Bridging the Gap: Adapting Video Language Models for Egocentric Understanding

Final Update

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Problem Statement and Objectives

Problem Statement

- EgoCentric data has been overlooked by researchers
- Overlooking EgoCentric may have negatively impacted existing methods
- Utilizing EgoCentric data could extend capabilities of existing methods

Objectives

- Benchmark existing LVLM’s on egocentric data (EgoSchema dataset)
- Perform fine-tuning on egocentric data (Ego4D dataset)

EgoCentric Video Data

- Video from first person perspective
- Potential Uses
  - AR/VR
  - Law Enforcement
  - Activity Recognition
  - Memory Enhancement
  - Navigation and Guidance

EgoSchema Dataset

- Over 5000 human curated multiple choice question pairs
- Subset of 500 pairs provided with answers

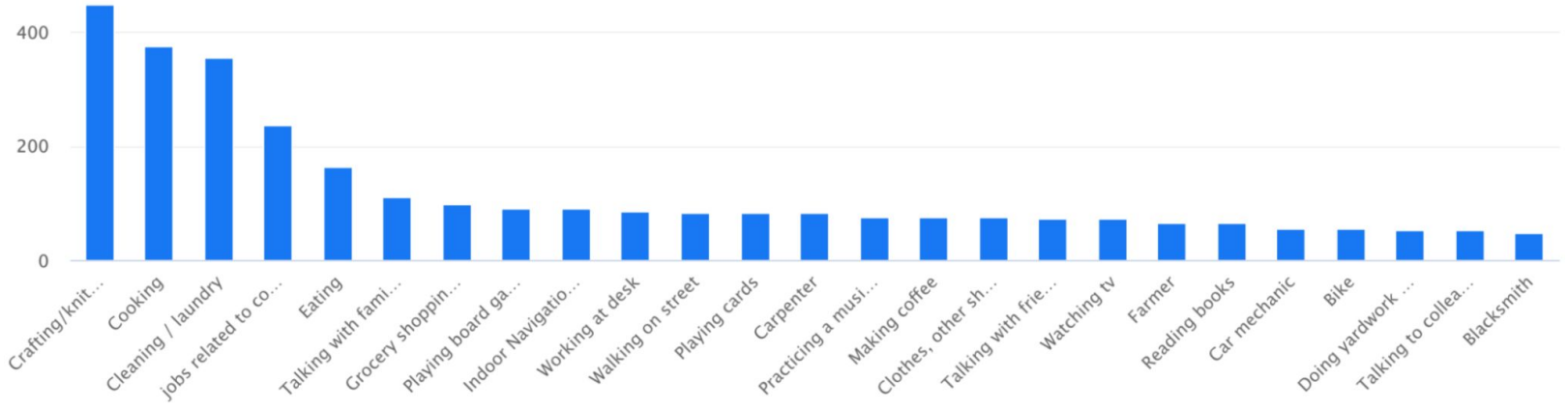
? What is the overarching behavior of C and the man in the video?

1. C teaches the man game rules but the man seems distracted and is not paying attention
2. The man teaches C how to play the card game while organizing the deck for future games
3. C and the man are playing a card game while keeping track of it in a notebook
4. C shows the man how to properly shuffle cards while the man plays them
5. The man shows C a new card game while C takes notes for future reference

Full Video Link: youtu.be/Tp4q5GeHVMY

Ego4D Dataset

- Data Types
  - Full Scale Videos
  - Clips
  - Annotations
  - Visualization Data
  - Video Components
  - Features



Experiments

Benchmarking on EgoSchema

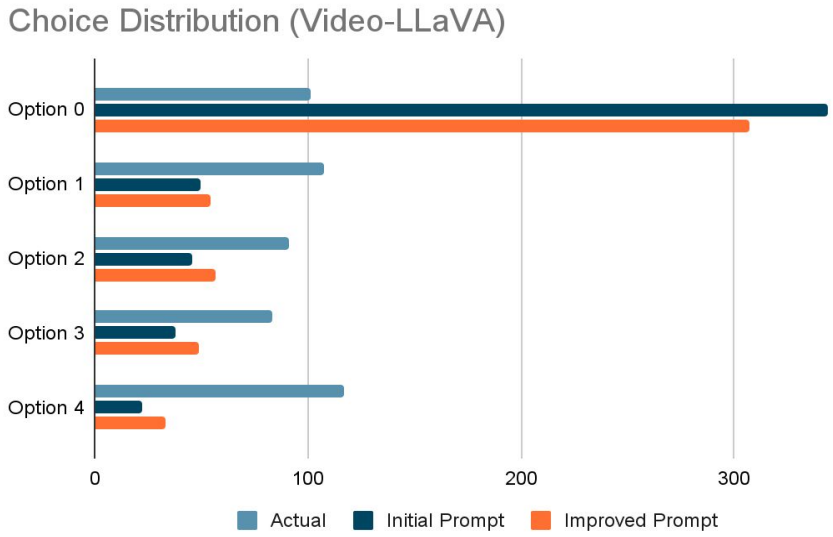
- Benchmark on the 500 multiple choice question pairs with answers
- Record the accuracy achieved by LVLMs

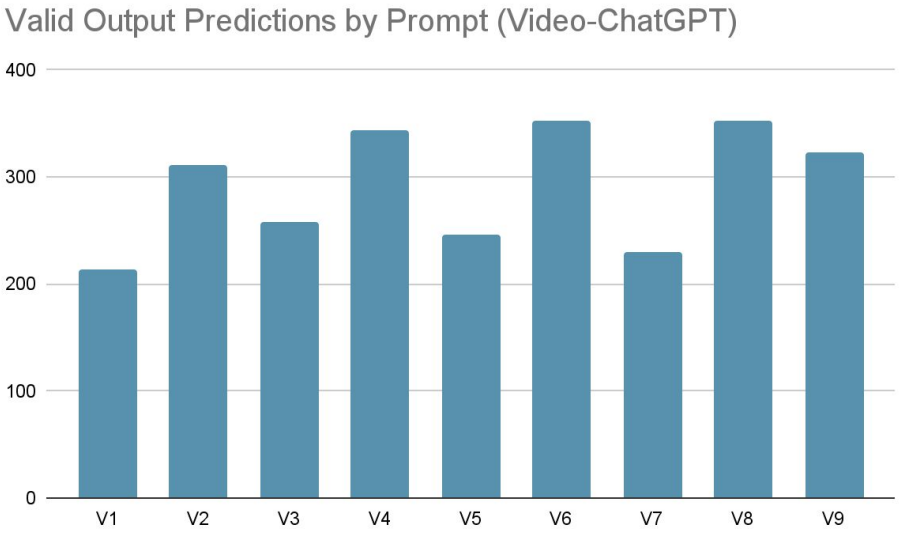
Fine-tuning on Ego4D

- Fine-tune on the full scale videos
- Create fine-tuning data using the Ego4D narration annotations

Prompt Engineering for Benchmarking

- General Formatting
- Combating Choice Bias
- Optimizing for Desired Outputs





Finetuning Data Generation

Experimental Results

- Achieved commendable results on EgoSchema
- Finetuning results were not fully completed

Method	Accuracy
VIOLET	19.9
mPLUG-Owl	31.1
InternVideo	32.1
InternVideo2-6B	41.1
Video-ChatGPT	27.6
Video-LLaVA	37.4
Gemini 1.5 (1st Frame)	54.3
Gemini 1.5 (16 frames)	**64.5**
Gemini 1.5 (150 frames)	63.6

Limitations

- Uniform selection of frames for tuning
- Reliance on Narration annotations from Ego4D
- Commendable performance in zero-shot multiple choice VQA
  - Bias is choice selection
  - Difficulty generating valid outputs

Conclusion

- Extended LVLM’s for Long-Context Video Question Answering (EgoSchema)
- Developed a finetuning scheme using Ego4D narration annotations

- Obtained commendable benchmark results
- Made significant progress towards completing finetuning

Future Work

- Narration-based frame selection (nonuniform)
- Exploring fine-tuning for specific Ego4D benchmark tasks
- Creating improved narration annotations for Ego4d using a different method

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Questions?