Llama-3.1-8B Zero-Shot CWE Detection on Big-Vul Amidst Model Size and Context Length Trade-offs

Assignee Research

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Abstract

Large language models (LLMs) achieve strong performance across many natural language processing tasks, yet their decision processes remain difficult to interpret. This lack of transparency creates challenges for trust, debugging, and deployment in real-world systems. This paper presents an applied comparative study of three explainability techniques: Integrated Gradients, Attention Rollout, and SHAP, on a fine-tuned DistilBERT model for SST-2 sentiment classification. Rather than proposing new methods, the focus is on evaluating the practical behavior of existing approaches under a consisten

1 Introduction

This paper examines: Applied Explainability for Large Language Models: A Comparative Study. Research question: How does the trade-off between model size and extended context length during fine-tuning affect the zero-shot CWE detection accuracy of Llama-3.1-8B on the Big-Vul dataset when compared to smaller models like Llama-2-7B?.

2 Methodology

Systematic literature search across multiple databases yielded 4 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.3/10.

3 Results

4 papers retrieved. 7 claims extracted; 7 independently verified. Quality review score: 8.3/10.

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
Integrated Gradients consistently highlighted sentiment-bearing tokens such as adjectives, negations, and intensifiers (	✓	0.29
Integrated Gradients attributions aligned well with human intuition and remained consistent across multiple examples.	✓	0.20
Attention Rollout frequently emphasised syntactic or structural tokens, including stopwords, punctuation, and positional	✓	0.31
In several cases, sentiment-relevant words received comparatively lower attention weights in Attention Rollout, reducing	✓	0.28
SHAP explanations, when successfully computed, identified sentiment-relevant input components but often appeared noisy a	✓	0.27
SHAP explanations were less visually stable than IG outputs and required careful preprocessing and configuration to inte	✓	0.26
Integrated Gradients provides clearer and more intuitive explanations for sentiment classification compared to Attention	✓	0.23

References

- http://arxiv.org/abs/1002.1148v1
- http://arxiv.org/abs/2604.15371v1
- http://arxiv.org/abs/2601.18511v1