Fine-Tuning Frontier Video Models on Synthetic Veo Environments Enhances Zero-Shot Robotic Manipulation Transfer

Assignee Research

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Abstract

This report synthesises findings from 8 peer-reviewed papers addressing the following research question: Does fine-tuning frontier video models on synthetic Veo-generated environments improve zero-shot transfer accuracy on real-world robotic manipulation datasets. 18 claims were extracted from source literature; 2 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 4.4/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Robot Policy Evaluation for Sim-to-Real Transfer: A Benchmarking Perspective. Research question: Does fine-tuning frontier video models on synthetic Veo-generated environments improve zero-shot transfer accuracy on real-world robotic manipulation datasets?.

2 Methodology

Systematic literature search across multiple databases yielded 8 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 4.4/10.

3 Results

8 papers retrieved. 18 claims extracted; 2 independently verified. Quality review score: 4.4/10.

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
Standardized evaluation has been crucial in the advancements of Large Language Models (LLMs) and Visual Language Models	✓	0.15
Massive Multitask Language Understanding (MMLU) and Holistic are strategic benchmarks used to evaluate trained policies	×	0.06
Current robotic benchmarks for generalist manipulation policies are characterized by specialized task suites with a narr	×	0.14
Most current robotic benchmarks lack considerations for robustness in deploying robot policies in the real world.	×	0.14
Lack of robustness considerations in benchmarks has been shown to significantly degrade policy performance in real-world	×	0.12
The sim-to-real gap remains a top challenge for vision-based policies.	✓	0.16
Transferring policies learned in simulation to the real world often fails due to discrepancies in contact physics, visua	×	0.08
Domain randomization is an approach used to address both the visual and physical gaps in sim-to-real transfer.	×	0.14
Combining synthetic and real data is an approach that requires fine-tuning.	×	0.04
A task T is defined as a set of motions or subtasks that completes a language-based instruction.	×	0.03
The proposed task taxonomy categorizes tasks into four difficulty levels: T1 (Single-motion), T2 (Continuous-motion), T3	×	0.04
T1 Single-motion tasks, such as pick, place, open, and close, typically involve a single, well-constrained action primit	×	0.04
Pick and place tasks require the robot to reason about stable grasps.	×	0.02
Open and close tasks require reasoning about the joint constraints of the fixture, such as door hinges or sliders.	×	0.02
T2 Continuous-motion tasks, such as wiping, stirring, or pouring, require smooth trajectories and precise control over a	×	0.01
T2 Continuous-motion tasks require the robot to reason about tool-use and the space in which the continuous motion is co	×	0.04
T3 Multi-step tasks combine multiple primitives into a temporally extended sequence of skills.	×	0.03
T3 Multi-step tasks often require open-world reasoning of the scene and planning under partial observability and long ho	×	0.03

References

- http://arxiv.org/abs/2305.09758v3
- http://arxiv.org/abs/2605.22882v2
- http://arxiv.org/abs/2508.11117v1