Infineon Technologies Dresden AG & Co. KG

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Infineon hat rund 58.600 Mitarbeiterinnen und Mitarbeiter aus über 100 Ländern und gehört zu den weltweit führenden Unternehmen der Halbleiterbranche. Der Fertigungsstandort Infineon Dresden wurde 1994 gegründet – damals noch als Teil von Siemens. Heute ist Dresden einer der modernsten und größten Standorte für Fertigung, Technologie- und Produktentwicklung – und beschäftigt inzwischen ca. 3.900 Mitarbeiter*innen. Damit ist Infineon Dresden einer der wichtigsten industriellen Arbeitgeber der Region.

#WeAreIn to create tiny chips and big careers. Research with purpose. Innovation with direction. As a PhD at Infineon, you'll collaborate with passionate minds, shape innovations that power tomorrow's world, and build a career where your expertise truly makes a difference. Are you in?

Doctoral Thesis - Supercomputer quantum inspired optimization solutions for semiconductor production use cases (f/m/div)

- Promotion, Kennziffer HRC1395794
- Remotearbeit möglich
- Einsatzort: Sachsen, Dresden

- Befristetes Arbeitsverhältnis, Vollzeit

Ihr Aufgabengebiet

- **Please apply here.**

  Your Role
  As an industrial doctorate at Infineon, you will pursue a doctoral degree at a University and gain professional experience simultaneously - an ideal start for your career. Advance your research with us and profit from our vast network of doctoral candidates and the expertise of a university. Mentorship is handled by both professors and dedicated Infineon employees. The research is carried out in cooperation with the University of Technical University Dresden and under the supervision of Prof. Dr.-Ing. habil. Dr. sc. nat. Christian Mayr.

  In the "Digital Manufacturing" department at Infineon Dresden, your goal is to advance the digitalization of manufacturing as well as the networking and optimization of production areas. This involves using innovative mathematical methods to maximize the benefits of the vast amount of existing data and to make material-flow in the production-line or in the global manufacturing network more efficient and faster.

  To master optimization problems in semiconductor production is key for business success. Such NP-hard challenges are bringing even today’s conventional supercomputers towards its limits with billions of parameters to optimize. Therefor alternative approaches like quantum computers, able to run extreme parallelism using quantum superposition, are considered, but technically challenging itself. Less well-known neuromorphic compute approaches, however, have already demonstrated their capabilities for distributed processing and simulation approaches. Here we therefore combine this strength on SpiNNaker2 as a "quantumorphic" system, i.e. a system that, while not a quantum computer, shares certain characteristics with it, using SpiNNaker2 for physics/quantum-inspired algorithms. It has already shown better scaling than either quantum computers or conventional supercomputers for quadratic unconstrained binary optimization [1]. Another example could be stochastic spiking neurons for solving finite-element tessellations in a highly parallel, asynchronous fashion [2], or highly parallel Monte-Carlo Sampling.

  Literature:
  [1] Chen, Zihao, et al. "ON-OFF neuromorphic ISING machines using Fowler-Nordheim annealers." Nature communications 16.1 (2025): 3086.
  [2] Theilman, Bradley H., and James B. Aimone. "Solving Sparse Finite Element Problems on Neuromorphic Hardware." arXiv preprint arXiv:2501.10526 (2025).

  Key responsibilities in your new role:
  A tentative work plan could e.g. focus on using QUBO and other heuristics for industrial optimization.

  - **Analyzing the state of the art:** Analyze current approaches and their fit on SpiNNaker2
  - **Identifying potential for improvement:** Choose a single algorithm or small subset for optimization and implementation, plus a sample application to industrial optimization
  - **Implementation:** Complete a full processing chain from use case to implementation e.g. as a Q-Matrix on SpiNNaker2, respecting time constraints
  - **Thinking outside the box:** Hybridize/cascade/combine heuristics approaches, e.g. particle swarm optimization, etc. to potentially identify advantages on SpiNNaker2 that none of the individual approaches could achieve

  The learnings out of the thesis will lead to findings in the research focus areas:

  - Physics-inspired computing
  - Numerical algorithms
  - Probabilistic computing
  - Neuromorphic computing

  Your Profile

  Qualifications and skills to help you succeed:

  - **Education**: Master’s Degree (or equivalent) in applied mathematics, physics, computer science or related fields of expertise
  - **Programming**: Very good programming skills (e.g. C++, Python, PyTorch)
  - **Experience**: Excellent skills and practical experience in one or more of the following research areas are mandatory:
    - Hardware/Embedded Systems
    - Probabilistic computing
    - Quantum computing at a logical/mathematical level
  - **Personality**: Ability to collaborate well in an interdisciplinary environment and a high degree of independence, commitment, team spirit, and good communication skills
  - **Language skills**: Fluency in technical and non-technical English

  #WeAreIn for driving decarbonization and digitalization.
  As a global leader in semiconductor solutions in power systems and IoT, Infineon enables game-changing solutions for green and efficient energy, clean and safe mobility, as well as smart and secure IoT. Together, we drive innovation and customer success, while caring for our people and empowering them to reach ambitious goals. Be a part of making life easier, safer and greener.
  Are you in?

  We are on a journey to create the best Infineon for everyone.
  This means we embrace diversity and inclusion and welcome everyone for who they are. At Infineon, we offer a working environment characterized by trust, openness, respect and tolerance and are committed to give all applicants and employees equal opportunities. We base our recruiting decisions on the applicant´s experience and skills. Learn more about our various contact channels.
  We look forward to receiving your resume, even if you do not entirely meet all the requirements of the job posting.
  Please let your recruiter know if they need to pay special attention to something in order to enable your participation in the interview process.
  Click here for more information about Diversity & Inclusion at Infineon.

  Please apply here.

Ihr Profil

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Kontakt

- Please only **apply through our career page!**
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Anschrift

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