Pre-training SNNs for robust classification of neural recordings

Spiking neural networks (SNNs) are an energy-efficient alternative to artificial neural networks. Here, we use SNNs to classify neural recordings from rat barrel cortex. Whiskers of rats have been stimulated with different stimulus intensities and neural responses in barrel cortex have been recorded. We use SNNs to classify stimulus intensities from these recordings using a simple Liquid-State-Machine approach. Performance however strongly depends on the network initialization and on the particular behavior of the biological network response. In this project, we will use backpropagation-through-time in order to pre-train the SNN with the goal to obtain more robust classification performance.

Goals & Tasks

- Based on the available dataset, produce dataset variants that capture the variability of recorded data.

- Set up a pre-training setup for the SNN based on these dataset variants (basic SNN training algorithms are available).

- Perform pre-training experiments and evaluate their effectiveness.

Contact

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Qualifications

- Basic knowledge of SNNs (e.g., visited course Principles of Brain Computation).

- Experience with Python based deep learning frameworks such as TensorFlow or PyTorch are beneficial.

- Registered to one of the following:

  - ✓ **Bachelor Thesis**
  - ✓ **Seminar Project**
  - ✓ **Master Thesis**