

Optimal Transport Distillation in Adversarial Cross-Lingual Retrieval for Low-Resource Languages

Assignee Research

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Abstract

Benefiting from transformer-based pre-trained language models, neural ranking models have made significant progress. More recently, the advent of multilingual pre-trained language models provides great support for designing neural cross-lingual retrieval models. However, due to unbalanced pre-training data in different languages, multilingual language models have already shown a performance gap between high and low-resource languages in many downstream tasks. And cross-lingual retrieval models built on such pre-trained models can inherit language bias, leading to suboptimal result for low-reso

1 Introduction

This paper examines: Improving Cross-lingual Information Retrieval on Low-Resource Languages via Optimal Transport Distillation. Research question: How does the robustness of optimal transport distillation compare to standard knowledge distillation when evaluated on adversarial cross-lingual retrieval tasks in low-resource languages using precision@k and nDCG metrics on the MIRACL dataset?.

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 7.5/10.

3 Results

13 papers retrieved. 13 claims extracted; 10 independently verified. Quality review score: 7.5/10.

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
CAL significantly outperforms strong baselines on low-resource languages, including neural machine translation.	✓	0.21
WikiCLIR is a large cross-lingual retrieval collection based on linked foreign language articles from Wikipedia pages.	✓	0.23
Relevance judgments in WikiCLIR are synthetically generated based on mutual links across pages.	✓	0.16
mMARCO is a multilingual passage ranking dataset built by translating queries and passages in MS MARCO into the target l	✓	0.27
OPTICAL is a knowledge distillation framework based on Optimal Transport for low-resource Cross-lingual Information Retr	✓	0.19
OPTICAL formulates the cross-lingual token alignment task as an optimal transport problem where the cost matrix is the c	✓	0.23
In OPTICAL, the optimal transportation plan serves as a soft token alignment.	✓	0.21
The loss in OPTICAL is defined as the Frobenius inner product of the transportation plan and the cost matrix.	✓	0.23
OPTICAL only requires bitext data for distillation training.	×	0.14
Experiments were performed on seven language pairs for CLIR training and evaluation.	✓	0.17
The experimental setup included four low-resource languages from diverse linguistic families.	×	0.12
The experimental setup included three medium or high-resource languages as a comparison.	×	0.12
OPTICAL achieved a 13.7% improvement in Mean Average Precision (MAP) over a method based on neural machine translation o	✓	0.21

References

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

- <http://arxiv.org/abs/2302.13400v1>
- <http://arxiv.org/abs/2301.12566v1>