Adversarial Training Stability in VLP Models for Multimodal Reasoning

Assignee Research

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Abstract

Despite the substantial advancements in Vision-Language Pre-training (VLP) models, their susceptibility to adversarial attacks poses a significant challenge. Existing work rarely studies the transferability of attacks on VLP models, resulting in a substantial performance gap from white-box attacks. We observe that prior work overlooks the interaction mechanisms between modalities, which plays a crucial role in understanding the intricacies of VLP models. In response, we propose a novel attack, called Collaborative Multimodal Interaction Attack (CMI-Attack), leveraging modality interaction thro

1 Introduction

This paper examines: Improving Adversarial Transferability of Vision-Language Pre-training Models through Collaborative Multimodal Interaction. Research question: Can adversarially trained VLP models maintain alignment stability under noisy conditions when evaluated on multimodal reasoning benchmarks like VCR or OK-VQA?.

2 Methodology

Systematic literature search across multiple databases yielded 14 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

14 papers retrieved. 10 claims extracted; 10 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
VLP models play a crucial role in offering a universal solution for multiple tasks, including image-text retrieval (ITR)	✓	0.29
Recent studies have elucidated the vulnerability and sensitivity of VLP models to adversarial examples.	✓	0.18
Single-modal attacks such as PGD and BERT-Attack exhibit good adversarial performance in the visual and text domains.	✓	0.24
Applying single-modal attacks directly to VLP models still poses challenges because VLP models integrate multimodal info	✓	0.25
Sep-Attack directly combines both BERT-Attack and PGD.	✓	0.22
Co-Attack considers image-text collaborative information and is specifically designed for customized attack forms for di	✓	0.25
The proposed Collaborative Multimodal Interaction Attack demonstrates effectiveness in experimental results.	✓	0.16
VLP models can be classified into two categories: Fused VLP models and Aligned VLP models.	✓	0.22
Fused VLP models (e.g., ALBEF, TCL) use a single encoder to extract feature representations from both images and text, f	✓	0.25
Aligned VLP models (e.g., CLIP) use a single encoder to independently learn feature representations.	✓	0.25

References

- http://arxiv.org/abs/2403.10883v2

- http://arxiv.org/abs/2008.11416v3
- http://arxiv.org/abs/2210.09263v1