



Conducting research for a changing society: This is what drives us at Forschungszentrum Jülich. As a member of the Helmholtz Association, we aim to tackle the grand societal challenges of our time and conduct research into the possibilities of a digitized society, a climate-friendly energy system, and a resource-efficient economy. Work together with around 7,500 employees in one of Europe's biggest research centres and help us to shape change!

The Peter Grünberg Institute - Neuromorphic Software Ecosystems (PGI-15) led by Prof. Dr. Emre Neftci explores neuromorphic computing technologies that learn and work like the brain. Our research team designs computing algorithms and architectures from the perspective of neuroscience and their physical realizations in dedicated circuits and devices. Applications of our research are targeted to improve computing in computer vision, autonomous control, data processing in mobile devices, and scientific data analysis.

As part of a new MSCA Doctoral Network “ELEVATE” (101227453), we are offering a

PhD Position - Synaptic Plasticity Rules for Few-Shot Event-based Reinforcement Learning

Your Job:

Reinforcement Learning (RL) is a versatile and powerful tool for control, but often data-inefficient, requiring numerous updates and non-local information such as replay buffers and batch-based processing. This project will investigate event-driven learning approaches in the context of RL in an event-triggered fashion. Data efficiency will be improved by using meta-learning and pre-training that facilitate few-shot adaptations. The research will show how the complementarity of event-triggered learning and meta-learning can drastically increase RL efficiency at test time. The co-design of algorithms and digital neuromorphic hardware is an additional avenue for enhancing the efficiency of the methods. In this context the research will explore digital, event-based implementations of the event-based RL learning rule. Benchmarking criteria include accuracy, latency, data efficiency, and energy consumption to reach a learned solution on small robotic control tasks. Your tasks in detail:

- Develop an event-driven RL algorithm that sparsely updates network state and parameters that will significantly improve energy to-solution efficiency compared to

We look forward to receiving your application until 19.09.2025 via our **Online-Recruitment-System!**

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

conventional digital accelerators when applied to control problems or tiny RL scenarios.

- Explore digital hardware realizations of the proposed RL algorithms within existing spiking neural network chip designs.
- Quantitative comparisons with different hardware backends. Design conventional (GPU-based) deep neural networks for comparison.
- Publish research articles, regular participation in top international conferences to present your work.
- Complete two 6-month internships at TU Delft (Prof. Charlotte Frenkel) and at Mercedes-Benz, Böblingen.
- Participate in yearly retreats organized by the doctoral network participants
- Support the dissemination of software tools and concepts.
- Supervise student projects and BSc/MSc theses.

Your Profile:

- Master's degree in physics, electrical/electronic engineering, computer science, mathematics, or a related field.
- Strong coding skills for programming neural networks, machine learning and machine learning software frameworks (e.g. PyTorch or Jax) is a must.
- The ability for creative and analytical thinking across discipline boundaries and abstraction levels is a must.
- Knowledge in integrated circuit design, testing and simulation using Cadence is a plus.
- Knowledge of digital neuromorphic hardware and sensors is a plus.
- Ability for collaborative work, interdisciplinary and cross-topical thinking.
- Very good communication skills in English, both spoken and written. PGI-15 offers an English speaking environment, therefore German language skills are not required.

Our Offer:

We work on the very latest issues that impact our society and are offering you the chance to actively help in shaping the change! We offer ideal conditions for you to complete your doctoral degree:

- The prestige and career benefits of being a Marie Skłodowska-Curie Actions (MSCA) Doctoral Fellow, including international visibility, research excellence, mobility opportunities, and competitive salary arrangements.
- A world-leading, interdisciplinary and international research environment, provided with state-of-the-art experimental equipment and versatile opportunities to grow as a curious researcher.
- An interdisciplinary and collaborative work environment including researchers at the following institutes: Neuromorphic Hardware Nodes (PGI-14), Electronics Materials (PGI-7), the Institute of Neuroscience and Medicine - Computational and Systems Neuroscience (INM-6), The Jülich Supercomputing Center (JSC) and the Faculty of Electrical Engineering and Information Technology at RWTH Aachen.
- 30 days of annual leave and provision for days off between public holidays and weekends (e.g. between Christmas and New Year)
- Flexible working hours
- 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/en/judocs>
- You will be enrolled in the PhD program of the department of Electrical Engineering and Information Technology, RWTH Aachen.

- Targeted services for international employees, e.g. through our International Advisory Service

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

The position is initially for a fixed term of 3 years. Pay in line with 75 % of pay group 13 of the Collective Agreement for the Public Service (TVöD-Bund) and additionally 60 % of a monthly salary as special payment („Christmas bonus“). The monthly salaries in euro can be found on the BMI website: <https://go.fzj.de/bmi.tvod.entgelt> Further information on doctoral degrees at Forschungszentrum Jülich (including its various branch offices) is available at <https://www.fz-juelich.de/en/careers/phd>

Place of employment: Aachen

We welcome applications from people with diverse backgrounds, e.g. in terms of age, gender, disability, sexual orientation / identity, and social, ethnic and religious origin. A diverse and inclusive working environment with equal opportunities in which everyone can realize their potential is important to us.

Further information on diversity and equal opportunities: <https://go.fzj.de/equality>