Performance comparison of prompt-tuning vs. fine-tuning in zero-shot cross-lingual code generation with 1B-70B parameter models

Assignee Research

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Abstract

Pre-trained multilingual language models show significant performance gains for zero-shot cross-lingual model transfer on a wide range of natural language understanding (NLU) tasks. Previously, for zero-shot cross-lingual evaluation, pre-trained models are only fine-tuned on English data and tested on a variety of target languages. In this paper, we do cross-lingual evaluation on various NLU tasks (sentence classification, sequence labeling, question answering) using prompt-tuning and compare it with fine-tuning. The results show that prompt tuning achieves much better cross-lingual transfer t

1 Introduction

This paper examines: Prompt-Tuning Can Be Much Better Than Fine-Tuning on Cross-lingual Understanding With Multilingual Language Models. Research question: How does the performance of 1B-70B parameter models trained with prompt-tuning compare to fine-tuning on zero-shot cross-lingual transfer in HumanEval-X code generation tasks when using English intermediate tasks?.

2 Methodology

Systematic literature search across multiple databases yielded 7 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

7 papers retrieved. 23 claims extracted; 18 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
Fine-tuning on large pre-trained language models leads to strong performance on downstream tasks, however, it is memory-	✓	0.29
In prompt tuning, only a small part of the parameters (e.g., prompts or task classifier) are tuned during learning.	✓	0.20
Prompt tuning can be better than fine-tuning when the model size is not extremely large (10 billion parameters).	✓	0.24
Prex-tuning (Li and Liang, 2021) obtains comparable performance for natural language generation tasks.	✓	0.25
Liu et al. (2022) shows prompt tuning can be matched to fine-tuning on language understanding tasks even at hard sequenc	✓	0.29
The continuous prompts are added as prefix tokens and tuned during learning.	✓	0.17
Each transformer layer has separated prompts.	✓	0.20
The frozen models are built on the top of the pre-trained XLM-R checkpoint of LARGE size with about 560M parameters.	✓	0.22
XLM-R-LARGE achieves stronger performance than mBERT.	×	0.13
Prompt length is set to 16 or 32 and tuned on the English validation set.	✓	0.26
For the prompt tuning test results in Table 1, we did limited tuning on prompt length. The prompt length is 16, except p	✓	0.33
With only 0.1% to 0.3% additional prompt parameters as compared to the original model, the framework already demonstrate	✓	0.26
Fine Tuning results for XNLI, PAWS-X, UD-POS, XQuAD are 10.2, 12.4, 24.3, 16.3 respectively.	✓	0.16
Prompt Tuning results for XNLI, PAWS-X, UD-POS, XQuAD are 9.7, 8.7, 20.7, 14.5 respectively.	×	0.14
Fine Tuning results for XNLI, PAWS-X, UD-POS, XQuAD, TyDiQA are 81.5, 85.4, 83.0, 71.8, 68.2 respectively.	×	0.10
Prompt Tuning results for XNLI, PAWS-X, UD-POS, XQuAD, TyDiQA are 96.4, 97.3, 96.6, 94.8, 93.8 respectively.	×	0.13
Fine Tuning results for XNLI, PAWS-X, UD-POS, XQuAD, TyDiQA are 90.4, 92.1, 88.8, 76.8, 75.3 respectively.	×	0.13
Prompt Tuning results for XNLI, PAWS-X, UD-POS, XQuAD, TyDiQA are 98.4, 98.6, 98.3, 96.3, 96.0 respectively.	✓	0.15
Fine Tuning results for XNLI, PAWS-X, UD-	✓	0.24

References

- http://arxiv.org/abs/2503.19469v2
- http://arxiv.org/abs/2005.13013v2
- http://arxiv.org/abs/2210.12360v2