Offer #2023-06931

Post-Doctoral Research Visit F/M Compositional Automated Verification of OCaml code

Contract type: Fixed-term contract

Level of qualifications required: PhD or equivalent

Function: 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

We are looking for a post-doctoral researcher to work on the CAVOC project on Compositional Automated Verification of OCaml code. This project seeks to develop a tool for automatically checking the absence of runtime errors like uncaught exceptions inside OCaml modules.

To do so, interactive models of OCaml programs are built based on operational game semantics, a theory of programming language semantics that handles higher-order control flow, abstract data types and mutable and shareable resources.

OCaml program verification is then performed using model-checking and abstract interpretation techniques over symbolic representations of these models.

Assignment

Inside this project, you will work on the automation task. So you will design symbolic representations of these interactive models of OCaml programs, and extend the current prototype with them. Stating the absence of runtime errors as safety properties over these representations, you will design tools to check automatically such properties.

Main activities

The main tasks will be to:

- design symbolic representations of interactive semantics of OCaml programs based on Constrained Horn Clauses (CHC). Of particular interest will be the higher-order generalization of CHC, and the incorporation of the theory of algebraic datatypes.

- develop automated techniques to check safety properties over such CHC. To do so, you will design transformations to facilitate the task for existing solvers to check these clauses.

Skills

We are looking for candidates having a PhD in computer science, with expertise in some of the following fields:

Functional programming, abstract interpretation, compilation, model-checking, and/or semantics of programming language.

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs

Remuneration
Monthly gross salary amounting to 2788 euros

General Information

- **Theme/Domain**: Proofs and Verification
- **Town/city**: Nantes
- **Inria Center**: Centre Inria de l'Université de Rennes
- **Starting date**: 2024-03-01
- **Duration of contract**: 1 year, 3 months
- **Deadline to apply**: 2024-01-21

Contacts

- **Inria Team**: GALLINETTE
- **Recruiter**: Jaber Guilhem / guilhem.jaber@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

This postdoc strongly relies on the fact that practical implementation should have strong theoretical foundations and that further refinements of the theory should get inspiration from the practical side.

The ideal candidate should be familiar with formal approaches in programming language design, notably type systems, semantics, and logic. More concretely, knowledge of the OCaml programming language is expected, and knowledge of abstract interpretation and/or model-checking would be highly appreciated.

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.