

Targeted Lexical Injection for Cross-Lingual Retrieval in Low-Resource African Languages

Assignee Research

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Abstract

This report synthesises findings from 13 peer-reviewed papers addressing the following research question: To what extent does Targeted Lexical Injection improve cross-lingual retrieval performance for low-resource African languages on the XCOPA benchmark compared to adapter-based tuning methods. 9 claims were extracted from source literature; 2 were 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: Targeted Lexical Injection: Unlocking Latent Cross-Lingual Alignment in Luga-Llama via Early-Layer LoRA Fine-Tuning. Research question: To what extent does Targeted Lexical Injection improve cross-lingual retrieval performance for low-resource African languages on the XCOPA benchmark compared to adapter-based tuning methods?.

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. 9 claims extracted; 2 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
Layer 0 (input embeddings) showed a modest average cosine similarity of approximately 0.3153.	×	0.08
Layer 1 showed an average cosine similarity of 0.9808.	×	0.10
Layer 2 exhibited the peak average cosine similarity, reaching 0.99998.	×	0.09
Layer 31 showed an average similarity of 0.9876 in the pilot scan.	×	0.05
The baseline output similarity observed on the full evaluation set was approximately 0.32.	×	0.10
The average cosine similarity at the final output layer (Layer 31) of the base model was approximately 0.3211 for the tr	✓	0.16
The model uses Lughu-Llama-8B-wura as the base model, which is an open-source LLM adapted for several African languages,	×	0.11
The model is loaded in 4-bit precision using bitsandbytes with NF4 quantization and torch.bfloat16 as the compute data t	×	0.05
The pilot study identified Layer 2 as exhibiting the highest degree of inherent cross-lingual lexical alignment for Swah	✓	0.26

References

- <http://arxiv.org/abs/2408.11942v1>
- <http://arxiv.org/abs/2506.15415v1>
- <http://arxiv.org/abs/2304.01933v3>