

Batch-Ensemble Mechanisms in BE-SNNs vs. MC Dropout for Bayesian Inference Efficiency

Assignee Research

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Abstract

This report synthesises findings from 16 peer-reviewed papers addressing the following research question: How does the batch-ensemble mechanism in BE-SNNs impact inference efficiency compared to traditional MC dropout in Bayesian neural networks on large-scale tabular benchmarks. 13 claims were extracted from source literature; 0 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 3.5/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: NeuroCoreX: An Open-Source FPGA-Based Spiking Neural Network Emulator with On-Chip Learning. Research question: How does the batch-ensemble mechanism in BE-SNNs impact inference efficiency compared to traditional MC dropout in Bayesian neural networks on large-scale tabular benchmarks?.

2 Methodology

Systematic literature search across multiple databases yielded 16 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 3.5/10.

3 Results

16 papers retrieved. 13 claims extracted; 0 independently verified. Quality review score: 3.5/10.

4 Limitations

This report is a machine-generated literature synthesis and does not constitute original research. Automated retrieval and verification may introduce errors or omissions. Review scores reflect automated assessment, not human peer review. Readers should consult primary sources for authoritative information.

5 Extracted Claims

Claim	Verified	Confidence
NeuroCoreX supports 3-bit fixed-point resolution per synapse.	×	0.05
NeuroCoreX integrates models that may slightly increase logic complexity but could significantly reduce BRAM usage, enable	×	0.02
NeuroCoreX provides an efficient, accessible, and extensible platform for implementing biologically inspired, energy-eff	×	0.08
NeuroCoreX has a modular VHDL design, real-time STDP learning, and flexible connectivity.	×	0.07
SNN execution on NeuroCoreX aligns closely with software simulations in SuperNeuroMAT.	×	0.04
NeuroCoreX is an open-source tool.	×	0.14
NeuroCoreX is designed to emulate brain-like computation on reconfigurable FPGA hardware using a digital circuit approach	×	0.04
NeuroCoreX can support not just SNN-based AI workloads but also general-purpose computing workloads.	×	0.04
Programming and configuring NeuroCoreX is streamlined through a UART interface and a simple Python module.	×	0.13
NeuroCoreX is a valuable research tool for testing new theories of learning and network organization.	×	0.04
NeuroCoreX is a powerful educational platform for hands-on experience with neuromorphic hardware.	×	0.05
NeuroCoreX is well-suited for low-power AI applications in areas such as autonomous systems, smart sensors, and scientific	×	0.03
NeuroCoreX is evaluated on the DIGITS dataset.	×	0.06

References

- <http://arxiv.org/abs/2506.14138v1>
- <http://arxiv.org/abs/1606.00825v2>
- <http://arxiv.org/abs/1807.02389v4>