Robotics, Artificial Intelligence and Embedded Systems

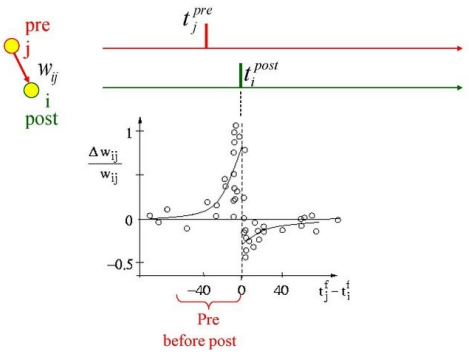
Human Brain Project

Guided Research

Neuromorphic STDP Learning

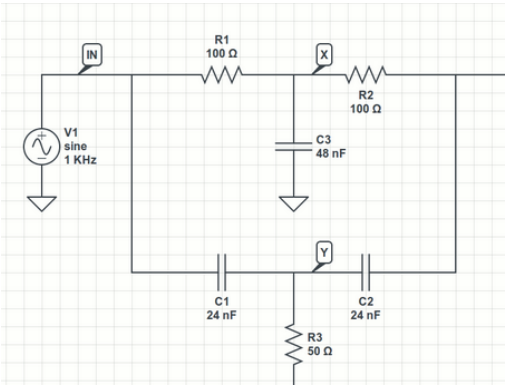
BACKGROUND

Nowadays Artificial Neural Networks are computationally very capable, however quite inefficient in terms of performance on classical von Neuman computer architectures. Additionally, artificial neuronal networks only approximate the electrophysical behavior of biological neurons in a very simplified way. Here, biologically derived spiking neurons with learning rules such as Spike-Timing Dependent Plasticity can be implemented efficiently on novel neuromorphic computing architectures that model individual neurons in electronic circuits.



YOUR TASK

In your guided research you will investigate and compare different types of neuromorphic architectures and their biological realism/abstraction level. With particular interest in STDP learning mechanisms you will collect and evaluate different implementations of the underlying principles. You will evaluate an efficient circuit design that you will implement in an electric circuit simulations. Results will be evaluated and compared to the state of the art research.



REQUIRED SKILLS

- Python
- Electronics and design of electric circuits
- Basic Knowledge in either Hebbian Learning, STDP Learning, Artificial Neural Networks, Neuromorphic Hardware

FURTHER READING

www.neurorobotics.net
http://www.scholarpedia.org/article/Spike-timing_dependent_plasticity
http://brainscales.kip.uni-heidelberg.de/public/results/

CONTACT

Benedikt Feldotto
✉ feldotto@in.tum.de

Technical University of Munich
Faculty of Informatics
Chair of Robotics, AI and Real-Time Systems
www6.in.tum.de