



Offer #2024-07982

Junior Research Leader

The offer description below is in French

Contract type : Fixed-term contract

Level of qualifications required : PhD or equivalent

Fonction : Temporary Research Position

Context

Position in the framework of PEPR (Programmes et équipements prioritaires de recherche) NISQ2LSQ

Assignment

The engineering of bosonic GKP qubits or cat qubits relies on complex and subtle mechanisms, involving numerous approximations such as the rotating wave approximation, adiabatic theory, and adiabatic elimination. In practice, the validity of some of these approximations may be questioned, in particular due to the appearance of chaotic phenomena or simply as the precision of the systems studied increases. For a high-precision bosonic code, it is essential to precisely understand the phenomena, even very weak ones, likely to generate logical errors, as well as to what extent the reduced models studied are capable of accounting for these phenomena.

In addition to understanding the limits of the models obtained, the development of bosonic codes requires precise and efficient simulations of superconducting circuits. These simulations are crucial for identifying limiting phenomena, optimizing the controls underlying logical gates and quickly estimating system parameters (calibration). The QUANTIC team, ENS de Lyon and the start-up Alice&Bob use techniques based on the engineering of dissipative systems, modeled by the Lindblad equation. However, these simulations quickly become very complex when it is necessary to model several cavities (for logic gates and/or buffer cavity modeling) or a large number of photons (GKP codes, large cat qubits). The development of new stable, robust and fast numerical schemes for temporal discretization and space truncation would represent an innovative and reliable tool for the bosonic codes community.

These research topics are central for all theoretical and experimental tasks of WP1 of NISQ2LSQ, concerning superconducting bosonic codes. A better understanding of the error models and limitations of the bosonic encodings could then be exploited in a transversal manner with WP3, where the concatenation of such bosonic qubits and LDPC codes can be investigated. Furthermore, the numerical tools can go well beyond the particular applications of WP1 and could provide efficient and stable schemes for simulating bosonic systems including those encountered in WP2.

The junior research leader will work within the Inria-ENS-Mines-CNRS Quantic team with a small team of 1 PhD student and/or 1 postdoc to address the above issues. The position is open for a fixed-term contract of 3 years for a junior research leader. The applicant can also be a young researcher, already hired on a permanent position and intending to pursue a research topic in line with the above theme. In this second case, the funding will be used to cover the hiring of a PhD student and a postdoc, collaborating with the young researcher.

Main activities

- 1- Research with a team of 1 PhD student and/or 1 postdoc on the above topics. The candidate will be co-supervising the PhD student with a member of team who has the habilitation.
- 2- Writing reports on the work progress and writing research articles when the work is finalized.
- 3- Participating to conferences for presenting the work.

Skills

The candidate must have expertise in quantum physics, numerical methods, and control theory, a PhD, and a good track record.

Benefits package

- Restauration subventionnée
- Transports publics remboursés partiellement

- Congés: 7 semaines de congés annuels + 10 jours de RTT (base temps plein) + possibilité d'autorisations d'absence exceptionnelle (ex : enfants malades, déménagement)
- Possibilité de télétravail (après 6 mois d'ancienneté) et aménagement du temps de travail
- Équipements professionnels à disposition (visioconférence, prêts de matériels informatiques, etc.)
- Prestations sociales, culturelles et sportives (Association de gestion des œuvres sociales d'Inria)
- Accès à la formation professionnelle
- Sécurité sociale

General Information

- **Theme/Domain** : Numerical schemes and simulations
Scientific computing (BAP E)
- **Town/city** : Paris
- **Inria Center** : [Centre Inria de Paris](#)
- **Starting date** : 2024-11-01
- **Duration of contract** : 3 years
- **Deadline to apply** : 2024-08-31

Contacts

- **Inria Team** : [QUANTIC](#)
- **Recruiter** :
Mirrahimi Mazyar / Mazyar.Mirrahimi@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

Required documents: CV, publication list, research statement, recommendation letters

Apply before: 15/09/24

<https://quantic.phys.ens.fr/files/Quantic-PEPR.pdf>

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.