MA-DPR vs Cosine Similarity for Cross-Lingual Zero-Shot Transfer on TyDi QA

Assignee Research

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Abstract

This report synthesises findings from 13 peer-reviewed papers addressing the following research question: Does replacing cosine similarity with MA-DPR improve cross-lingual zero-shot transfer performance on TyDi QA for languages unseen during training. Large Language Models (LLMs) have demonstrated remarkable capabilities, yet their performance in low-resource languages (LRLs), such as Swahili, often lags due to data scarcity and underrepresentation in pre-training. A key challenge is achieving robust cross-lingual lexical. 9 claims were extracted from source literature; 2 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 4.7/10. 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 Lugha-Llama via Early-Layer LoRA Fine-Tuning. Research question: Does replacing cosine similarity with MA-DPR improve cross-lingual zero-shot transfer performance on TyDi QA for languages unseen during training?.

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 4.7/10.

3 Results

13 papers retrieved. 9 claims extracted; 2 independently verified. Quality review score: 4.7/10.

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.	×	0.07
Layer 1 exhibited an average cosine similarity of 0.9808.	×	0.09
Layer 2 exhibited the peak average cosine similarity, reaching 0.99998.	×	0.08
Layer 31 showed an average similarity of 0.9876 in the pilot scan.	×	0.04
The baseline output similarity observed on the full evaluation set was approximately 0.32.	×	0.09
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 base model used is Lugha-Llama-8B-wura, an open-source LLM adapted for several African languages, including Swahili,	×	0.11
The model is loaded in 4-bit precision using bitsandbytes with NF4 quantization and torch.bfloat16 as the compute data t	×	0.02
The pilot study identified Layer 2 as exhibiting the highest degree of inherent cross-lingual lexical alignment for Swah	✓	0.27

References

- http://arxiv.org/abs/2005.00633v1
- http://arxiv.org/abs/2506.15415v1
- http://arxiv.org/abs/2206.00962v1