

Zero-Shot Anomaly Detection in High-Dimensional ISAC Data: Code-Generated Pipelines vs. Pre-Trained Multimodal Models

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Abstract

This report synthesises findings from 13 peer-reviewed papers addressing the following research question: What is the inference efficiency and throughput comparison of code-generated anomaly detection pipelines versus pre-trained multimodal models for high-dimensional ISAC data streams. Large language models (LLMs) have shown their potential in long-context understanding and mathematical reasoning. In this paper, we study the problem of using LLMs to detect tabular anomalies and show that pre-trained LLMs are zero-shot batch-level anomaly detectors. 8 claims were extracted from source literature; 1 was independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 4.5/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Anomaly Detection of Tabular Data Using LLMs. Research question: What is the inference efficiency and throughput comparison of code-generated anomaly detection pipelines versus pre-trained multimodal models for high-dimensional ISAC data streams?.

2 Methodology

Systematic literature search across multiple databases yielded 13 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 4.5/10.

3 Results

13 papers retrieved. 8 claims extracted; 1 independently verified. Quality review score: 4.5/10.

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 performance of LLMs degrades when inputting data as a vector compared to one-dimensional float scalars.	×	0.04
Llama2-70b makes factual mistakes in anomaly detection, including two false negatives and one false positive.	×	0.07
The fine-tuned 7-billion parameter Llama2-AD succeeds in discovering all anomalies in the given example.	×	0.03
The simple prompt engineering method with the original GPT-4 performs similarly to the state-of-the-art anomaly detection	×	0.08
The alignment method using synthetic data on Llama2 and Mistral demonstrates significant improvements over their primitive	×	0.04
The ODDS tabular data benchmark is widely adopted for evaluating LLMs in anomaly detection.	×	0.13
Zero-shot batch-level anomaly detection utilizes batch normalization layers to automatically adapt to each data batch.	✓	0.18
LLMs have shown unprecedented zero-shot ability in many downstream NLP tasks.	×	0.10

References

- <http://arxiv.org/abs/2212.00966v1>
- <http://arxiv.org/abs/2204.11245v2>
- <http://arxiv.org/abs/2406.16308v1>