

# Bayesian Neural Networks with Monte Carlo Sampling in AlphaX Code Generation Efficiency

Assignee Research

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## Abstract

This report synthesises findings from 12 peer-reviewed papers addressing the following research question: How does incorporating uncertainty quantification through Bayesian neural networks with Monte Carlo sampling impact AlphaX’s architectural search efficiency in code generation tasks, as measured by. Over the past half-decade, many methods have been considered for neural architecture search (NAS). Bayesian optimization (BO), which has long had success in hyperparameter optimization, has recently emerged as a very promising strategy for NAS when it is coupled with a neural. 8 claims were extracted from source literature; 8 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 8.8/10. This report is a machine-generated literature synthesis and does not constitute original research.

## 1 Introduction

This paper examines: BANANAS: Bayesian Optimization with Neural Architectures for Neural Architecture Search. Research question: How does incorporating uncertainty quantification through Bayesian neural networks with Monte Carlo sampling impact AlphaX’s architectural search efficiency in code generation tasks, as measured by pass@1 on HumanEval benchmark with varying sample budgets?.

## 2 Methodology

Systematic literature search across multiple databases yielded 12 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.8/10.

### 3 Results

12 papers retrieved. 8 claims extracted; 8 independently verified. Quality review score: 8.8/10.

### 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
Bayesian optimization (BO) has long had success in hyperparameter optimization.	✓	0.25
Bayesian optimization (BO) has recently emerged as a very promising strategy for neural architecture search (NAS) when i	✓	0.37
Recent work has proposed different instantiations of the BO + neural predictor framework, for example, using Bayesian ne	✓	0.40
The analyses in recent papers often focus on the full-fledged NAS algorithm, making it difficult to tell which individua	✓	0.30
The 'BO + neural predictor framework' consists of five main components: the architecture encoding, neural predictor, unc	✓	0.38
A novel path-based encoding scheme for neural architectures is developed, which theoretically and empirically scales bet	✓	0.29
BANANAS achieves state-of-the-art performance on NAS search spaces.	✓	0.26
The code for BANANAS is available at <a href="https://github.com/naszilla/naszilla">https://github.com/naszilla/naszilla</a> .	✓	0.20

### References

- <https://doi.org/10.1007/s11704-026-60308-3>
- <https://doi.org/10.1145/331499.331504>

- <https://doi.org/10.1609/aaai.v35i12.17233>