Requirements on neuromorphic computing from brain-scale neuronal networks

A Python package for simulator-independent specification of neuronal network models. http://neuralensemble.org/PyNN/

Multi-scale spiking network model of macaque visual cortex https://github.com/INM-6/multi-area-model

Spiking Neural Network imulation on SpiNNaker

1% of human brain - 10 mics

sPyNNaker: A Software Package for Running PyNN Simulations on SpiNNaker - https://www.frontiersin.org/articles/10.3389/fnins.2018.00816/full

Synaptic Rewriting - https://www.frontiersin.org/articles/10.3389/fnins.2018.00434/full

HBP Neuro-robotics Platform https://neurorobotics.net/
https://developer.humanbrainproject.eu/docs/projects/HBP%20Neurorobotics%20Platform/2.0/nrp/developer_manual/CLE/spinnaker.html

Performance Comparison of the Digital Neuromorphic Hardware SpiNNaker and the Neural Network Simulation Software NEST for a Full-Scale Cortical Microcircuit Model - https://www.frontiersin.org/articles/10.3389/fnins.2018.00291/full

Biology Suggests New Forms of Deep Learning in Reccurent Networks of Spiking Neurons

topics
computational units that boost temporal processing capabilities
powerfull
backpropagation through time(BPTT) by e-prop
cur. replace by feed forward connections
proposed. e-prop, there is no transmission of error signals backwards in time or space
an abundance of error- and learning signals in the brain. microcircuitry of performance monitoring. Nature 2019 - https://www.biorxiv.org/content/10.1101/187989v2
backwards propagation of erros is replaed by augmented forward computation
cf. Long short-term memory and learning-to-learn in networks of spiking neurons - https://arxiv.org/abs/1803.09574
cf. Biologically inspired alternatives to backpropagation through time for learning in recurrent neural nets - https://arxiv.org/abs/1901.09049

Large-scale simulation of cortico-thalamo-cerebellar cicuits toward whole brain simulations

post-ke exploratory challenge 4

spiking neural network model   50   1 neuron   7 billion neurons

Nonlinear Neural Dynamics and its Electronic and Optical Implementation

Physical models of biological computation

topics
      real-time analog neural network emulator
      systems based on novel devices/materials
motivations for keeping up the tradition
      massively parallel collections of non-linear dynamical elements
      analog computation, digital asynchronous communication
      memory and computation are co-localized
The FeFET neuron, H.Mulaosmanovic et al., Nanoscale 2018 - Mimicking biological neurons with a nanoscale ferroelectric transistor https://pubs.rsc.org/en/content/articlelanding/2018/nr/c8nr07135 g#!divAbstract
Bilogical evidences - cf. https://www.ncbi.nlm.nih.gov/pubmed/3340148
New materials: challenges and opportunity
Learning and recall of orthogonal patterns

Resistive Analog Neuromorphic Devices for Edge AI Computing

Panel