

Learning of delays in spiking neural networks

Spiking Neural Networks (SNNs) are a neural network model closely inspired by biological neural networks. Novel neuromorphic hardware implements SNNs in order to achieve high energy-efficiency. SNNs do not communicate analog values but rather events in times (spikes). Therefore, they are well-suited to process temporal input data where timing matters. Besides synaptic weights, SNNs can also use synaptic delays as tunable parameters. This seems in particular important for temporal processing. In this project, you will investigate a learning algorithm that uses Backprop to adapt synaptic weights and delays. A preliminary code for this algorithm is available. You will extend the code and apply it to various benchmarks tasks.

Goals & Tasks

- Review literature on delay-learning in SNNs
- Understand backprop-based delay learning
- Explore the mechanism to obtain a deep understanding of it.
- Perform further simulations on benchmark tasks.

Contact

Robert Legenstein
robert.legenstein@igi.tugraz.at

Qualifications

- Interest in computational neuroscience.
- Experience with Python.
- Course Principles of Brain Computation is recommended.
- Registered to one of the following:
 - ✓ **Bachelor Thesis**
 - ✓ **Seminar Project**
 - ✓ **Master Thesis**