

# Node-Based vs. Weight-Based BNNs: Inference Efficiency on Large-Scale Tabular Data

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## Abstract

This report synthesises findings from 14 peer-reviewed papers addressing the following research question: How does the inference efficiency of node-based BNNs compare to weight-based BNNs on large-scale tabular datasets like CIFAR-10 or MNIST when evaluated using latency and memory footprint metrics. 9 claims were extracted from source literature; 1 was independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 4.2/10. This report is a machine-generated literature synthesis and does not constitute original research.

## 1 Introduction

This paper examines: Efficient Stochastic Inference of Bitwise Deep Neural Networks. Research question: How does the inference efficiency of node-based BNNs compare to weight-based BNNs on large-scale tabular datasets like CIFAR-10 or MNIST when evaluated using latency and memory footprint metrics?.

## 2 Methodology

Systematic literature search across multiple databases yielded 14 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 4.2/10.

## 3 Results

14 papers retrieved. 9 claims extracted; 1 independently verified. Quality review score: 4.2/10.

## 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
The CIFAR-10 dataset contains 60,000 images in $32 \times 32$ pixel RGB resolution and 10 different classes.	✓	0.15
The network structure used is 128C3–128C3–MP2–256C3–256C3–MP2–512C3–512C3–MP2–1024FC–1024FC–10SVM4.	×	0.02
The model was trained for 500 epochs with hyperparameters from [4] and without any preprocessing or augmentations on the	×	0.03
The classification error rate of the floating-point reference model on the CIFAR-10 test set is 10.74%.	×	0.14
A stochastic BNN ensemble with at least four members always performs better than the floating-point reference model.	×	0.04
The best classification error rate achieved with an ensemble of 23 networks is 9.41%.	×	0.09
The classification error rate of the high-precision reference model with ReLU activation is 6.13%.	×	0.08
The best classification error rate achieved with an ensemble of 29 networks using ReLU activation is 5.81%.	×	0.13
The classification error rates for ensembles of networks with ReLU activation are 6.91%, 6.21%, 6.12%, 6.06%, 6.04%, and	×	0.05

## References

- <http://arxiv.org/abs/1905.05918v1>
- <http://arxiv.org/abs/2504.20900v1>
- <http://arxiv.org/abs/1611.06539v1>