Fine-tuning synthetic gesture datasets for improved generalization in video encoders

Assignee Research

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Abstract

In this work, we explore the possibility of using synthetically generated data for video-based gesture recognition with large pre-trained models. We consider whether these models have sufficiently robust and expressive representation spaces to enable "training-free" classification. Specifically, we utilize various state-of-the-art video encoders to extract features for use in k-nearest neighbors classification, where the training data points are derived from synthetic videos only. We compare these results with another training-free approach – zero-shot classification using text descriptions o

1 Introduction

This paper examines: An Evaluation of Large Pre-Trained Models for Gesture Recognition using Synthetic Videos. Research question: To what extent does fine-tuning large pre-trained video encoders on synthetic gesture datasets improve generalization performance on unseen real-world gesture classes compared to training-free k-NN approaches?.

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 7.4/10.

3 Results

13 papers retrieved. 23 claims extracted; 19 independently verified. Quality review score: 7.4/10.

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
The RoCoG-v2 dataset consists of 7 gesture categories.	✓	0.16
The synthetic training data consists of 44K videos.	×	0.14
The small real dataset consists of 203 videos.	×	0.12
K=3 is used for all KNN classification experiments.	×	0.12
The ViT-B/16 model is used for all experiments, with an additional study of the ViT-L/16 model for the best setting.	×	0.15
UMT is a state-of-the-art video self-supervised learning approach.	✓	0.23
UMT is pre-trained on K710 videos (a union of K400, K600, and K700).	✓	0.17
Eight frames are sampled from each video using the TSN frame-sampling strategy.	✓	0.18
ViCLIP uses a video-language contrastive objective similar to CLIP.	✓	0.23
ViCLIP is pre-trained on a filtered version of the InternVid dataset with 10M video-text pairs.	✓	0.18
VideoMAE is a powerful self-supervised pre-training approach that works by encoding partially masked inputs and reconstr	✓	0.32
VideoMAE models are pre-trained on a larger dataset (1.3B).	✓	0.15
The KNN accuracy for ViT-B/16 with UMT pre-training on K710 is 18.2% for synthetic train and 31.2% for real train.	✓	0.19
The KNN accuracy for ViT-B/16 with ViCLIP pre-training on InternVid FLT-10M is 19.2% for synthetic train and 40.4% for r	✓	0.23
The KNN accuracy for ViT-B/16 with UMT pre-training on K710 and fine-tuning on K710 is 42.4% for synthetic train and 49.	✓	0.22
The KNN accuracy for ViT-B/16 with UMT pre-training on K710 and fine-tuning on K710 + K400 is 38.4% for synthetic train	✓	0.23
The KNN accuracy for ViT-B/16 with UMT pre-training on K710 and fine-tuning on K710 + K600 is 33.3% for synthetic train	✓	0.23
The KNN accuracy for ViT-B/16 with UMT pre-training on K710 and fine-tuning on K710 + K700 is 35.4% for synthetic train 4	✓	0.23
The KNN accuracy for ViT-B/16 with VideoMAE pre-training on UnlabeledHybrid and fine-tuning on K710 is 32.3% for synthet	✓	0.20
The KNN accuracy for ViT-B/16 with VideoMAE pre-training on UnlabeledHybrid and fine-tuning on SSv2 is 43.4% for synthet	✓	0.20
The KNN accuracy for ViT-L/16 with Video-	✓	0.20

References

- http://arxiv.org/abs/2410.02152v1
- http://arxiv.org/abs/2404.17929v1
- http://arxiv.org/abs/2604.14953v1