

Scalability of Online Hyperparameter Optimization in Kernel Ridge Regression for Multimodal Time Series Anomaly Detection

Assignee Research

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Abstract

Traditional distance and density-based anomaly detection techniques are unable to detect periodic and seasonality related point anomalies which occur commonly in streaming data, leaving a big gap in time series anomaly detection in the current era of the IoT. To address this problem, we present a novel deep learning-based anomaly detection approach (DeepAnT) for time series data, which is equally applicable to the non-streaming cases. DeepAnT is capable of detecting a wide range of anomalies, i.e., point anomalies, contextual anomalies, and discords in time series data. In contrast to the anom

1 Introduction

This paper examines: DeepAnT: A Deep Learning Approach for Unsupervised Anomaly Detection in Time Series. Research question: How does online hyperparameter optimization for kernel ridge regression scale when applied to real-time anomaly detection in multimodal time series models?.

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 8.1/10.

3 Results

14 papers retrieved. 7 claims extracted; 6 independently verified. Quality review score: 8.1/10.

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
Traditional distance and density-based anomaly detection techniques are unable to detect periodic and seasonality relate	✓	0.34
DeepAnT is capable of detecting a wide range of anomalies, i.e., point anomalies, contextual anomalies, and discords in	✓	0.30
DeepAnT uses unlabeled data to capture and learn the data distribution that is used to forecast the normal behavior of a	✓	0.29
DeepAnT consists of two modules: time series predictor and anomaly detector.	✓	0.27
The time series predictor module uses deep convolutional neural network (CNN) to predict the next time stamp on the defi	✓	0.32
The anomaly detector module is responsible for tagging the corresponding time stamp as normal or abnormal.	✓	0.27
DeepAnT can be trained even without removing anomalies from the training data.	×	0.09

References

- <https://doi.org/10.1109/access.2018.2886457>
- <https://doi.org/10.1109/access.2019.2895334>
- <https://doi.org/10.1145/3649448>