Technische Universität München

ENB Elite Master Program Neuroengineering (MSNE)
Invited Presentation

Prof. Dr. Wulfram Gerstner
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Eligibility traces and three-factor rules of synaptic plasticity

Abstract: Hebbian plasticity combines two factors: presynaptic activity must occur together with some postsynaptic variable (spikes, voltage deflection, calcium elevation ...). In three-factor learning rules the combination of the two Hebbian factors is not sufficient, but leaves a trace at the synapses (eligibility trace) which decays over a few seconds; only if a third factor (neuromodulator signal) is present, either simultaneously or within a short a delay, the actual change of the synapse via long-term plasticity is triggered. After a review of classic theories and recent evidence of plasticity traces from plasticity experiments in rodents, I will discuss two studies from my own lab: the first one is a modeling study of reward-based learning with spiking neurons using an actor-critic architecture; the second one is a joint theory-experimental study showing evidence for eligibility traces in human behavior and pupillometry. Extensions from reward-based learning to surprise-based learning will be indicated.

Biography: Wulfram Gerstner is Director of the Laboratory of Computational Neuroscience LCN at the EPFL. He studied physics at the universities of Tubingen and Munich and received a PhD from the Technical University of Munich. His research in computational neuroscience concentrates on models of spiking neurons and spike-timing dependent plasticity, on the problem of neuronal coding in single neurons and populations, as well as on the role of spatial representation for navigation of rat-like autonomous agents. He currently has a joint appointment at the School of Life Sciences and the School of Computer and Communications Sciences at the EPFL. He teaches courses for Physicists, Computer Scientists, Mathematicians, and Life Scientists. He is the recipient of the Valentino Braitenberg Award for Computational Neuroscience 2018 and a corresponding member of the Academy of Sciences and Literature Mainz (Germany).

The talk will be hosted by MSNE Students Jin Hwa Lee and Melanie Tschiersch.

Thursday, December 12 2019, 17:30

Theresienstrasse 90, 80333 Munich (Room N1135)

Registration: http://go.tum.de/046998 (or QR-Code)

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