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MASTER THESIS
for
Student Name
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Boltzmann Machine on a Million Core Computer

Problem description:

A Boltzmann Machine is a network of symmetrically connected, neuronlike units that make stochastic decisions about whether to be on or off. Boltzmann machines have a simple learning algorithm that allows them to discover interesting features in datasets composed of binary vectors.[1] Since the function and learning process of Boltzmann Machines relies only on local information[2], it is well suited for computer architectures with distributed local memory like SpiNNaker[3]. In this thesis a learning Boltzmann Machine shall be implemented on SpiNNaker.

Tasks:

The subtasks comprising this project are

- to develop a thorough understanding of the mathematical structure of Boltzmann Machines and their learning algorithms
- to understand the low-level system architecture and constraints of the SpiNNaker system
- to create a flexible SpiNNaker implementation of Boltzmann Machines including learning
- to demonstrate and assess the effectiveness of the implementation

Bibliography:

- [1] G. Hinton: *Boltzmann Machines*, Encyclopedia of Machine Learning, 132-136, Springer US (2011)
[2] D.H. Ackley, G.E. Hinton, T.J. Sejnowski: *A Learning Algorithm for Boltzmann Machines*, Cognitive Science 9, 147-169 (1985)
[3] S.B. Furber, F. Galluppi, S. Temple, L.A. Plana: *The SpiNNaker Project*, Proceedings of the IEEE 102, DOI: 10.1109/JPROC.2014.2304638, (2014)

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Start:
Intermediate Report:
Delivery:

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