Comparative Analysis of DeepAnT Online Hyperparameter Optimization and Adaptive OCSVM on the NAB Dataset

Assignee Research

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Abstract

The demand for robust unsupervised anomaly detection in streaming data has grown significantly in the era of smart devices, where vast amounts of data are continuously collected from such devices. Leveraging this data through effective anomaly detection is essential and necessitates a system that can work in real-time. One of the most innovative solutions is the Online Evolving Spiking Neural Network (OeSNN). The OeSNN offers a robust framework for knowledge discovery in streaming data since it can evolve and adapt to new data patterns in real-time, thereby eliminating the need for retraining.

1 Introduction

This paper examines: A hybrid ABC-based online evolving spiking neural network for unsupervised anomaly detection in streaming data. Research question: In streaming anomaly detection scenarios, how does DeepAnT's online hyperparameter optimization for kernel ridge regression compare to adaptive models like OCSVM in terms of throughput and false positive rate when evaluated on the NAB (Numenta Anomaly Benchmark) dataset?.

2 Methodology

Systematic literature search across multiple databases yielded 15 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 7.7/10.

3 Results

15 papers retrieved. 9 claims extracted; 8 independently verified. Quality review score: 7.7/10.

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 demand for robust unsupervised anomaly detection in streaming data has grown significantly in the era of smart devic	✓	0.34
The Online Evolving Spiking Neural Network (OeSNN) can evolve and adapt to new data patterns in real-time.	✓	0.34
The Online Evolving Spiking Neural Network (OeSNN) eliminates the need for retraining.	✓	0.26
Reliance on manual hyperparameter tuning presents challenges for OeSNN that can compromise model accuracy and stability.	✓	0.24
The proposed HABCOeSNN approach combines the Artificial Bee Colony (ABC) algorithm with Online Evolving Spiking Neural N	✓	0.33
HABCOeSNN optimizes five key hyperparameters: window size (Wsize), anomaly classification factor (ε), similarity value (	✓	0.30
The proposed method was evaluated on the Numenta Anomaly Benchmark (NAB) dataset.	✓	0.15
The proposed method was evaluated on the Yahoo Webscope dataset.	×	0.10
A Multi-Criteria Decision-Making (MCDM) approach was employed to validate performance across multiple criteria.	✓	0.23

References

- http://arxiv.org/abs/2212.06370v4
- https://www.semanticscholar.org/paper/1bb45a34ab910da372f46a3cb7917f2c078f353c
- http://arxiv.org/abs/2105.07346v1