NANSNA: Improving Neuromorphic Computing Efficiency with Neuromorphic Accelerators with Novel Spiking Neural Subnetwork Ensemble-Based Architecture

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ABSTRACT

As a field, neuromorphic computing is expected to nearly double annually until 2032 and have an expected valuation of $9.5 trillion USD. However, current implementations of neuromorphic accelerators contains models which are not large enough for Vision and Language (VaL) tasks and are relatively incapable of multi-domain learning due to the specialization of current Spiking Neural Network (SNN) architectures. As a result, the NANSNA architecture aims to improve the efficiency of SNNs by developing a novel encoder/decoder-based SNN architecture which utilizes a neural subnetwork ensemble. The architecture contains multiple novel neuron and layer types for increasing efficiency, specialization, and multi-domain learning. The NANSNA model is trained on an adapter-based approach. Each subnetwork in the subnetwork ensemble is assigned a single adapter. This allows for specialization to occur while simultaneously increasing the performance of multi-domain tasks. The NANSNA model and architecture demonstrate statistically significant improvement in several key metrics within neuromorphic computing, including Synaptic Operations per Second (SOPS), synaptic density, Neuromorphic MNIST (N-MNIST), and the cost per neuron.

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Condition	n	p
A	5	0.1
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