simula: floating point computations, automated driving, cardiac modelling, and neuroimaging (eg <https://www.narps.info/>).

Main activities

Main activities (5 maximum) : The goal of this post-doc is to make reproducible science more resilient through the management of software variability. We plan to consider at least the following case studies, spanning different fields and research expertise of DiverSE and Simula: floating point computations, automated driving, cardiac modelling, and neuroimaging (eg <https://www.narps.info/>).

Planned visits at Simula (Norway): The candidate will be invited to visit Simula Research Laboratory in Norway not only to interact with the research scientists working in the VIAS department, but also to get involved with other application fields of software reproducibility such as scientific computing in cardiac modelling and intelligent transport systems. In addition to remote, weekly meetings with both Inria and Simula partners, at least two visits per year will be planned ahead in Norway.

Skills

Candidates must have completed their PhD before the starting date and should have a solid background in one or multiple of the following areas:

- Automated software engineering (automated testing, modelling, etc.)
- Machine learning (statistical machine learning, large language models)
- Computational science (e.g., reproducible science)

The candidate should further have:

- An excellent publication track record in international conferences or journals
- Strong interpersonal skills and the ability to work and communicate well in an internationally collaborative environment

Possible and temporary derogations can be granted to exceptional candidates not having yet defended their PhD but expecting to do so before the end of the 2023 year.

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 2746 euros

General Information

- **Theme/Domain** : Distributed programming and Software engineering
Instrumentation et expérimentation (BAP C)
- **Town/city** : Rennes
- **Inria Center** : [Centre Inria de l'Université de Rennes](#)
- **Starting date** : 2023-11-01
- **Duration of contract** : 2 years
- **Deadline to apply** : 2023-06-18

Contacts

- **Inria Team** : [DIVERSE](#)
- **Recruiter** :
Acher Mathieu / Mathieu.Acher@irisa.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

For more information, please contact mathieu.acher@irisa.fr

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.