There is a current opening for a doctoral project exploring energy-efficient memristor-based processing, inspired by the neuro-computational and biophysical properties of the cortex. The project area addresses a large class of critical problems that challenge both algorithms and hardware: efficient edge processing of (spatio-)temporal patterns from sensors, such as health monitoring on wearable devices. The challenging task can be described as processing general time-series signals, possessing rich long-short term correlations and scaling variations, with a tight energy consumption budget. The proposed approach combines findings from neuroscience in understanding how the brain performs efficient mixed-signal processing (e.g. in dendritic arbor and plateau potentials) with existing state-of-the-art deep learning techniques (e.g. Transformer networks and variants). By leveraging novel memristor device capabilities in in-memory computing architectures, we aim to bring higher computing performance and efficiency to critical edge operations.

We are looking to recruit a

**PhD Position – Algorithm-Circuit Codesign for Neuromorphic Computing with Memristors**

**Your Job:**
We are looking for a doctoral researcher who will explore and implement hybrid CMOS-memristor spiking neural networks, exploiting optimal neural architectures (e.g. analyzing the complexity-and-performance tradeoff in different neuron models, dendritic compartments, etc.) in task-specific hardware designs, for both training and inference for identifying complex sequential patterns. The researcher will:

- develop circuit-plausible training/inference algorithms and analyze with hardware-aware simulations (e.g. LTspice and Cadence Spectre)
- iterate algorithm-circuit co-designs and quantify improved schemes, compare and benchmark to competing approaches
- support printed circuit board design and tape-out of integrated circuits (e.g. Altium

Questions about the vacancy?
Get in touch with us by using our contact form.
Please note that for technical reasons we cannot accept applications via email.
www.fz-juelich.de
Designer / Cadence Virtuoso)

• set up experimental systems for memristive circuit measurements and experimental data analysis
• interact with cross-disciplinary experts (e.g. neuroscientists and device physicists)

Your Profile:
• Master’s degree in electrical/electronic engineering, computer engineering, computer science, or related fields
• Background in device physics and analog or mixed-signal circuit designs
• Strong skill in mixed-signal circuit designs (active filter circuits, ADC, …) and simulation (SPICE, Cadence Spectre) is a must.
• Skills in circuit layout tools, such as Altium Designer (printed circuit board) and Cadence Virtuoso (integrated circuits)
• Skills in setting electrical measurements and analysis
• Interest and background in neuromorphic computation or machine learning is a plus
• Coursework and experience in machine learning and spiking neural networks is desired
• Excellent communication skills and ability to work in a team are essential.
• Strong English skills will be required for the international working environment

Our Offer:
We work on cutting-edge research topics with a high potential to positively impact society. We offer ideal conditions for you to complete your doctoral degree:
• A world-leading, international research environment with state-of-the-art equipment
• Opportunity to work in the highly interdisciplinary and exciting field of neuromorphic and brain-inspired computing, collaborating with physicists, neuroscientists, materials scientists, and engineers
• Flexible working arrangements e.g. working from home
• 30 days of annual leave as well as an arrangement for bridging days (e.g. between Christmas and New Year’s Day)
• Further development of your personal strengths, e.g. through an extensive range of training courses; a structured program of continuing education and networking opportunities specifically for doctoral researchers via JuDocS, the Jülich Center for Doctoral Researchers and Supervisors: https://www.fz-juelich.de/judocs
• Targeted services for international employees, e.g. through our International Advisory Service

In addition to exciting tasks and the collaborative working atmosphere at Jülich, we have a lot more to offer: https://go.fzj.de/benefits

Place of employment: Aachen

The position is initially for a fixed term of 3 years but with the prospect of longer-term employment. The salary is in line with pay group 13 (75%) of the Collective Agreement for the Public Service (TVöD-Bund). In addition, an annual special payment is granted (“Christmas payment”), which amounts to 60 % of the monthly salary. Further information on doctoral degrees at Forschungszentrum Jülich (including its various branch offices) is available at https://www.fz-juelich.de/en/careers/phd

More information about the PGI-14, you find here: https://www.fz-juelich.de/en/pgi/pgi-14

We particularly welcome applications from people from a diverse range of backgrounds (e.g. regardless of age, gender, disabilities, sexual orientation/identity, as well as social, ethnic, and religious background). We strive to offer a diverse and inclusive working
environment in which people enjoy equal opportunities and are able to fulfill their potential.