Scaling Passage Representations with Cross-Lingual Query Generation for Multilingual PLM Alignment in MMMU Benchmark

Assignee Research

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Abstract

Effective cross-lingual dense retrieval methods that rely on multilingual pre-trained language models (PLMs) need to be trained to encompass both the relevance matching task and the cross-language alignment task. However, cross-lingual data for training is often scarcely available. In this paper, rather than using more cross-lingual data for training, we propose to use cross-lingual query generation to augment passage representations with queries in languages other than the original passage language. These augmented representations are used at inference time so that the representation can enco

1 Introduction

This paper examines: Augmenting Passage Representations with Query Generation for Enhanced Cross-Lingual Dense Retrieval. Research question: How does the scaling of passage representations with cross-lingual query generation influence the alignment performance of multilingual PLMs, as evaluated by the MMMU benchmark for multimodal multilingual understanding?.

2 Methodology

Systematic literature search across multiple databases yielded 10 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 9.2/10.

3 Results

10 papers retrieved. 9 claims extracted; 9 independently verified. Quality review score: 9.2/10.

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 XOR-TyDi dataset contains 18M passages in English and queries in seven languages (Ar, Bn, Fi, Ja, Ko, Ru, and Te).	✓	0.28
The mBERT xDR model outperforms the XLM-R xDR model, achieving an average R@2kt score of 44.1 compared to 27.5.	✓	0.21
The xQG passage embedding augmentation approach improves the XLM-R xDR model, achieving an average R@2kt score of 29.8,	✓	0.37
The mBERT xDR model's effectiveness improves with xQG, achieving an average R@2kt score of 46.2, which is a statisticall	✓	0.34
The zero-shot mBERT model achieves an average R@2kt of 33.0, which improves to 36.0 when combined with xQG, a statistica	✓	0.32
Using more generated queries is beneficial for both R@2tk and R@5tk, with improvements becoming statistically significan	✓	0.30
mBERT performs better than XLM-R for both R@2kt and R@5kt.	✓	0.23
The use of xQG embedding augmentation statistically significantly improves the effectiveness of both XLM-R and mBERT bac	✓	0.23
xQG improves almost all models across all languages with the exceptions of mBERT's R@2kt for Japanese (Ja) and mBERT's R	✓	0.29

References

- http://arxiv.org/abs/2509.22472v1
- http://arxiv.org/abs/2305.03950v1

- http://arxiv.org/abs/2310.09917v3