Offer #2024-07885

PhD Position F/M Reasoning with and optimising Quantum Circuits.

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : PhD Position

Level of experience : Up to 3 years

Context

Inria Mocqua team at Centre Inria de l'Université de Lorraine and Loria.

Assignment

Quantum circuits are fundamental to quantum computing, providing a low-level representation of quantum programs and serving as the primary means of depicting quantum algorithms. Indeed, most quantum programming languages are essentially languages for describing quantum circuits.

Transforming circuits is crucial for optimizing code, tailoring algorithms to specific constraints (like qubit layout in a quantum computer's memory), or verifying algorithms. In this setting, an equational theory that facilitates the transformation of circuits into equivalent ones is essential.

In recent years, the Mocqua team has contributed to the first complete equational theory for quantum circuits, and refined it to make it provably minimal.

Main activities

The objectives of the PhD thesis are:
- to extend these results to more general settings, including qudit quantum circuits;
- to develop optimisation techniques for quantum circuits;
- to contribute to developing tools and software for quantum circuit reasoning and optimisation.

To this end, the candidate will develop new techniques and make connections with existing languages like the LOv- and ZX-calculi.

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 (after 6 months of employment) 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

Remuneration

2100€ gross/month the 1st year

General Information

- **Theme/Domain** : Proofs and Verification
  Scientific computing (BAP E)
- **Town/city** : Villers lès Nancy
- **Inria Center** : [Centre Inria de l'Université de Lorraine](link)
- **Starting date** : 2024-10-01
- **Duration of contract** : 3 years
- **Deadline to apply** : 2024-07-24

Contacts

- **Inria Team** : MOCQUA
- **PhD Supervisor** :
  Perdrix Simon / simon.perdrix@loria.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

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.