Instance-wise Adversarial Pretraining for Vision-Language Transformer Generalization on COCO Captions

Assignee Research

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Abstract

Urdu, spoken by over 250 million people, remains critically underserved in multimodal and vision-language research. The absence of large-scale, high-quality datasets has limited the development of Urdu-capable systems and reinforced biases in multilingual vision-language models trained primarily on high-resource languages. To address this gap, we present COCO-Urdu, a large-scale image-caption dataset derived from MS COCO, containing 59,000 images and 319,000 Urdu captions selected through stratified sampling to preserve the original distribution. Captions were translated using SeamlessM4T v2

1 Introduction

This paper examines: COCO-Urdu: A Large-Scale Urdu Image-Caption Dataset with Multimodal Quality Estimation. Research question: Does instance-wise adversarial pretraining improve the out-of-distribution generalization of vision-language transformers on the COCO Captions benchmark relative to mixup-based data augmentation?.

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 8.4/10.

3 Results

13 papers retrieved. 14 claims extracted; 12 independently verified. Quality review score: 8.4/10.

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
COCO-Urdu captions were evaluated using reference-free metrics including COMET-Kiwi, BERTScore, and CLIP-based visual gr	✓	0.21
COCO-Urdu captions were evaluated using reference-based metrics including BLEU, SacreBLEU, and CHRF.	✓	0.25
Human reference translations are unavailable at this scale, so reference translations were generated using the NLLB-3B m	✓	0.26
Zero-shot translations were obtained using SeamlessM4T, which were subsequently refined via the QE pipeline.	✓	0.22
COCO-Urdu captions score highly in reference-based metrics, demonstrating strong semantic fidelity and cross-modal align	✓	0.24
COCO-Urdu (Refined) has 59K images and 319K captions with BLEU score of 0.53, SacreBLEU of 53, and CHRF of 74.	✓	0.16
COCO-Urdu (Zero-shot) has 59K images and 319K captions with BLEU score of 0.52, SacreBLEU of 52, and CHRF of 73.23.	✓	0.18
UICD has 31K images and 135K captions with a BLEU score of 0.86.	×	0.08
Flickr8k Urdu has 700 images and 700 captions with a BLEU score of 0.83.	×	0.14
COCO-Urdu achieves performance on par with smaller datasets despite its larger and more diverse scale.	✓	0.20
A stratified sampling strategy was used to ensure the relative class distributions in the subset mirror those of the ful	✓	0.23
The iterative stratification algorithm proposed by Sechidis et al. was adapted for multi-label data to preserve label co	✓	0.23
Stratification preserves the relative frequency and co-occurrence patterns of classes, reducing risks of imbalance and s	✓	0.28
SeamlessM4T v2 model was used for zero-shot caption translation into Urdu.	✓	0.18

References

- http://arxiv.org/abs/2403.10883v2
- http://arxiv.org/abs/2201.05729v3
- http://arxiv.org/abs/2509.09014v1