



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 Eco Systems (PGI-15), led by Prof. Dr. Emre Neftci, explores neuromorphic computing technologies that learn and work like the brain. In line with this mission, we draw inspiration from the structure and function of biological neurons to inform the design of more efficient and powerful learning systems. Neurons in the brain receive most of their inputs on dendritic trees, where signals are integrated through biophysical processes operating on long time-scales. These dendritic dynamics represent a collection of latent states, which can be used to dynamically store information. The type of activation and input-output functions implemented by dendrites improve the expressivity of neurons, decrease energy consumption, and mitigate the inherent variability and noise in the neuronal circuit. However, to date, it is not well understood how these properties can be effectively leveraged to improve artificial intelligence models.

**Join our team to the next possible date as**

## **Student Assistant / Master Thesis - Dendritic subunits to bridge timescales in spiking neuronal network learning**

### **Your Job:**

In this project, we will incorporate non-linear input integration mimicking dendritic dynamics into spiking neural networks. This will involve:

- Designing dendritic modules in PyTorch that can be embedded within spiking neural architectures
- Training and evaluation of these enhanced networks on sequence learning tasks and comparing their performance against state-of-the-art sequence learning models
- Investigation of these models in light of recent advancements in Selective State Space Models (SSMs), aiming to bridge the dynamics and working principles of SSMs with the dendrite-augmented spiking neural networks

### **Your Profile:**

The job will be advertised until the position has been successfully filled. You should therefore submit your application as soon as possible. We look forward to receiving your application 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](http://www.fz-juelich.de)

- Current master studies in physics, computer science, mathematics, electrical/electronic engineering or a related science or engineering field
- Strong background in mathematics, e.g., probability theory, linear algebra, differential/integral calculus
- Prior programming experience in Python is a must, C++ and CUDA experience are a plus
- Hands-on experience in working with neural simulators (NEST, Brian, etc.) and/or machine learning frameworks (PyTorch, Tensorflow, etc.) is a plus
- Experience with spiking neural networks and/or neuromorphic computing is a plus

Please feel free to apply for the position even if you do not have all the required skills and knowledge. We may be able to teach you missing skills during your introduction.

#### **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 support you in your work with:

- A world-leading, interdisciplinary and international research environment, provided with state-of-the-art experimental equipment and versatile opportunities
- An interesting and relevant topic for your thesis with a future-oriented focus
- Qualified support through your scientific colleagues
- The chance to independently prepare and work on your tasks
- Flexible working hours as well as a reasonable remuneration

Place of employment: Aachen

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

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>