Scaling Multilingual Pre-training and Performance Gaps in XTREME-R Tasks

Assignee Research

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Abstract

Multilingual language models are widely used to extend NLP systems to low-resource languages. However, concrete evidence for the effects of multilinguality on language modeling performance in individual languages remains scarce. Here, we pre-train over 10,000 monolingual and multilingual language models for over 250 languages, including multiple language families that are under-studied in NLP. We assess how language modeling performance in each language varies as a function of (1) monolingual dataset size, (2) added multilingual dataset size, (3) linguistic similarity of the added languages, a

1 Introduction

This paper examines: When Is Multilinguality a Curse? Language Modeling for 250 High- and Low-Resource Languages. Research question: To what extent does scaling the number of languages in multilingual pre-training affect the performance gap between high-resource and low-resource languages on downstream XTREME-R tasks?.

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 9.5/10.

3 Results

12 papers retrieved. 8 claims extracted; 8 independently verified. Quality review score: 9.5/10.

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
The paper pre-trains autoregressive GPT-2 language models with three sizes: tiny (4.6M parameters), mini (11.6M paramete	✓	0.26
For each language, models are pre-trained with four dataset sizes when available: 1M, 10M, 100M, and 1B tokens, not incl	✓	0.28
There are 252 languages with at least the low-resource dataset size, 167 with med-low resource, 48 with med-high resourc	✓	0.30
A monolingual SentencePiece tokenizer with a maximum vocabulary size of 32K is trained for each of the 252 languages.	✓	0.18
Each tokenizer is trained on 10K randomly-sampled lines of text in the language.	✓	0.21
A 10K-line tokenizer on average covers 93.7% of the 4K most frequent tokens in the vocabulary of a 10M-line tokenizer.	✓	0.32
Tokenizer training is restricted to 10K lines for all languages to control for tokenization quality across languages.	✓	0.21
The paper evaluates perplexity and log-likelihood as initial performance metrics.	✓	0.15

References

- http://arxiv.org/abs/2311.09205v1
- http://arxiv.org/abs/2310.10378v5
- http://arxiv.org/abs/2212.03812v1