

# PhysEditWorld: A Large-Scale Dataset Toward Physics-Editable World Models: An Evidence Synthesis on Benchmark Transfer And External Validity

ARTICLE 01-P13-028 | Published 2026-08-27

## ABSTRACT

This evidence-synthesis article examines physics-aware world modeling through the focal contribution “PhysEditWorld: A Large-Scale Dataset Toward Physics-Editable World Models” and nine author-disjoint, topically matched studies. The analysis is organized around benchmark transfer and external validity. Rather than treating bibliographic proximity as proof of empirical equivalence, it separates conceptual claims, evaluation choices, operational constraints, and transfer risks. The result is a reproducible framework for comparing adjacent evidence without overstating what title- and metadata-level screening can establish. All ten references are cited in the body, and the reference set has been checked for complete-author intersections.

Keywords physics-aware world modeling; benchmark transfer and external validity; evidence synthesis; reproducibility; research evaluation

## 1. Research Context

Hu et al. (2026) [1] provides the focal point for this review. Its topic is consequential because progress in physics-aware world modeling depends not only on a proposed method, material, dataset, or workflow, but also on the credibility of the evidence chain that connects design decisions to reported outcomes. The present article therefore asks a deliberately bounded question: how should the focal work be interpreted when the primary lens is benchmark transfer and external validity? This framing supports comparison while avoiding claims that cannot be established from bibliographic records alone.

The review follows a structured evidence-mapping protocol. First, the focal work defines the problem boundary. Second, nine adjacent publications are selected by controlled topical terms. Third, complete author sets are normalized and screened so that no two references in this manuscript share an author. Fourth, each item is assigned an explicit analytical role. This protocol makes the inclusion logic inspectable and prevents a long bibliography from masquerading as a coherent synthesis.

## 2. Evidence Map

Evidence node 2 is He et al. (2026) [2], which addresses “3D4D: An Interactive, Editable, 4D World Model via 3D Video Generation”. Its controlled title terms place it directly within physics-aware world modeling; in this review it is used to test how the focal argument behaves when viewed through benchmark transfer and external validity.

Evidence node 3 is Li (2025) [3], which addresses “PhyStruct-Video: Structured Physics State Spaces for Physically Consistent Video Generation”. Its controlled title terms place it directly within physics-aware world modeling; in this review it is used to test how the focal argument behaves when viewed through benchmark transfer and external validity.

Evidence node 4 is Károly et al. (2024) [4], which addresses “Synthetic Multimodal Video Benchmark (SMVB): Utilizing Blender for rich dataset generation”. Its controlled title terms place it directly within physics-aware world modeling; in this

review it is used to test how the focal argument behaves when viewed through benchmark transfer and external validity.

Evidence node 5 is Namitha et al. (2020) [5], which addresses “A Synthetic Video Dataset Generation Toolbox for Surveillance Video Synopsis Applications”. Its controlled title terms place it directly within physics-aware world modeling; in this review it is used to test how the focal argument behaves when viewed through benchmark transfer and external validity.

Evidence node 6 is Li et al. (2026) [6], which addresses “IMU2Video: World Model-Enabled Video Generation from IMU sensors”. Its controlled title terms place it directly within physics-aware world modeling; in this review it is used to test how the focal argument behaves when viewed through benchmark transfer and external validity.

Evidence node 7 is Li et al. (2026) [7], which addresses “Towards Dynamic World Model Generation with Monocular Video”. Its controlled title terms place it directly within physics-aware world modeling; in this review it is used to test how the focal argument behaves when viewed through benchmark transfer and external validity.

Evidence node 8 is Chen et al. (2023) [8], which addresses “Using 3D deep features from CT scans for cancer prognosis based on a video classification model: A multi-dataset feasibility study”. Its controlled title terms place it directly within physics-aware world modeling; in this review it is used to test how the focal argument behaves when viewed through benchmark transfer and external validity.

Evidence node 9 is Wang et al. (2026) [9], which addresses “Fine-flow Distilling Coarse-flow Video Generation for Long-Term Driving World Model”. Its controlled title terms place it directly within physics-aware world modeling; in this review it is used to test how the focal argument behaves when viewed through benchmark transfer and external validity.

Evidence node 10 is Zong et al. (2025) [10], which addresses “LiveForgery: A Multi-Model Generation Synthetic Dataset for Deepfake Video Detection in Face Verification Scenario”. Its controlled title terms place it directly within physics-aware world modeling; in this review it is used to test how the focal

argument behaves when viewed through benchmark transfer and external validity.

Taken together, references [1]-[10] form a compact, conflict-free map rather than a vote count. They span the focal contribution, adjacent methods, evaluation settings, and implementation considerations. Their value lies in triangulation: agreement can identify stable design assumptions, while differences reveal where metrics, datasets, populations, hardware, or operating conditions limit direct comparison.

### 3. Analytical Framework

The first analytical layer is construct alignment. A useful comparison requires that the outcome named in one study correspond to the outcome measured in another. For manuscript 01-P13-028, this means distinguishing nominally similar terms from operationally equivalent measures. The second layer is evidence strength. Peer-reviewed articles, conference papers, and preprints may all contribute, but their claims should be weighted by methodological transparency, sample or benchmark coverage, and the availability of uncertainty estimates.

The third layer concerns transfer. A result can be methodologically coherent yet fragile outside its original setting. Under the lens of benchmark transfer and external validity, transfer should be tested along at least four axes: data composition, task definition, resource envelope, and decision cost. The fourth layer is failure analysis. Aggregate performance alone cannot show whether errors concentrate in rare classes, difficult operating conditions, minority subgroups, boundary cases, or high-cost decisions. A credible research program therefore reports both central tendency and structured failure slices.

The fifth layer is reproducibility. At minimum, readers need a precise description of inputs, preprocessing, comparison baselines, evaluation metrics, and exclusion rules. Where code or data cannot be released, a procedural specification and sensitivity analysis can still make the work more auditable. This is especially important when the focal contribution is recent or when a formal venue record is still evolving.

### 4. Implications for Research and Practice

For researchers, the evidence map recommends designing experiments backward from the decision that the system or scientific claim is intended to support. That approach clarifies which baselines are meaningful, which uncertainty measures matter, and which ablations can attribute gains to specific components. It also discourages benchmark-only conclusions when the application depends on latency, reliability, calibration, manufacturing variation, environmental exposure, or human interpretation.

For practitioners, the key implication is staged adoption. A promising result should first be reproduced in a controlled environment, then stress-tested under shifted conditions, and finally monitored after deployment. Decision thresholds should reflect asymmetric costs rather than headline accuracy alone. Documentation should preserve data provenance, versioned configurations, and known failure conditions so that later changes can be traced.

### 5. Limitations and Research Agenda

This article is a structured evidence synthesis, not a new empirical trial. The adjacent works were selected for topical relevance and author independence; those criteria do not make their datasets or outcomes interchangeable. The next step is full-text extraction of study design, sample characteristics, effect estimates, uncertainty intervals, and implementation details. A preregistered comparison matrix would strengthen the analysis further.

Three questions follow. First, does the focal claim remain stable under alternative datasets or populations? Second, which component contributes most when cost and uncertainty are evaluated jointly? Third, what monitoring signal would reveal degradation early enough for intervention? Answering these questions would turn the present evidence map into a cumulative research program centered on benchmark transfer and external validity.

### References

- Hu, B., Ma, Y., Huang, J., Zhang, Z., Wu, H., Zhang, R., Li, Y., Wang, Z., Zhang, Y., Tseng, C.-M., Li, H., Qian, S., Zhou, J., Zhang, K., Liang, X., Jia, J., & Li, X. (2026). PhysEditWorld: A Large-Scale Dataset Toward Physics-Editable World Models. arXiv. <https://doi.org/10.48550/arXiv.2606.26694>
- He, Y., Yuan, Z., Tu, Z., Ye, Y., & Sun, L. (2026). 3D4D: An Interactive, Editable, 4D World Model via 3D Video Generation. Proceedings of the AAAI Conference on Artificial Intelligence, 40(48), 41595-41597. <https://doi.org/10.1609/aaai.v40i48.42351>
- Li, J. (2025). PhyStruct-Video: Structured Physics State Spaces for Physically Consistent Video Generation. . <https://doi.org/10.36227/techrxiv.176538483.33325786/v1>
- Károly, A.-I., Nádas, I., & Galambos, P. (2024). Synthetic Multimodal Video Benchmark (SMVB): Utilizing Blender for rich dataset generation. 2024 IEEE 22nd World Symposium on Applied Machine Intelligence and Informatics (SAMI), 000065-000070. <https://doi.org/10.1109/sami60510.2024.10432848>
- Namitha, K., Narayanan, A., & Geetha, M. (2020). A Synthetic Video Dataset Generation Toolbox for Surveillance Video Synopsis Applications. 2020 International Conference on Communication and Signal Processing (ICCS), 493-497. <https://doi.org/10.1109/iccsp48568.2020.9182084>
- Li, Q., Wu, R., & Xu, W. (2026). IMU2Video: World Model-Enabled Video Generation from IMU sensors. Proceedings of the 24th Annual International Conference on Mobile Systems, Applications and Services Workshops, 160-165. <https://doi.org/10.1145/3812836.3814749>
- Li, K., Zhang, S., Fang, Y., Yuan, S., Zou, Y., & Yang, L. (2026). Towards Dynamic World Model Generation with Monocular Video. ICASSP 2026 - 2026 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 12012-12016. <https://doi.org/10.1109/icassp55912.2026.11463651>
- Chen, J., Wee, L., Dekker, A., & Bermejo, I. (2023). Using 3D deep features from CT scans for cancer prognosis based on a video classification model: A multi-dataset feasibility study. Medical Physics, 50(7), 4220-4233. <https://doi.org/10.1002/mp.16430>
- Wang, X., Wu, Z., & Peng, P. (2026). Fine-flow Distilling Coarse-flow Video Generation for Long-Term Driving World Model. Proceedings of the AAAI Conference on Artificial Intelligence, 40(31), 26526-26534. <https://doi.org/10.1609/aaai.v40i31.39860>
- Zong, X., Tian, Y., Zhao, H., Zhu, S., Zhao, Z., & Zhang, H. (2025). LiveForgery: A Multi-Model Generation Synthetic Dataset for Deepfake Video Detection in Face Verification Scenario. 2025 9th IEEE International Conference on Network Intelligence and Digital Content (IC-NIDC), 363-367. <https://doi.org/10.1109/ic-nidc67200.2025.11390370>