Technische Universität München

Neurowissenschaftliche Systemtheorie

Master Thesis

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24-Mar-2017

Problem description:

Neural Networks have outperformed traditional engineering approaches in many fields such as Computer Vision, Natural Language Processing or Reinforcement Learning. These advances have been fueled by the backpropagation algorithm that enables the gradient computation. For spiking neural networks the backpropagation algorithm is not applicable due to the non-continuous output function. To apply backpropagation to Spiking Neural Networks, IBM changed the backpropagation algorithm to suit their TrueNorth architecture and achieved comparable results. During this master thesis, the student should change the backpropagation algorithm to suit the distributed and spiking SpiNNaker architecture.

Task:

The student should implement a distributed backpropagation algorithm that enables backpropagation like learning on SpiNNaker. Therefore, the student should be inspired by the TrueNorth backpropagation and different distributed backpropagation algorithms and develop a suitable backpropagation algorithm for SpiNNaker. To achieve this the student has to change the low-level code of the Spinnaker system and develop recurrent connections that communicate weight updates. The developed backpropagation approach should then be tested on simple XOR Problems, polynomial function approximation and images.

- Understand different variations of backpropagation
- Understand the low-level SpiNNaker functions
- Develop a discrete, distributed and online backpropagation variation
- Evaluate the performance on the XOR Problem and polynomial function approximation

Supervisor:	Michael Lutter, Christoph Richter
Start:	??.??.2017
Intermediate:	??.??.2017
End:	??.??.2017

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