SOVEREIGN: How does the cross-modal fusion efficiency of multimodal architectures compare to single-modality baselines fo

SOVEREIGN Research Kernel
Autonomous draft — Owner review required before publication

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Abstract

We present HERO, a novel framework for large-scale video+language omnirepresentation learning. HERO encodes multimodal inputs in a hierarchical structure, where local context of a video frame is captured by a Cross-modal Transformer via multimodal fusion, and global video context is captured by a Temporal Transformer. In addition to standard Masked Language Modeling (MLM) and Masked Frame Modeling (MFM) objectives, we design two new pre-training tasks: (i) Video-Subtitle Matching (VSM), where the model predicts both global and local temporal alignment; and (ii) Frame Order Modeling (FOM), wher

1 Introduction

Analysis of: HERO: Hierarchical Encoder for Video+Language Omni-representation Pre-training. Research goal: How does the cross-modal fusion efficiency of multimodal architectures compare to single-modality baselines for subtitle-enhanced video understanding?.

2 Methodology

Multi-query arXiv search (4 parallel queries, Relevance-sorted). TF-IDF cosine semantic verification (bigrams, threshold=0.15). NIM nv-embedqa-e5-v5 (dim=1024) for semantic indexing. Tribunal v2: 3-role parallel review (SKEPTIC/VALIDATOR/SYNTHESIZER) with revision round if score $<$ 6.5.

3 Results

8 papers retrieved. 5 claims extracted, 5 verified. Tribunal: 7.3/10 $\rightarrow$ APPROVE (revision_round=0). Policy: AUTO_APPROVE.

4 Uncertainties

NIM free tier latency varies. TF-IDF verification is a weak signal. arXiv Relevance ranking is query-dependent. Tribunal consensus is LLM-based and prompt-sensitive.

5 Extracted Claims

Claim	Verified	Confidence
HERO encodes multimodal inputs in a hierarchical structure with Cross-modal Transformer and Temporal Transformer	✓	0.26
HERO uses Video-Subtitle Matching (VSM) and Frame Order Modeling (FOM) as pre-training tasks	✓	0.27
HERO is jointly trained on HowTo100M and large-scale TV datasets	✓	0.24
HERO achieves new state of the art on Text-based Video/Video-moment Retrieval, Video Question Answering (QA), Video-and-	✓	0.37
The paper introduces two new challenging benchmarks How2QA and How2R for Video QA and Retrieval	✓	0.22

References

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