

TUD Dresden University of Technology, as a University of Excellence, is one of the leading and most dynamic research institutions in the country. For TUD diversity is an essential feature and a quality criterion of an excellent university. Accordingly, we welcome all applicants who would like to commit themselves, their achievements and productivity to the success of the whole institution.

At the **Faculty of Electrical and Computer Engineering, Institute of Circuits and Systems (IEE)**, the **Chair of Highly-Parallel VLSI Systems and Neuro-Microelectronics** offers a project position as

Research Associate (m/f/x)

Physics- and Quantum-Inspired Computing on the SpiNNaker2 Neuromorphic compute platform

(subject to personal qualification, employees are remunerated according to salary group E 13 TV-L)

starting **as soon as possible** as part of a project funded by the European Regional Development Fund (ERDF). The position is limited until August 31, 2028. The period of employment is governed by § 2 (2) Fixed Term Research Contracts Act (Wissenschaftszeitvertragsgesetz - WissZeitVG).

Tasks: In modern supercomputing, there is a trend towards alternative hardware approaches and alternative compute paradigms, as conventional CPUs are approaching scaling limits. One prominent example of such alternative approaches are quantum computers. These promise to tackle numerical problems such as monte carlo sampling or large-scale optimization, which are NP-hard for conventional CPU-based machines, through a mixture of extreme parallelism (quantum superposition) and probabilistic computing. Less prominent examples include for instance neuromorphic compute approaches such as the SpiNNaker2 system, which employs a massive amount of ARM microcontrollers (153 per chip, 5Mio in overall machine) that are embedded in a slim, low-latency communication fabric inspired from neuronal connections in the brain. It is a generally programmable computing substrate, but greatly differs from classical architectures like CPUs or GPUs, allowing for more distributed processing and simulation approaches.

Inspired by the brain, SpiNNaker2 contains accelerators for probabilistic computing, and it can utilize a large number of compute elements in an asynchronous fashion, bypassing the usual Amdahl limit of conventional supercomputers. Thus, we see SpiNNaker2 as a "quantumorphic" system, i.e. a system that, while not a quantum computer, shares certain characteristics with it. One particular focus of our group is thus on using SpiNNaker2 for physics/quantum-inspired algorithms. We have e.g. already shown better scaling than either quantum computers (in terms of scale) or conventional supercomputers (in terms of achievable parallelism) for quadratic unconstrained binary optimization. Another example could be stochastic spiking neurons for solving finite-element tessellations in a highly-parallel, asynchronous fashion, or highly parallel Monte-Carlo Sampling.

Specifically, in the project "Supercomp", we want to apply these methods to solving real-world industrial problems in the Infineon manufacturing chain. A tentative work plan could e.g. focus around quadratic unconstrained binary optimization, where algorithms exist for classic supercomputers, quantum computers (D-wave annealers), and neuromorphic hardware.

The workplan would then be:

1. Analyze current approaches and their fit on SpiNNaker2.
2. Choose a single algorithm or small subset for optimization and implementation.
3. In parallel, derive with your PhD colleagues at Infineon a set of industrial benchmarks.
4. Complete a full processing chain using neuromorphic versions of QUBO or similar and
5. hybridize/cascade/combine above approaches by networking with other PhDs of the team.

A hybrid of these approaches could potentially show advantages on SpiNNaker2 that none of the individual approaches could achieve.

Requirements:

- university degree (Master's or equivalent) in applied mathematics, physics, computer science or related fields of expertise
- very good programming skills (e.g. C++, Python, PyTorch)
- ability to collaborate well in an interdisciplinary environment
- fluency in technical and non-technical English
- a high degree of independence, commitment, team spirit, and good communication skills
- excellent skills and practical experience in one or more of the following research areas is beneficial:
 - hardware/embedded Systems
 - probabilistic computing
 - quantum computing at a logical/mathematical level

We offer:

- the opportunity for engaging and independent work within a flat hierarchy, in an open-minded team and supportive atmosphere
- flexible arrangements for work hours to support a good work-life balance
- 30 days of vacation per year (based on a 5-day workweek)
- extensive opportunities for professional development and continuing education
- health care and sports programs offered by TUD
- a discounted job ticket (also available as a Deutschlandticket)
- participation in the supplementary pension scheme for employees in the public sector via VBL (Federal and State Government Employees Retirement Fund)

TUD strives to employ more women in academia and research. We therefore expressly encourage women to apply. The university is a family-friendly university. We welcome applications from candidates with disabilities. If multiple candidates prove to be equally qualified, those with disabilities or with equivalent status pursuant to the German Social Code IX (SGB IX) will receive priority for employment.

Application: Please submit your detailed application with the usual documents (Cover letter, CV, degree certificate) quoting the **reference number w26-260** by **October 16, 2026** (stamped arrival date of the university central mail service or the time stamp on the email server of TUD applies), preferably via the TUD SecureMail Portal <https://securemail.tu-dresden.de> by sending it as a single pdf file to christian.mayr@tu-dresden.de or to:

TU Dresden, Chair of Highly-Parallel VLSI Systems and Neuro-Microelectronics, Prof. Christian Mayr, Helmholtzstr. 10, 01069 Dresden, Germany.

Please submit copies only, as your application will not be returned to you. Expenses incurred in attending interviews cannot be reimbursed.

TUD is a founding partner in the DRESDEN-concept alliance.

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