



Technische Universität Berlin



Technische Universität Berlin offers an open position:

Research Assistant - salary grade E13 TV-L Berliner Hochschulen - 1st qualification period (PhD candidate)

part-time employment may be possible

Faculty IV - Institute of High-Frequency and Semiconductor System Technologies / Semiconductor components and microelectronic systems

Reference number: IV-460/24 (starting at the earliest possible / for 5 years / closing date for applications 18/10/24)

Working field:

Neuromorphic Computing (Hardware for Artificial Intelligence)

Are you excited about designing hardware for artificial intelligence (AI) with the goal of solving important societal challenges? Are you a passionate, self-motivated and creative researcher who is curious about how the animal brain works? If so, then the Semiconductors and Microelectronic systems (SAM) group at TU Berlin has two exciting PhD opportunities at the interface between nanoelectronic devices, computational materials science and hardware-based AI.

Taking inspiration from the biological brain, the newly formed SAM group will design novel nanoelectronic devices and materials that can host an innovative form of AI which operates in hardware. This technology, called neuromorphic computing, aims to surpass the limitations of current software-based AI models, especially in terms of energy-efficiency, miniaturization, user privacy and scalability.

We are seeking a candidate for a PhD position described as follows:

- Bio-inspired neuromorphic learning:
 - o Here, you will explore newly discovered, bio-inspired learning algorithms that go beyond deep learning, and implement them in hardware. These algorithms include forward learning models and adaptive intelligence techniques.
 - o You will design novel nanoelectronic devices (e.g. ReRAMs, magnetic Domain Wall systems, Ferroelectric FETs and 2D devices) and leverage their complex physics to realize new types of learning algorithms found in the animal brain.
- This project will impact applications in healthcare, neurotechnology, intelligent sensing, smart energy and robotics.

Your tasks:

- Computationally design and test neuromorphic hardware including novel materials, devices and circuits. Implement bio-inspired learning algorithms on said hardware.
- Collaborate with an international, multi-disciplinary team to achieve our collective research agenda. Cooperate with machine learning and neuroscience groups on the algorithmic aspects, and with experimental groups on the fabrication aspects of the project.
- Produce high-quality publications and publicly disseminate research results through conferences.
- Contribute to the university through undergraduate teaching and mentoring.
- Serve the academic community at large through peer review, conference organization etc.

What you can expect from us:

- Participation in a young, energetic, growing, highly motivated and international team with a cordial and supportive culture.
- The opportunity to conduct parts of your project at the University of California, Berkeley and Lawrence Berkeley National Laboratory, USA.
- Benefit from close collaborations with world-renowned research groups at Fraunhofer Society, Germany, TU Delft, Netherlands, Institute of Neuroinformatics, Zurich, EPFL, Lausanne, and UC Berkeley, USA.
- Exposure to a multidisciplinary research program that spans nanoelectronic devices design, materials design, circuit development, AI algorithms and neuroscience.
- The opportunity to do a doctorate (PhD) under the supervision of experienced academics.

Requirements:

- Successful completion of a university degree (Master, Diplom or equivalent) in Electrical Engineering, Material Science, Applied Physics, Computer Engineering, or a related field.
- Knowledge or experience in at least two of the following topics:
 - a) Device physics (including simulation tools such as Sentaurus or mumax etc.).
 - b) Basic circuit design (including tools such as SPICE or Cadence Spectre etc.).
 - c) Computational materials science (including tools such as Quantum ATK or VASP etc.).
- Knowledge or experience in at least one of the following topics:
 - d) AI algorithms and deep neural networks (including deep learning frameworks such as TensorFlow or PyTorch etc.).
 - e) Novel bio-inspired algorithms.
- The ability to work and teach in English is required.

Desirable qualifications:

- Interest in neuromorphic computing and curiosity about the workings of the brain.
- Academic excellence, creativity, and strong motivation to succeed.
- Strong communication, interpersonal, and organizational skills.
- Important skills such as leadership, problem-solving, and initiative-taking.
- Previous experience in scientific research, independent working style and the ability to work in diverse teams.
- Programming experience in Python or R. Experience in open-source platforms such as GitHub.
- Experience in the development of neuromorphic hardware implementations.
- Background in Digital/Mixed-Signal Integrated Circuit (IC) design and Low power IC design.

Please send your application **with the reference number only by email** (single pdf file) to **personal@tmp.tu-berlin.de** with the following application materials:

- A cover letter in English, describing your motivation in applying for this position.
- Curriculum vitae in English, including a list of publications, if any.
- Academic Diplomas in English or German, of your relevant degrees.
- If possible, grade transcripts in English or German, including official description of the grading scale.

By submitting your application via email you consent to having your data electronically processed and saved. Please note that we do not provide a guaranty for the protection of your personal data when submitted as unprotected file. Please find our data protection notice acc. DSGVO (General Data Protection Regulation) at the TU staff department homepage: https://www.abt2-t.tu-berlin.de/menue/themen_a_z/datenschutzerklaerung/ .

To ensure equal opportunities between women and men, applications by women with the required qualifications are explicitly desired. Qualified individuals with disabilities will be favored. The TU Berlin values the diversity of its members and is committed to the goals of equal opportunities.

Technische Universität Berlin - Die Präsidentin - Fakultät IV, Institut für Hochfrequenz- und Halbleiter-Systemtechnologien, FG Halbleiterbauelemente und Mikroelektroniksysteme, Prof. Dr. Jadaun, Sekr. TIB 4/2-1, Gustav-Meyer-Allee 24, 13355 Berlin

The vacancy is also available on the internet at <https://www.personalabteilung.tu-berlin.de/menue/jobs/>

