Scalability of Hybrid Evolutionary Algorithms versus Gradient-Based Methods in Online Evolving Spiking Neural Networks for

Assignee Research

June 11, 2026

Abstract

Unsupervised anomaly discovery in stream data is a research topic with many practical applications. However, in many cases, it is not easy to collect enough training data with labeled anomalies for supervised learning of an anomaly detector in order to deploy it later for identification of real anomalies in streaming data. It is thus important to design anomalies detectors that can correctly detect anomalies without access to labeled training data. Our idea is to adapt the Online evolving Spiking Neural Network (OeSNN) classifier to the anomaly detection task. As a result, we offer an Online e

1 Introduction

This paper examines: Unsupervised Anomaly Detection in Stream Data with Online Evolving Spiking Neural Networks. Research question: How does the scalability of hybrid evolutionary algorithms in online evolving spiking neural networks compare to standard gradient-based methods when evaluated on large-scale unsupervised anomaly detection datasets like the Twitter Anomaly Detection Benchmark (TADB) in terms of model convergence speed and computational overhead?.

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 7.4/10.

3 Results

12 papers retrieved. 10 claims extracted; 8 independently verified. Quality review score: 7.4/10.

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 OeSNN-UAD detector inherits the property that all output neurons have the same thresholds.	✓	0.17
The OeSNN-UAD detector eliminates the necessity of recalculating thresholds when output neurons are updated during the l	✓	0.23
The elimination of threshold recalculation in OeSNN-UAD increases the speed of classification of input stream data.	×	0.14
Firing order values of input neurons in the proposed model do not depend on the values of TS and β parameters.	×	0.13
TS and β parameters were previously used in OeSNNs for input value encoding with Gaussian Receptive Fields.	✓	0.27
Experiments were conducted using stream data from the Numenta Anomaly Benchmark repository (Ahmad et al., 2017b).	✓	0.17
Experiments were conducted using stream data from the Yahoo Anomaly Datasets repository (Yahoo! Webscope, 2015).	✓	0.16
The proposed OeSNN-UAD detects anomalies in an unsupervised way more effectively than other state-of-the-art unsupervise	✓	0.25
The proposed OeSNN-UAD is able to make fast detection of anomalies among data stream input values.	✓	0.28
The proposed OeSNN-UAD works efficiently in environments with imposed restrictive memory limits.	✓	0.19

References

- `http://arxiv.org/abs/1912.08785v2`
- `http://arxiv.org/abs/2305.08977v2`
- `http://arxiv.org/abs/1905.05918v1`