

Prefix Length Modulation in Code-Switching NLI: Balancing Accuracy and Parameter Efficiency Across Language Pairs

Assignee Research

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Abstract

Parameter-efficient tuning aims to mitigate the large memory requirements of adapting pretrained language models for downstream tasks. For example, one popular method, prefix-tuning, prepends trainable tokens to sequences while freezing the rest of the model's parameters. Although such models attain comparable performance with fine-tuning when applied to sequences with short to moderate lengths, we show their inferior performance when modelling long sequences. To bridge this gap, we propose prefix-propagation, a simple but effective approach that conditions prefixes on previous hidden states.

1 Introduction

This paper examines: Prefix Propagation: Parameter-Efficient Tuning for Long Sequences. Research question: How do different prefix lengths in prefix-tuning affect the trade-off between accuracy and parameter efficiency in NLI tasks across multiple code-switching language pairs?.

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 7.2/10.

3 Results

13 papers retrieved. 15 claims extracted; 11 independently verified. Quality review score: 7.2/10.

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 ArXiv dataset is an 11-class classification task composed of academic research papers.	✓	0.21
The 20-newsgroups dataset is a classification task consisting of mailing lists that fall into one of 20 classes.	✓	0.18
The Hyperpartisan dataset is a binary classification task for extremist news classification.	✓	0.21
WikiHop is a long-document reading comprehension task requiring multi-step reasoning.	✓	0.19
The Hyperpartisan dataset is the smallest of the datasets with only 625 samples.	×	0.12
Prefix-tuning is inferior to fine-tuning long sequences.	✓	0.17
Prefix-propagation consistently outperforms prefix-tuning and is comparable to fine-tuning on most tasks.	×	0.15
Prefix-propagation performs competitively on Hyperpartisan, a relatively small dataset with only 625 samples.	✓	0.20
Prefix-tuning is known to underperform in low-data settings.	✓	0.17
Prefix-propagation’s performance exceeds prefix-tuning with statistical significance ($p < 0.05$, using a single-tailed t-	✓	0.17
Prefix-based methods, and especially prefix-propagation, achieve better calibration than fine-tuning.	✓	0.22
Prefix-propagation effectively balances calibration with accuracy metrics.	×	0.10
The calibration of fine-tuning deteriorates as training progresses.	✓	0.16
Prefix-based methods have insufficient capacity to properly model complex long-document multi-step question answering on	✓	0.24
Prefix-based methods use 50% fewer parameters compared to fine-tuning.	×	0.11

References

- <http://arxiv.org/abs/2305.15212v1>

- <http://arxiv.org/abs/2305.12086v2>
- <http://arxiv.org/abs/2506.13674v3>