Karlsruher Institut für Technologie

Communications Engineering Lab (CEL)
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Implementation and Evaluation of a Probabilistic Spiking Neural Network Training for Amplitude Classification

Master thesis

Project

Spiking Neural Networks (SNN) are handled to be the successors of Artificial Neural Networks (ANN). By carrying information by spikes rather than continuous signals SNNs mimic the human brain more precisely and promise savings in eneryg consumption.

However, having spikes the signal is no longer differentiable and therefore backpropagation, well-known from ANNs, can't be applied anymore. State-of-the-art research includes identification and implementation of training techniques for SNNs.

In this work the SNN should be described as a probabilistic model. The probability of a neuron spiking can be described by the Likelihood function, whereat the gradient of the Likelihood plays a key role for training. This already in literature discussed training algorithm should be implemented and evaluated by training a SNN for amplitude classification. Objective of this thesis is the training of a SNN based ASK detector featuring Maximum Likelihood performance.

Deliverables

1. Familiarize with the theory of Probabilistic Spiking Neural Networks and the python submodules *pytorch* and *bindsnet*
2. Implementation of the Probabilistic SNN based training
3. Evaluation of the implemented training using a SNN for amplitude classification

Requirements

- ✓ Profound knowledge in probability theory
- ✓ Basic knowledge in communication engineering and Machine Learning
- ✓ Having fun at programming in python

Institute

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