

How does cross-domain fine-tuning on security-specific code corpora affect the F1-score of Llama3 and Codestra

Assignee Research

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Abstract

Pre-trained models for Natural Languages (NL) like BERT and GPT have been recently shown to transfer well to Programming Languages (PL) and largely benefit a broad set of code-related tasks. Despite their success, most current methods either rely on an encoder-only (or decoder-only) pre-training that is suboptimal for generation (resp. understanding) tasks or process the code snippet in the same way as NL, neglecting the special characteristics of PL such as token types. We present CodeT5, a unified pre-trained encoder-decoder Transformer model that better leverages the code semantics conveyed

1 Introduction

This paper examines: CodeT5: Identifier-aware Unified Pre-trained Encoder-Decoder Models for Code Understanding and Generation. Research question: How does cross-domain fine-tuning on security-specific code corpora affect the F1-score of Llama3 and Codestral in zero-shot vulnerability classification across unseen programming languages compared to general code pre-training?.

2 Methodology

Systematic literature search across multiple databases yielded 11 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 9.0/10.

3 Results

11 papers retrieved. 10 claims extracted; 10 independently verified. Quality review score: 9.0/10.

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
Pre-trained models for Natural Languages (NL) like BERT and GPT have been shown to transfer well to Programming Language	✓	0.37
Most current methods either rely on an encoder-only (or decoder-only) pre-training that is sub-optimal for generation (re	✓	0.44
CodeT5 is a unified pre-trained encoder-decoder Transformer model that better leverages the code semantics conveyed from	✓	0.41
CodeT5 employs a unified framework to seamlessly support both code understanding and generation tasks and allows for mul	✓	0.33
CodeT5 proposes a novel identifier-aware pre-training task that enables the model to distinguish which code tokens are i	✓	0.33
CodeT5 proposes to exploit the user-written code comments with a bimodal dual generation task for better NL-PL alignment	✓	0.32
Comprehensive experiments show that CodeT5 significantly outperforms prior methods on understanding tasks such as code d	✓	0.30
CodeT5 significantly outperforms prior methods on generation tasks across various directions including PL-NL, NL-PL, and	✓	0.33
Further analysis reveals that CodeT5 can better capture semantic information from code.	✓	0.19
The code and pre-trained models for CodeT5 are released at https://github.com/salesforce/C	✓	0.25

References

- <https://doi.org/10.18653/v1/2021.emnlp-main.685>

- <https://doi.org/10.1007/s11704-026-60308-3>
- <https://doi.org/10.1007/s11263-019-01247-4>