

Llama Learns Experiments

Non-Reproducibility is Hurting Science!

- **70-80%** of published studies we reproduce in-house **do not work** at all

Pfizer Engineering Manager

- **\$28 billion per year** - Yearly cost of “Bad Science”

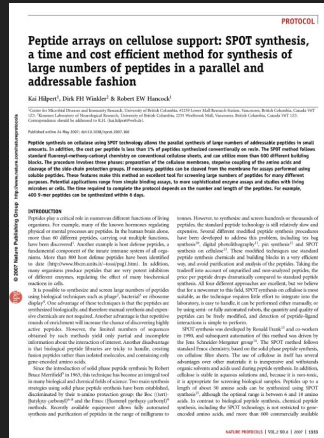
Nature Publications

Status Quo: Conveying Scientific Processes Through Text

Experiment Creator



Text Publication



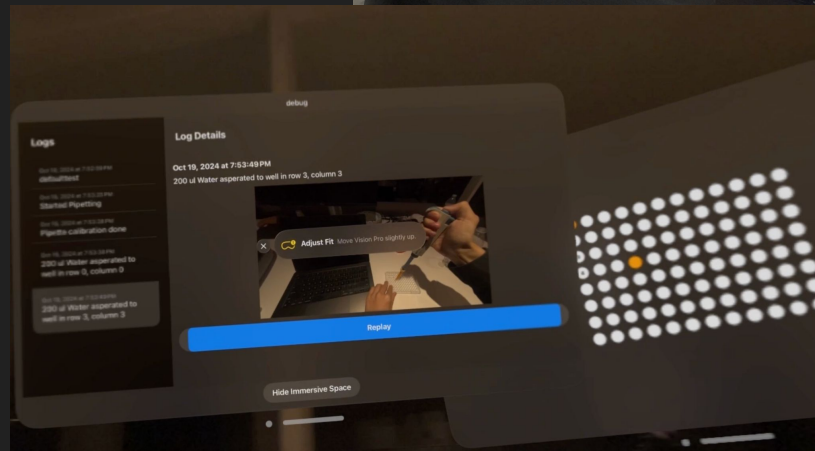
Other labs, frequently troubled



- Text descriptions **cannot properly detail** manual process
- Experimenters are **forgetful**
- “**Expert Know-hows**” needed to parse methodologies

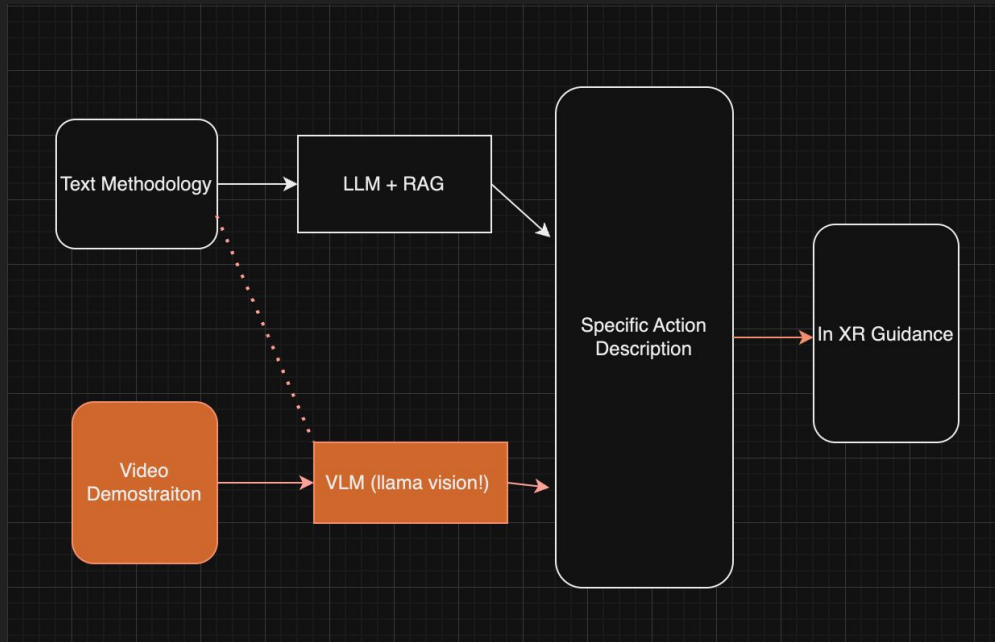
Our Solution: AR + AI - “Show, Don’t Tell”, For Science

- An LLM platform transforming any lab protocol document into instructions blended into reality.



In This Hack: Augmenting the Platform with VLM + Video Input

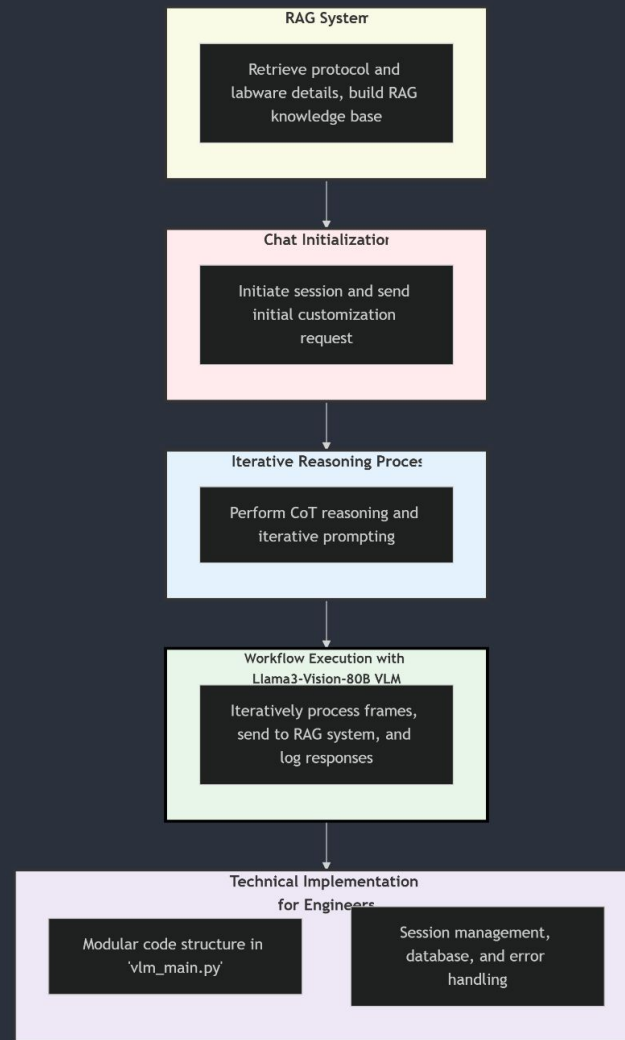
- Llama Vision + RAG to parse experiment videos
- Previously, text -> action description conversion was limited by certain steps requiring demonstration + more details
- VLMs directly understands experiment details from demonstration video



New Features in this Hack.

Schematics

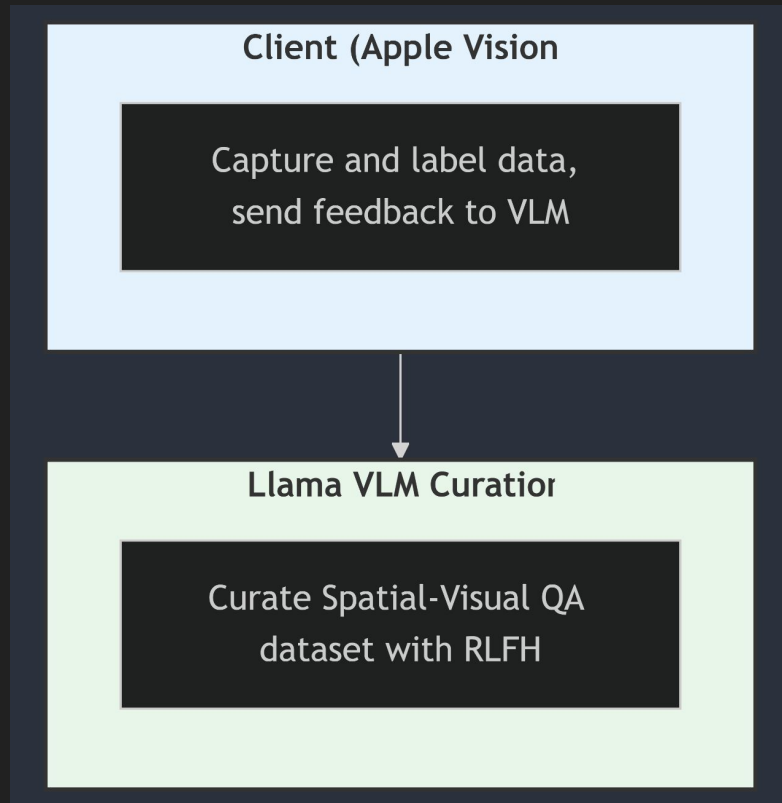
1. Doc QA
2. Action Protocol
3. Iterative reasoning over action step by Llama3-Vision-70B
4. Track and provide protocol guidance in XR



Potential for RLHF

Feedback loop: Augment the human experience with Llama; Augment the Llama Experience with human feedback

Make science scalable



Example: Llama Vision Pipeline Output

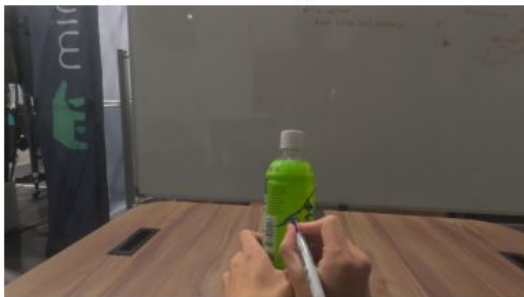
Step 1: Pick up the green bottle.



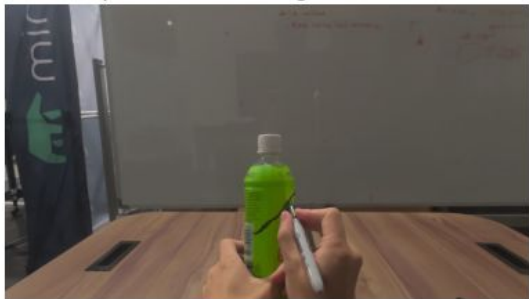
Step 1: Pick up the green bottle.



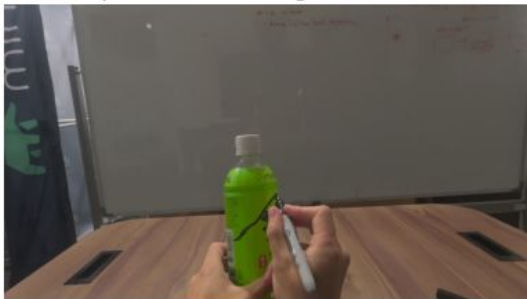
Step 2: Start drawing on the bottle.



Step 2: Start drawing on the bottle.



Step 2: Start drawing on the bottle.



Step 2: Start drawing on the bottle.



Example

A person is holding a green bottle with a white ca...

Frame 355

A person is holding a green bottle with a white ca...

Frame 360

A person is holding a green bottle with a white ca...

Frame 365

A person is holding a green bottle with a white ca...

Frame 370

A person is holding a green bottle with a white ca...

Frame 375

Labelling a bottle...

Frame 380

Labelling a bottle...

Frame 385

Labelling a bottle...

Frame 390

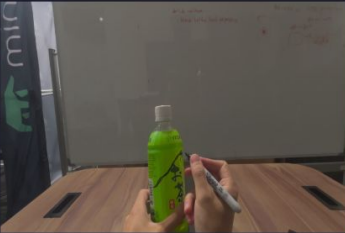
Labelling a bottle...

Frame 395

Labelling a bottle...

Frame 360

Labelling a bottle



Action 1: Pick up bottle

Action 2: Start drawing on bottle

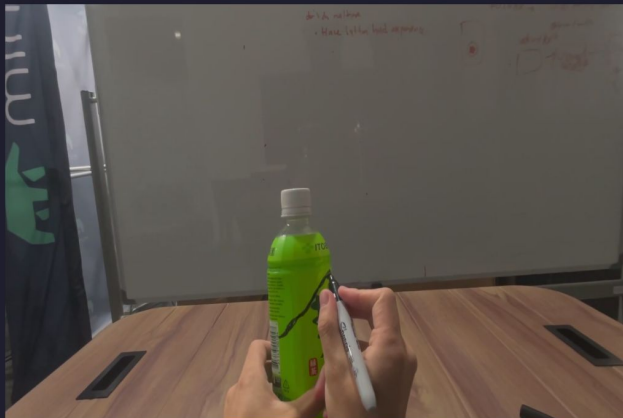
Action 3: Finished drawing on bottle

Action 4: Put the bottle down.

Example

Frame 300

Labelling a bottle



Action 1: Pick up bottle

Action 2: Start drawing on bottle

Action 3: Finished drawing on bottle

Considerations

- We are an early example of AI directing human operators to solve complicated physical-world problems!
- Llama would be welcomed by institutions with strict data requirements.