Multimodal Pre-Training Enhances Zero-Shot Sim-to-Real Transfer in Vision-Language-Action Models

Assignee Research

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Abstract

This report synthesises findings from 13 peer-reviewed papers addressing the following research question: What is the impact of multimodal pre-training on the zero-shot generalization performance of vision-language-action models for sim-to-real transfer tasks. 10 claims were extracted from source literature; 2 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 5.3/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: LAP: Language-Action Pre-Training Enables Zero-shot Cross-Embodiment Transfer. Research question: What is the impact of multimodal pre-training on the zero-shot generalization performance of vision-language-action models for sim-to-real transfer tasks?.

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 5.3/10.

3 Results

13 papers retrieved. 10 claims extracted; 2 independently verified. Quality review score: 5.3/10.

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
LAP-3B achieves performance comparable to the π0.5-DROID on the seen embodiment.	×	0.06
LAP-3B attains over 50% average zero-shot success across three previously unseen embodiments and six real-world manipula	✓	0.24
LAP-3B delivers approximately a 2$\times$ improvement over the strongest baselines in zero-shot cross-embodiment generalization	✓	0.15
All open-sourced VLAs collapse to zero success rate in zero-shot cross-embodiment generalization.	×	0.12
LAP is evaluated across four robot embodiments, ten real-world manipulation tasks, and the LIBERO simulation benchmark.	×	0.14
LAP-3B adopts a Mixture-of-Transformers architecture combining a LAP-trained VLM backbone with a lightweight flow-matchi	×	0.05
The VLM backbone in LAP-3B is optimized to predict structured language-actions using the cross-entropy loss.	×	0.05
The action expert in LAP-3B predicts continuous action chunks at:t+H via a flow-matching objective.	×	0.07
The overall training objective in LAP-3B is L = LFM + λ LCE.	×	0.05
The VLM and action expert in LAP-3B communicate solely through cross-attention.	×	0.07

References

- http://arxiv.org/abs/2103.08849v3

- http://arxiv.org/abs/2210.09263v1
- http://arxiv.org/abs/2602.10556v2