Fast sampling with neuromorphic hardware

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Fast & robust emulation of functional spiking networks

Left: Replacing individual neurons by sampling network modules increases the robustness of sampling towards hardware-inherent effects such as parameter noise and signal transmission delays. Right: Characteristic network activity.

Stochastic inference with deterministic spiking neurons

From single neuromorphic chips to wafer-scale integration

Left: Stochastic inference with deterministic spiking neurons. Middle: Mixed-signal neuromorphic “Spikey” chip with highlighted communication infrastructure (384 neurons, 100K synapses) [8]. Right: Characterization and calibration of neuromorphic circuits (here, for the neuronal reset potential) [6,7].

Left: Subthreshold and spiking dynamics of neuronal membranes. Middle: abstract models – Hodgkin-Huxley versus Adaptive Exponential Integrate-and-Fire (AdEx). Right: Embedding of model equations into VLSI circuits (schematic) [10].

Left: Simple inference scenario (pattern completion) [3]. Bottom left: Deep spiking networks as simultaneous discriminative and generative models of MNIST handwritten digits [9]. Bottom right: Beyond Boltzmann distributions – LIF sampling from arbitrary discrete probability spaces (explaining away effect in the Knill-Kersten illusion) [5].


Right: Characterization and calibration of neuromorphic circuits (here, for the neuronal reset potential) [6,7].

Left: Wafer-scale integration of 20K neurons and 50M synapses [10]. Right: Hybrid modeling facility.

http://electronicvisions.github.io/hbp-sp9-guidebook/


