S C I E N T I F I C   S E M I N A R

Models of short-term plasticity in spiking neural networks

Problem description:

Learning in (real) spiking neural networks happens in several ways. For instance, structural plasticity changes the physical configuration and number of pre- and post-synaptic synapses. The effect is usually long-lasting, i.e. knowledge obtained and stored in this way will be accessible even after longer periods. Another learning variant which induces long-lasting changes is long-term-potentiation and -depression. It depends on the precise spike time of pre- and post-synaptic neurons and effects either an increase or decrease of the synaptic weight. In contrast, short-term plasticity changes the synaptic weights only for a short duration of time. Afterwards, the weights will decay or increase back to its previous level.

The task of the student is split into several sub tasks. First, the student shall research biological mechanisms for short-term plasticity in spiking neural networks. Subsequently he/she shall search for models of short-term plasticity in biologically plausible models. Finally (and optionally), the student shall determine if there are technical implementations of the previously discovered models and in which way they are used. To succeed, the student will have to

1. understand spiking neural networks
2. learn about short-term plasticity in spiking neural networks
3. research models of short-term plasticity
4. (optional) discover applications of short-term plasticity and spiking neural networks in technical settings

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