

Open PhD position in Quantum Computing Engineering for Distributed Quantum Computing on Multi-QPU Architectures (collaboration between University of Stuttgart and IBM Germany, funded by IQST Graduate School @Quantum^{BW})

The Institute for Computer Architecture and Computer Engineering (ITI) at the University of Stuttgart, Germany, seek applications for a PhD position in the field of quantum computing. Located in one of Europe's main economic hubs, the Institute offer you an inspiring working atmosphere in a successful international team. The project is co-located with IQST (Center for Integrated Quantum Science and Technology), a multidisciplinary organization for groundbreaking research on quantum computing and quantum technology.

We invite candidates to be part of cutting-edge research on distributed quantum computer architectures that consist of multiple sparsely-connected quantum processing units (QPUs). The project investigates computer engineering for multi-QPU architectures, an emerging field that connects the domains of quantum algorithms and quantum hardware, encompassing tasks such as transpilation, finding suitable abstractions for multi-QPU workflows, and error suppression. Next-generation multi-QPU architectures will require novel methods for transpilation and inter-QPU communication to become useful for complex and yet optimized quantum computations.

The project is co-supervised with IBM, a world leader in multi-QPU systems, which pursues the evolution to multi-QPU architectures connected first via classical and then via quantum links. Parts of the planned research shall be conducted at IBM, e.g., in Böblingen, just 18 minutes away from the University of Stuttgart. IBM will provide mentoring and access to multi-QPU systems. This complements opportunities available in IQST, including various trainings, PhD retreats and networking activities with international research partners.

The project has a duration of four years. The employment is at the University of Stuttgart, remunerated with a 100% position according to the German public-service salary grade TV-L E13. In addition to research activities, we expect from you occasional contributions to our teaching program, supervising of student theses and participation in administrative duties, such as organization of scientific conferences.

Required qualifications:

- Above-average Master's degree in Computer Science, Mathematics, Electrical Engineering, Physics, or a related discipline.
- Profound knowledge in one of the two areas: (1) electronic design automation and (2) quantum computing, proven by, e.g., lectures taken as part of your study, extracurricular certificates or practical experiences, combined with strong interest in the other area.
- Programming skills in a procedural or object-oriented language (e.g., C++ or Python).

Preferred qualifications:

- Strong background in graph algorithms and/or distributed systems.
- Knowledge in quantum circuit synthesis, optimization or compilation.
- Contributions to open-source projects.
- Experiences with the programming language Rust.

To apply, please send, by email, your cover letter (explicitly explaining your interest in the topic and specifying your qualifications), CV and scans of your Master's and Bachelor's degree certificates including the transcripts with all grades. You can add, optionally, reference letters, existing publications, or other supplementary materials you consider relevant, or links to such materials. The University is pursuing a gender-equality policy and is therefore particularly encouraging qualified women to apply. Handicapped persons are given priority if they are equally qualified.

Deadline: Send your application to ilia.polian@informatik.uni-stuttgart.de before **January 15, 2025**.

The intended project start is on April 1, 2025. Questions regarding this position can be directed to:

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