Offer #2020-03162

Post-Doctoral Research Visit F/M Developing quantum or quantum-inspired simulation algorithms based on quantum walks

Contract type : Fixed-term contract

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

Context

This position is opened in the framework of the Inria-Microsoft joint lab and the work will be in collaboration with Microsoft Research. The candidate will be selected jointly by Inria and Microsoft. This is an academic research position and the main work will be carried out at Inria Paris. The candidate is however expected to take the opportunity to have extensive visits at Microsoft (Paris and US). The inria-Microsoft partnership is regularly extended, and in this context the position would typically be extended too, or a new call would be opened.

The QUANTIC lab at inria is well-known for its contributions to quantum hardware for fault-tolerance and error correction. We are opening our scope toward integrating more the quantum algorithms component into our research. This is motivated both by purely developing applications, and by interfacing algorithms more with the fault-tolerance aspect.

Assignment

The aim of this research is to connect the general class of quantum algorithms based on quantum walks, to applications in quantum simulation. The principle is essentially to be more concrete than specifying oracle-access to a graph/data to be worked upon. As a side-objective, we also want to explore the concrete power of the recently published “Quantum Fast-Forwarding” algorithm (S.Apers & A.Sarlette) for Markov chains.

The latter type of algorithm seems to point more toward finite differences simulation, but making connections to other approaches as e.g. more optimization-like methods would be considered a valuable contribution too

Collaboration:

The work at inria will be supervised by Alain Sarlette. On Microsoft side, the contacts will be Matthias Troyer and Martin Roetteler (US) as well as occasionally Vivien Londe (France).

Management:

This project launches a new research topic, at the boundaries of the respective expertise of the Microsoft team and the inria/QUANTIC team. This is an opportunity for the postdoctoral research associate to combine expertise from both sides, and he/she will be assumed to take an active part in the strategic decisions. We will provide all funding necessary for travel and professional expenses; we will actively assist in gathering further funding e.g. for hiring a PhD researcher on the topic if this seems to make strategic sense.

Main activities

The main activities would include:

- taking part in proposing concrete research directions within the research topic

- carrying out this research on your own (no PhD student coaching involved, at the moment; the project may grow though, among others under your initiative)

- presenting the results (conferences, journals, internally to the group)

- participating in the activities and discussions of the research team (see topics on web page)

- if intereseted, developing an integrated software solution (in some of the software and compiler

solutions that are emerging for quantum algorithms)

Skills

Technical skills and level required : quantum algorithms (PhD); general quantum mechanics (sufficient level to discuss with researchers in quantum control, quantum error correction, and quantum simulation applications)

Languages : English

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

General Information

- **Theme/Domain :** Algorithmics, Computer Algebra and Cryptology
  Scientific computing (BAP E)
- **Town/city :** Paris
- **Inria Center :** Centre Inria de Paris
- **Starting date :** 2021-01-01
- **Duration of contract :** 1 year, 6 months
- **Deadline to apply :** 2021-02-24

Contacts

- **Inria Team :** QUANTIC
- **Recruiter :**
  Sarlette Alain / alain.sarlette@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

We are looking for someone with a strong background on quantum algorithms, motivated to explore its bases, possibilities and limitations more thoroughly.

The collaboration with Microsoft is an opportunity if you want to experience collaboration with an industrial partner in this field, but the position will leave you full academic freedom. Bridging too busy groups, you will be very much encouraged to develop your own research track if you like.

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.