SOVEREIGN: Does the coordinated pass@k policy optimization proposed in Cast a Wider Net improve diversity of generated co

SOVEREIGN Research Kernel
Autonomous draft — Owner review required before publication

May 28, 2026

Abstract

Multilayer neural networks trained with the back-propagation algorithm constitute the best example of a successful gradient based learning technique. Given an appropriate network architecture, gradient-based learning algorithms can be used to synthesize a complex decision surface that can classify high-dimensional patterns, such as handwritten characters, with minimal preprocessing. This paper reviews various methods applied to handwritten character recognition and compares them on a standard handwritten digit recognition task. Convolutional neural networks, which are specifically designed to

1 Introduction

Analysis of: Gradient-based learning applied to document recognition. Research goal: Does the coordinated pass@k policy optimization proposed in Cast a Wider Net improve diversity of generated code reasoning paths for multimodal LLMs on visual programming tasks, as measured by distinct solution count and functional correctness?.

2 Methodology

Multi-query arXiv search (4 parallel queries, Relevance-sorted). TF-IDF cosine semantic verification (bigrams, threshold=0.15). NIM nv-embedqa-e5-v5 (dim=1024) for semantic indexing. Tribunal v2: 3-role parallel review (SKEPTIC/VALIDATOR/SYNTHESIZER) with revision round if score $<$ 6.5.

3 Results

10 papers retrieved. 7 claims extracted, 7 verified. Tribunal: 7.0/10 → APPROVE (revision_round=0). Policy: AUTO_APPROVE.

4 Uncertainties

NIM free tier latency varies. TF-IDF verification is a weak signal. arXiv Relevance ranking is query-dependent. Tribunal consensus is LLM-based and prompt-sensitive.

5 Extracted Claims

Claim	Verified	Confidence
Multilayer neural networks trained with the back-propagation algorithm constitute the best example of a successful gradi	✓	0.35
Gradient-based learning algorithms can be used to synthesize a complex decision surface that can classify high-dimension	✓	0.36
Convolutional neural networks, which are specifically designed to deal with the variability of 2D shapes, are shown to o	✓	0.30
A new learning paradigm, called graph transformer networks (GTN), allows such multimodule systems to be trained globally	✓	0.41
Experiments demonstrate the advantage of global training, and the flexibility of graph transformer networks	✓	0.28
A graph transformer network for reading a bank cheque uses convolutional neural network character recognizers combined w	✓	0.41
The graph transformer network for reading bank cheques is deployed commercially and reads several million cheques	✓	0.24

References

- https://doi.org/10.1088/0953-8984/21/39/395502
- https://doi.org/10.1109/5.726791
- https://doi.org/10.48550/arxiv.2312.10997