UNIVERSITÄT BERN

PhD position in digital accelerator design for computational neuroscience (4 years, 100%)

The position is available from June 1st, 2025. The expected duration for completion of the degree is 48 months. The position is based at the university of Bern, Switzerland, but extended visits to Yale University are envisioned.

We are seeking a highly motivated PhD candidate in accelerator design for computational neuroscience as part of a joint project between the *Neuro-inspired Theory, Modeling and Applications* (NeuroTMA) Lab led by Mihai A. Petrovici at the University of Bern and the *Asynchronous VLSI and Architecture* *(AVLSI)* Lab led by Rajit Manohar at Yale University.

The NeuroTMA Lab focuses on biologically inspired models of spatio-temporal processing in recurrent cortical networks and their relation to reinforcement learning, Bayesian computing, and neuromorphic implementations. The AVLSI Lab conducts research on semantics, design methodologies, and architectures for asynchronous systems with the goal of designing and implementing efficient and programmable computation structures.

The project will develop an accelerator for the simulation of cortical models of processing and learning.

About the role

The NeuroTMA Lab has recently developed a novel model of cortical processing and learning that describes the relevant biophysical processes evolving in continuous time through systems of differential equations. This model lends itself to a highly efficient hardware implementation capable of real-time on-line learning from various kinds of input data streams. Our project seeks to carry out such an implementation by building on a novel neuromorphic architecture co-developed by the AVLSI Lab.

You will contribute to the design, implementation, tape-out, and verification of a custom digital chip implementing a massively parallel, asynchronous differential equation solver. Furthermore, you will work on extending our existing theory of on-line learning to more complex single neuron dynamics, for example oscillators. To this end, you will collaborate with other researchers and faculty in an interdisciplinary setting and be mentored by an experienced postdoctoral fellow.

Requirements

A master's degree in electrical engineering, computer science, physics or a closely related field is required. You are expected to have demonstrated an excellent grasp on quantitative methods (dynamical systems theory, numerical methods, foundations of machine learning, etc.), evidenced by exemplary academic performance and/or outstanding project work. You will need to be able to communicate and collaborate effectively across discipline boundaries and have a well-developed attention to detail.

Ideal candidates have a strong enthusiasm for interdisciplinary research and are naturally curious, eager to continuously grow their knowledge and skillset. Experience in digital hardware development, from design to tape-out and proficiency with associated EDA and simulation tools are advantageous.

Training and mentoring

You will work closely with a postdoctoral researcher and actively participate in weekly lab meetings to share your progress and learn from other members of the respective labs. Our collaborative atmosphere provides ample opportunities to connect with other researchers, to learn about novel developments from neuroscience to asynchronous circuit design, and to contribute your own creative ideas. Our PhD candidates are generally encouraged to additionally develop and pursue their own project ideas towards the last third of their PhD to build independence and ease the transition into postdoctoral researcher positions.

Applications

If you are interested, please send one .pdf document including your CV (max two pages), a statement of research interests (max one page), at least one single-author work (e.g., bachelor's/master's thesis), and the name and contact details of two references to Mihai A. Petrovici, Jakob Jordan and Virginie Sabado.

Review of applications will begin immediately and continue until the position is filled. Informal inquiries are welcome.