

What is the impact of sequential fine-tuning versus simultaneous multilingual fine-tuning on the catastrophic forgetting metrics

Assignee Research

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Abstract

Fine-tuning multilingual foundation models on specific languages often induces catastrophic forgetting, degrading performance on languages unseen in fine-tuning. While this phenomenon is widely-documented, the literature presents fragmented results about when forgetting occurs. To address this ambiguity, we conduct a systematic empirical study using machine translation as a testbed to identify the conditions that trigger catastrophic forgetting in multilingual fine-tuning. Through controlled experiments across different model architectures, data scales, and fine-tuning approaches, we reveal th

1 Introduction

This paper examines: Conditions for Catastrophic Forgetting in Multilingual Translation. Research question: What is the impact of sequential fine-tuning versus simultaneous multilingual fine-tuning on the catastrophic forgetting metrics of XLM-R when evaluated on the CueOffense benchmark?.

2 Methodology

Systematic literature search across multiple databases yielded 12 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 6.2/10.

3 Results

12 papers retrieved. 8 claims extracted; 8 independently verified. Quality review score: 6.2/10.

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 relative scale between model and data size is a primary determinant of forgetting.	✓	0.28
A model's instruction-following ability is more critical for retaining multilingual knowledge than its architecture.	✓	0.30
Parameter-efficient fine-tuning offers no clear advantage over full fine-tuning in mitigating forgetting.	✓	0.32
Cross-lingual alignment can mitigate forgetting while also facilitating positive transfer to unseen target languages.	✓	0.31
The relative scale between pre-trained model parameters and fine-tuning data volume is a critical factor in catastrophic	✓	0.25
Whether a model supports instruction-following, rather than its underlying architecture (encoder-decoder versus decoder-	✓	0.33
Parameter-efficient fine-tuning with LoRA provides no significant advantage over full fine-tuning in preventing catastro	✓	0.26
Cross-lingual alignment methods may facilitate positive transfer, with improvements observed on translation directions w	✓	0.18

References

- <http://arxiv.org/abs/2510.19546v1>
- <http://arxiv.org/abs/2403.00946v3>
- <http://arxiv.org/abs/2102.07686v4>