

Progress on SNN and Neuromorphic System Research

Yassine Khedher
m5281019



Content

- Research Introduction
- Research progress
 - Completed
 - On-going
 - To-do
- Schedule

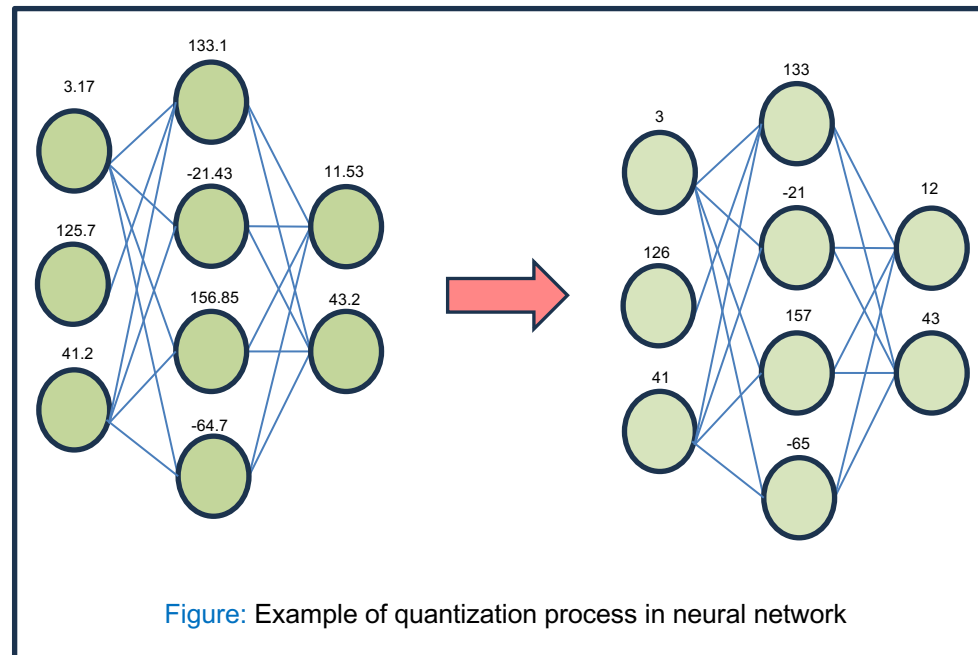


Content

- Research Introduction
- Research progress
 - Completed
 - On-going
 - To-do
- Schedule

Research Introduction

- Dynamic Quantization
 - Dynamically adjust the precision based on the network's current state and computational requirements
 - Significantly reduce energy consumption and memory usage without notably compromising accuracy
 - Implemented by using algorithms that monitor the activity of neurons and adjust precision levels accordingly



Research Introduction

- Dynamic Pruning
 - **Pruning:**
 - Removes synapses/neurons to reduce model size.
 - ➔ (+) Smaller models, potential for better generalization.
 - ➔ (–) Loss of network robustness, requires retraining

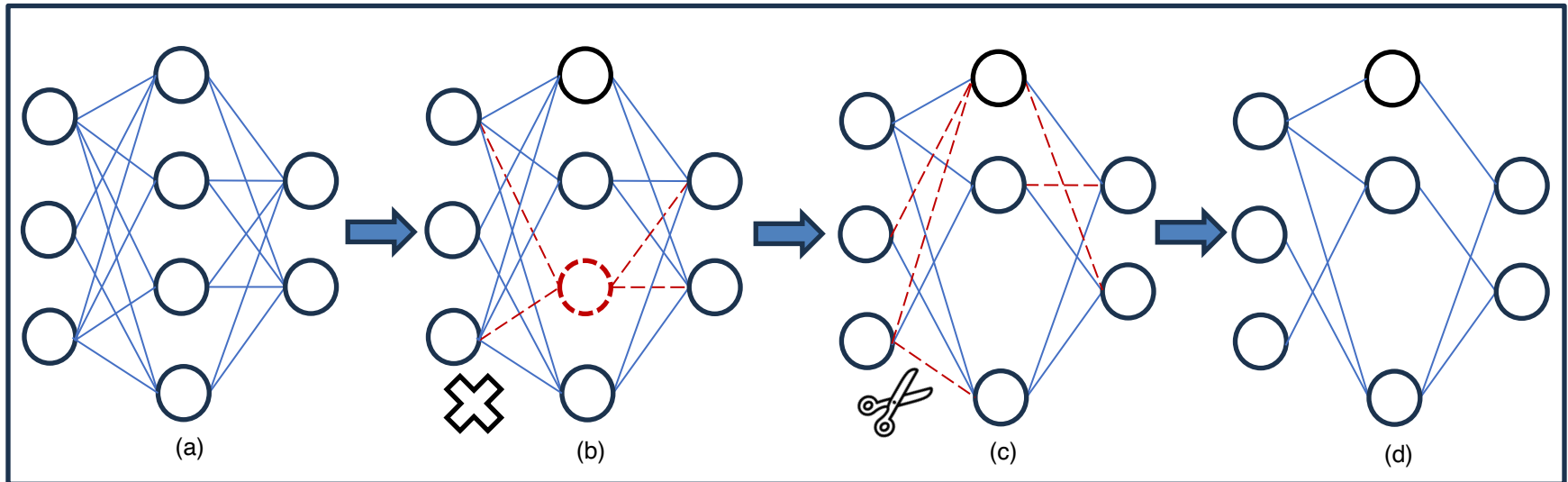


Figure: Pruning Examples in Neural Networks: Neurons Pruning (b) & Synapses Pruning (d)

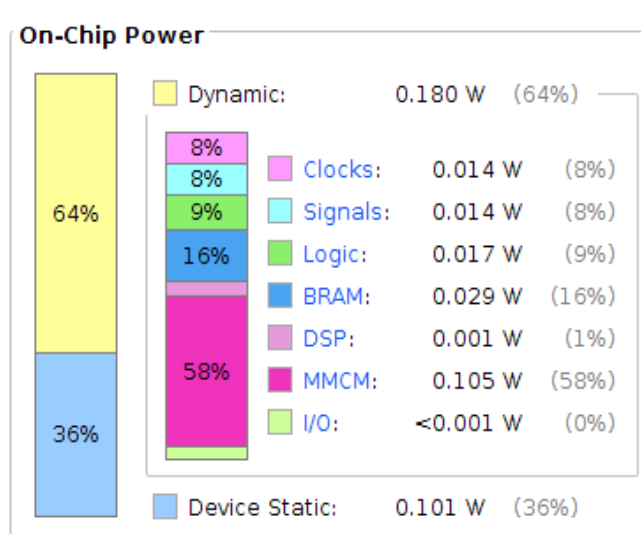


Content

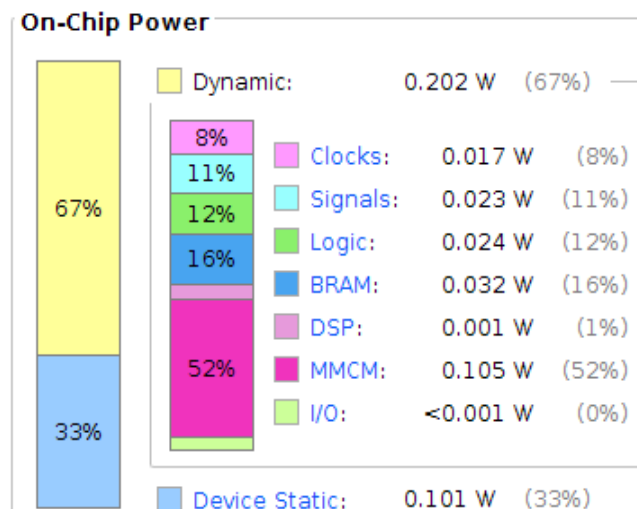
- Research Introduction
- Research progress
 - Completed
 - On-going
 - To-do
- Schedule

Research progress – Completed

- **Tutorial:**
 - Ran the 'DN-SoC: FPGA Implementation of Doanh Neuromorphic System-on-Chip' tutorial by a previous master's student
- **Power Estimation:**
 - Conducted power estimation for the SNN model ([784, 48, 10] & [784, 128, 10])



(a)



(b)

Power Consumption Report for SNN with [784, 48, 10] (a) and [784, 128, 10] (b) dimensions

Research progress – On-going

- **Understanding the ODIN proc.**
 - Analyze each block and it's code
 - Research how the Spike-dependent synaptic plasticity (SDSP) work

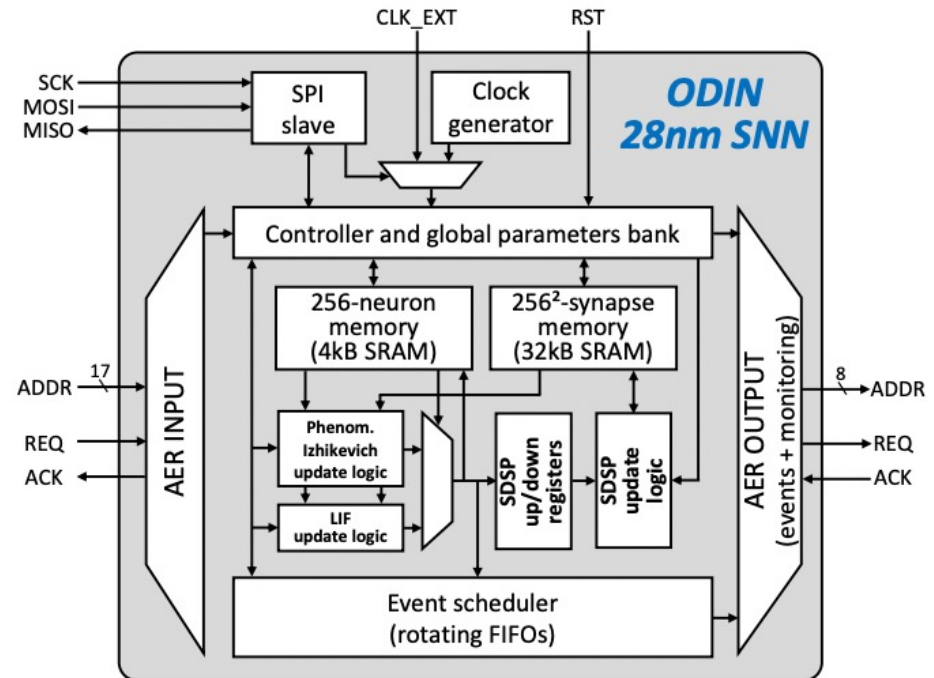


Figure – Block diagram of the ODIN online-learning digital spiking neuromorphic processor



Research progress – To-do

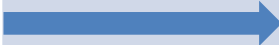
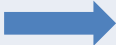
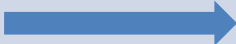
- **Benchmarking**
 - Learn how to test an SNN model
 - Analyze the results
- **White Paper:**
 - Plan to write a white paper explaining the SNN model size comparison ([784, 48, 10] vs. [784, 128, 10])
 - Aim to improve research paper writing skills



Content

- Research Introduction
- Research progress
 - Completed
 - On-going
 - To-do
- Schedule

Schedule

Task \ Time	Nov. 2024	Dec. 2024	...	
Learning about the ODIN processor				
Running tested SNN tutorials on the MNIST Dataset				
Writing white paper				

Thank you for your attention