

NCCAT Workshop - March 11, 2024

# CryoVR

Virtual Reality Augmented CryoEM Hands-on Pre-training

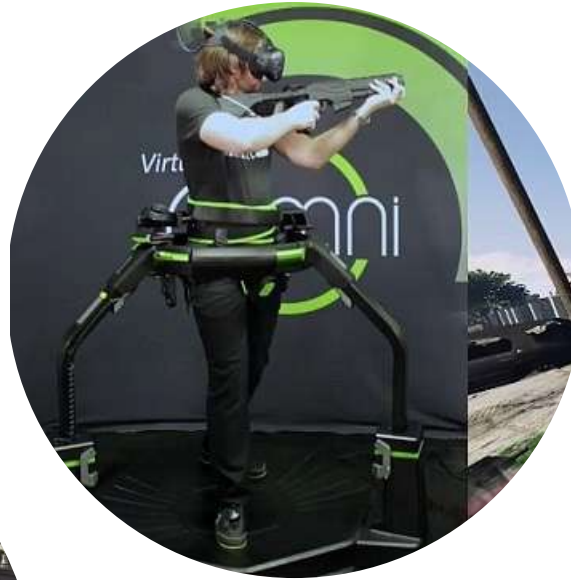
Abayomi Emmanuel Adegboyega

Tansi Zhang

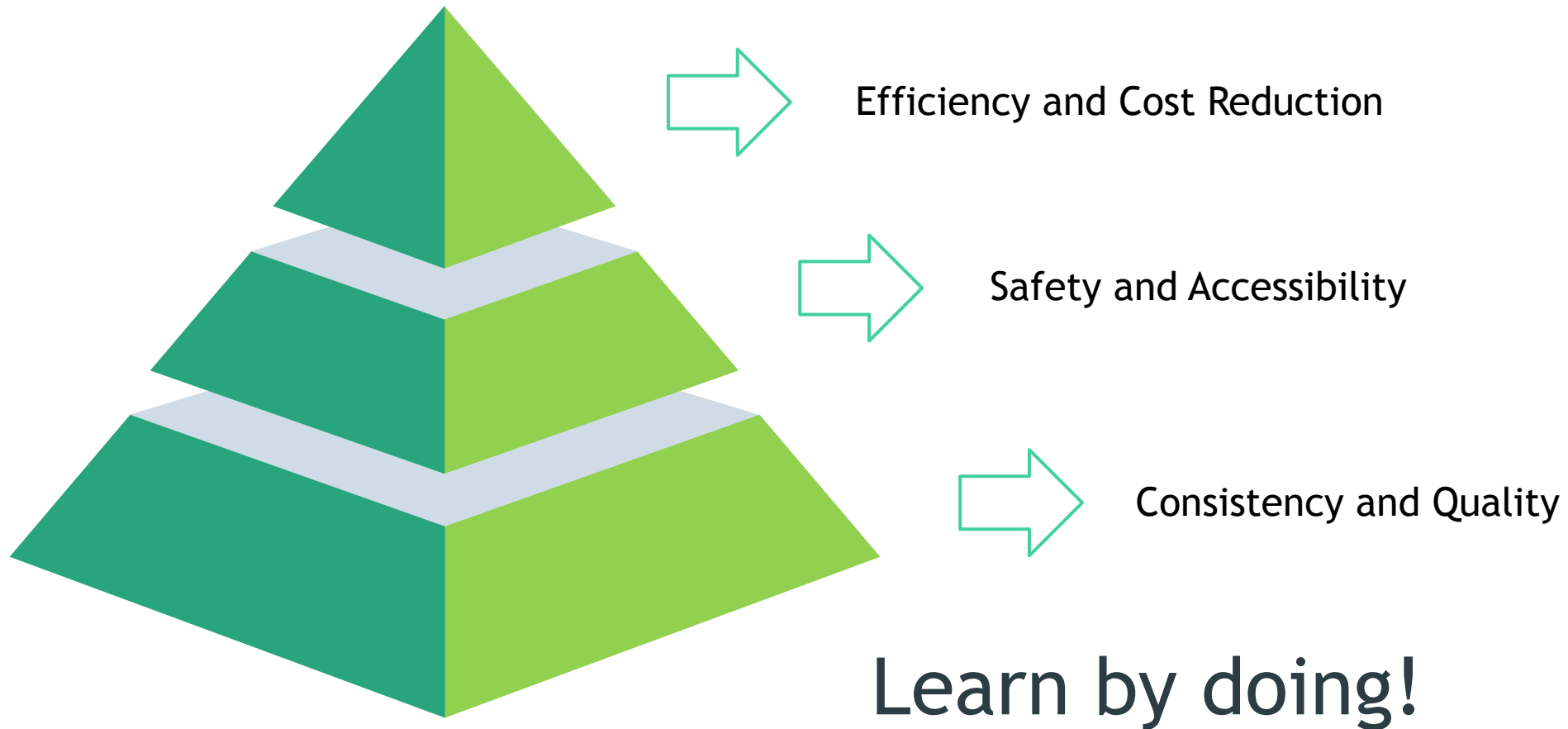


# Why Virtual Reality?

- VR transports users into simulated worlds, fostering deeper engagement and interaction than traditional formats.
- VR applications extend beyond entertainment, offering valuable tools for gaming, entertainment, education, training, and various other real-world scenarios.



# VR training emerges as a powerful solution



# Why CryoVR?



Broadening access to high-resolution *cryo-electron microscopy* and *tomography*

HOME

CryoEM CENTERS

CURRICULUM DEVELOPMENT

CryoET CENTERS

EVENTS

MERIT BADGES

RESOURCES

[CryoEM 101](#); [Getting Started in CryoEM](#); [CryoVR](#); [CryoEDU](#); [Principles of CryoEM](#)

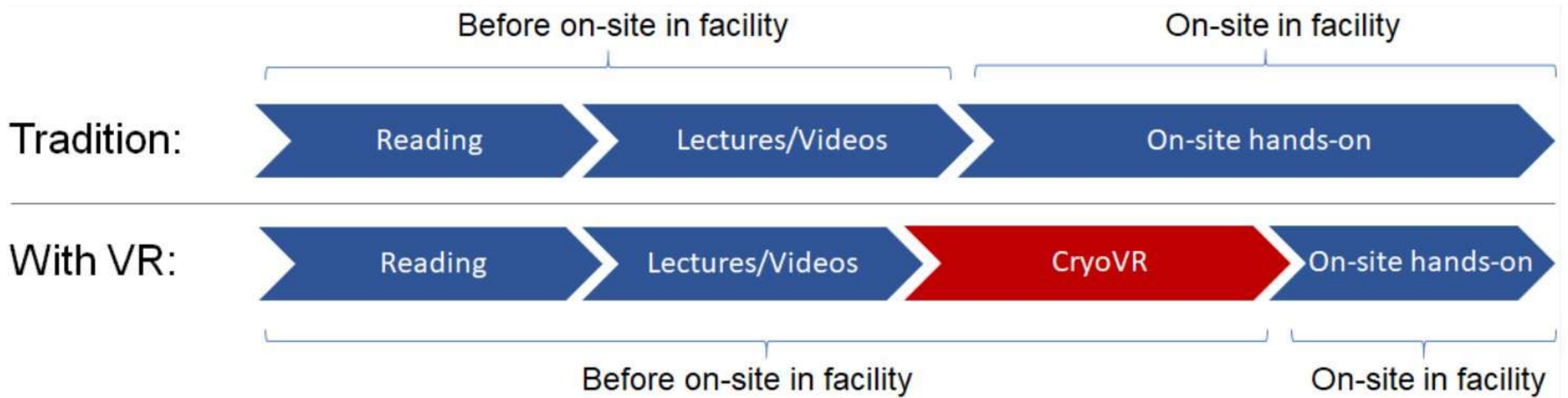
CryoVR is a project established to create **pre-training tools to familiarize new users with cryo-EM equipment**, through a free, safe, easily accessible, virtual environment.

# Introduction to CryoVR System

Purdue CryoVR Team

# CryoVR Learning Objectives

- Operational Fluency
- Fast-Track to Independence
- Safety Savvy



# Fidelity of CryoEM operation simulation

High visual fidelity:

- **Left:** real device
- **Right:** High fidelity models in virtual environment



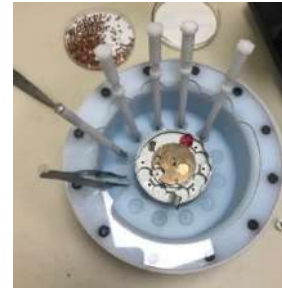
# Single Particle CryoEM - CryoVR Modules



**Glow Discharge**  
PELCO easiGlow



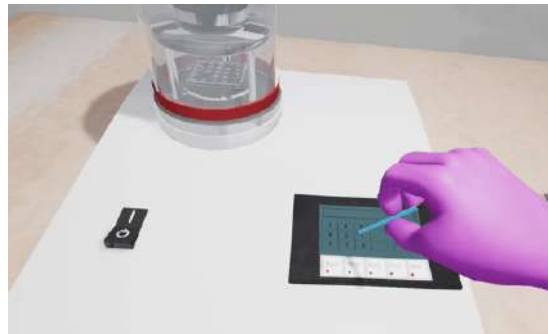
**Plunge Freezing**  
Vitrobot Mark IV



**Autogrid Clipping**



**Autogrid Loading**





# Cryo-CLEM and Tomography



**Plunge Freezing**

Leica EM GP2



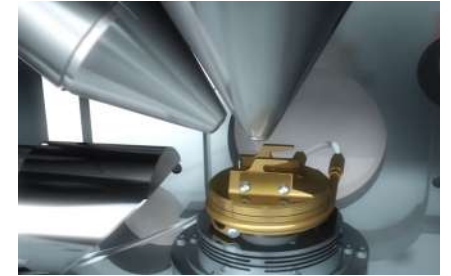
**CryoFM**

Leica THUNDER



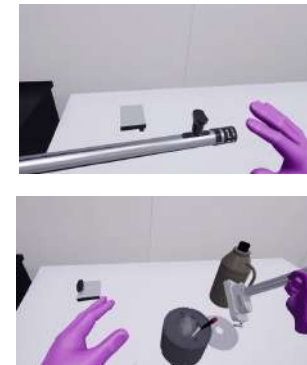
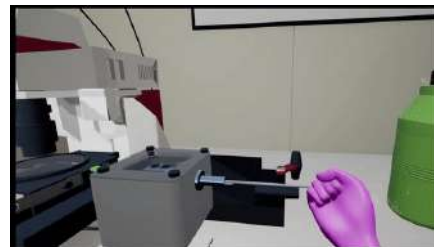
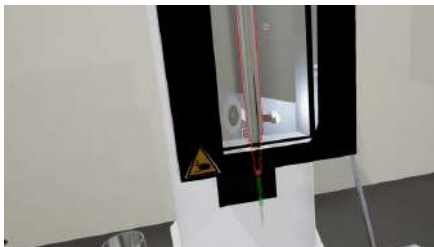
**Cryo-sectioning**

Aquilos 2 Cryo-FIB  
(Hand-on operation)

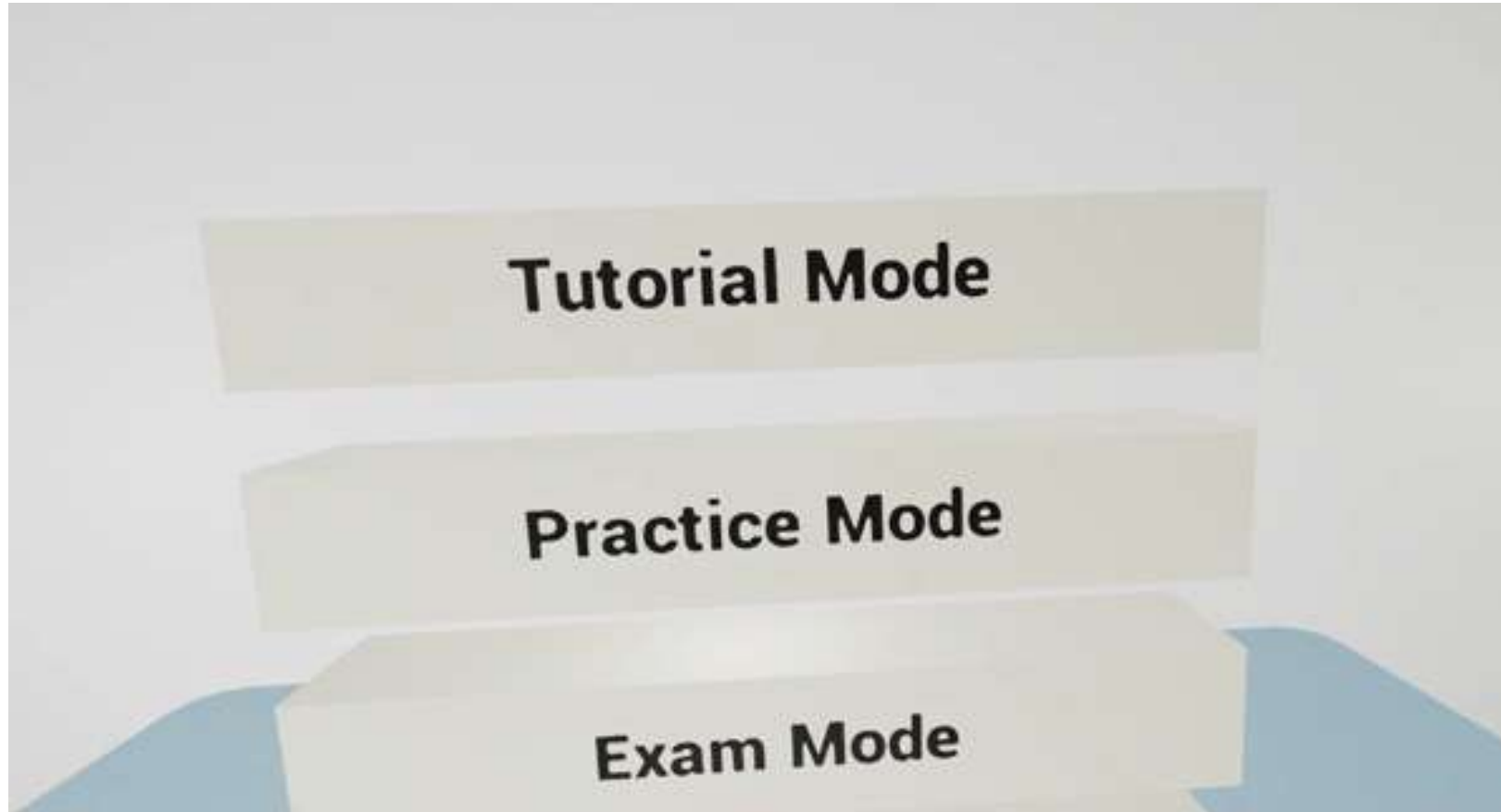


**Cryo-sectioning**

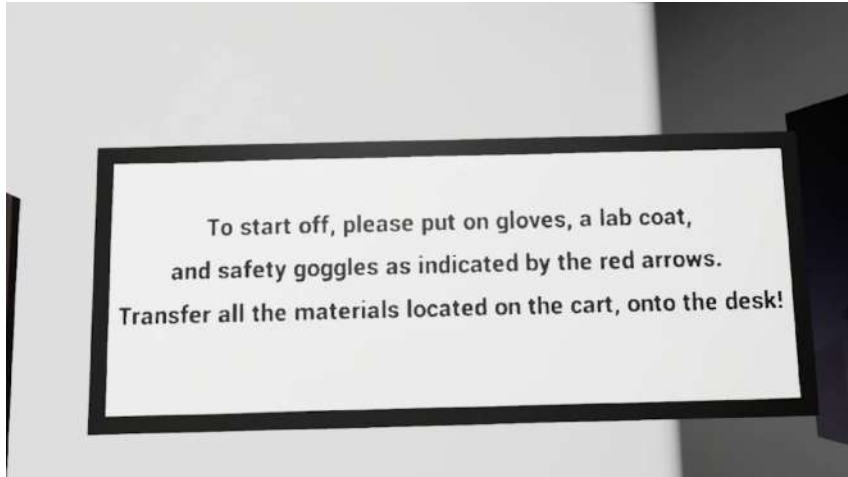
Aquilos 2 Cryo-FIB (Inner-  
chamber simulation)



# Multiple modes available



# Tutorial Mode



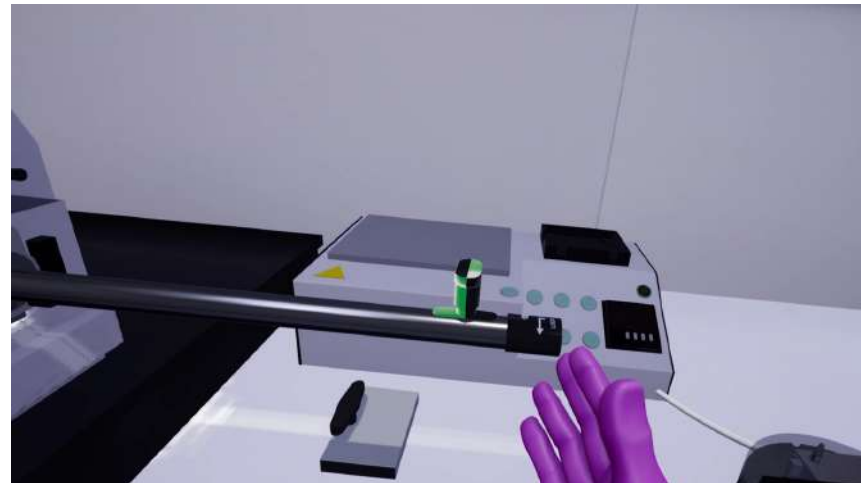
Text/Voice Instructions



Progress Bar



Visual Guidance



Animation

# Practice Mode



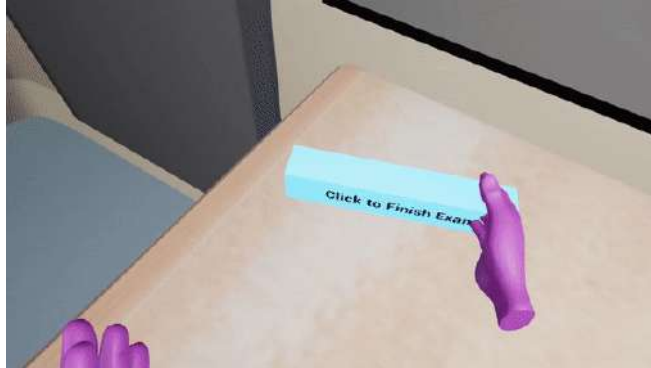
- No audio, or visual guidance
- With simple instruction text

# Exam Mode

- No instruction text, audio, and visual guidance
- Scoring the user's operation processes according to SOPs
- Target: 100% correct



# Merit Badge System



Issue redemption code  
in headset



Login using ORCID

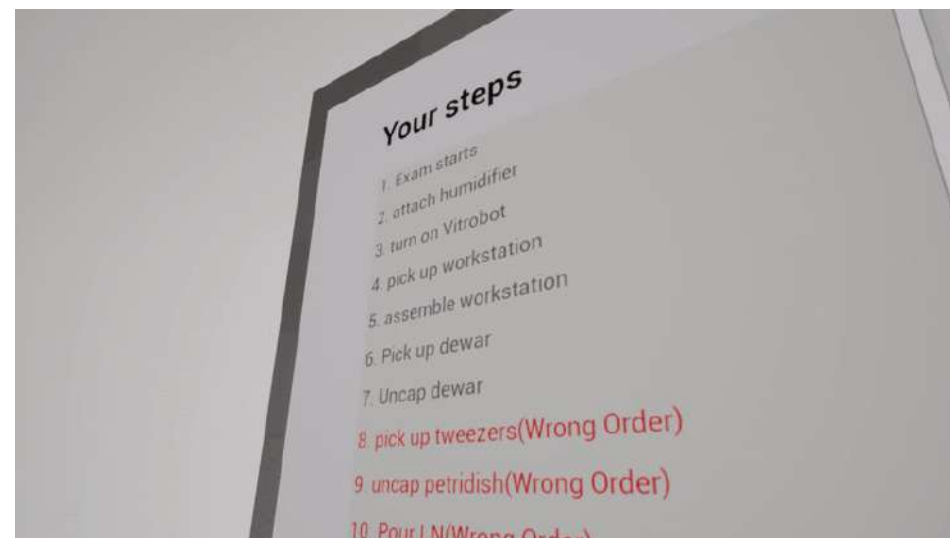
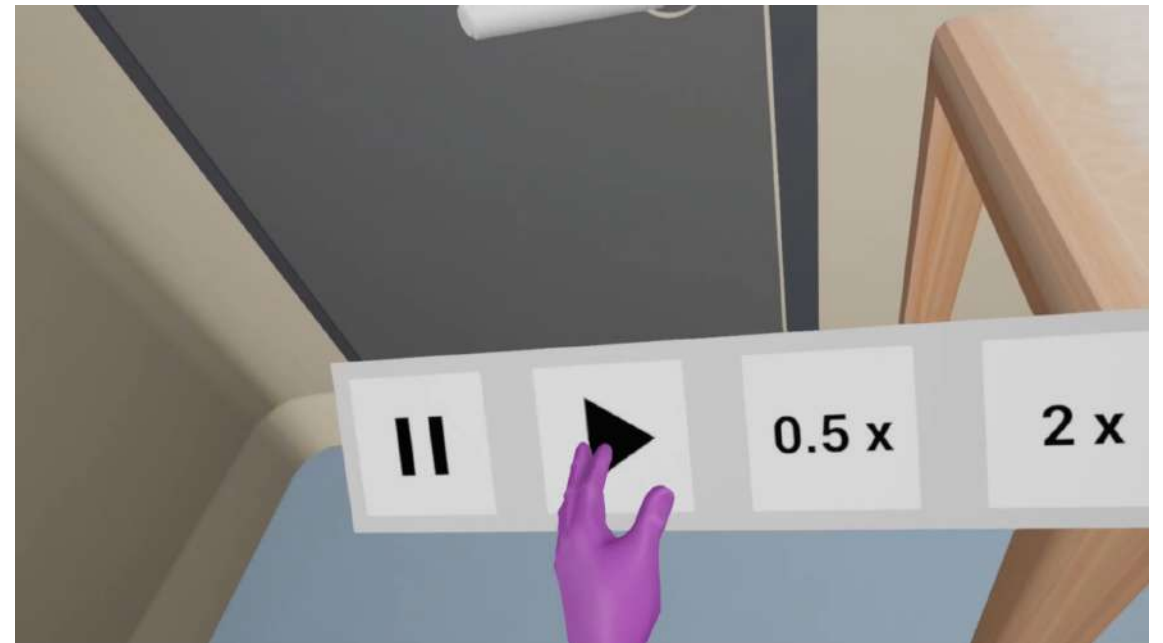


Redeem certificate of  
completion and link to ORCID



CryoVR certificate of  
completion

# Replay System



# Undo Feature



- Highly requested by users
- Can reset to any step in the procedure

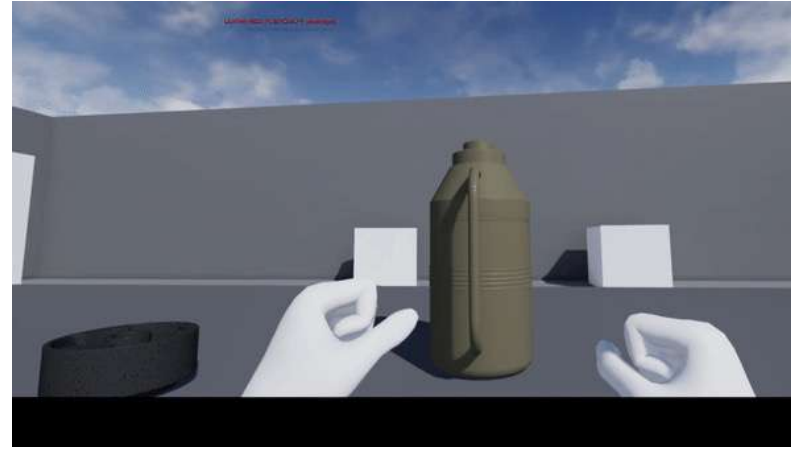
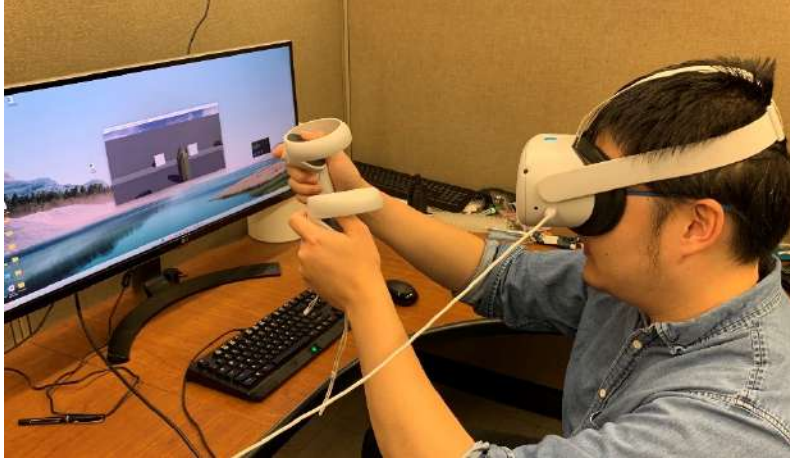


# Hazard Simulation



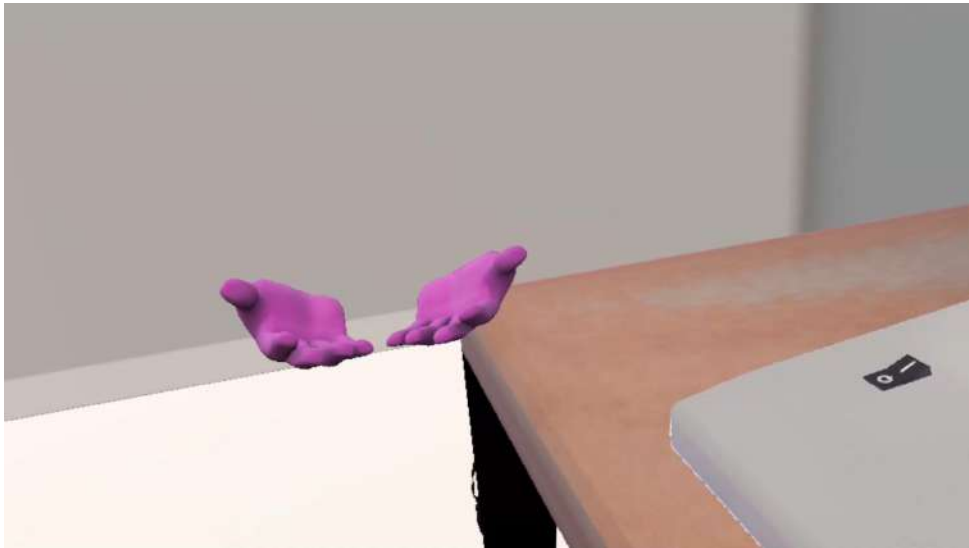
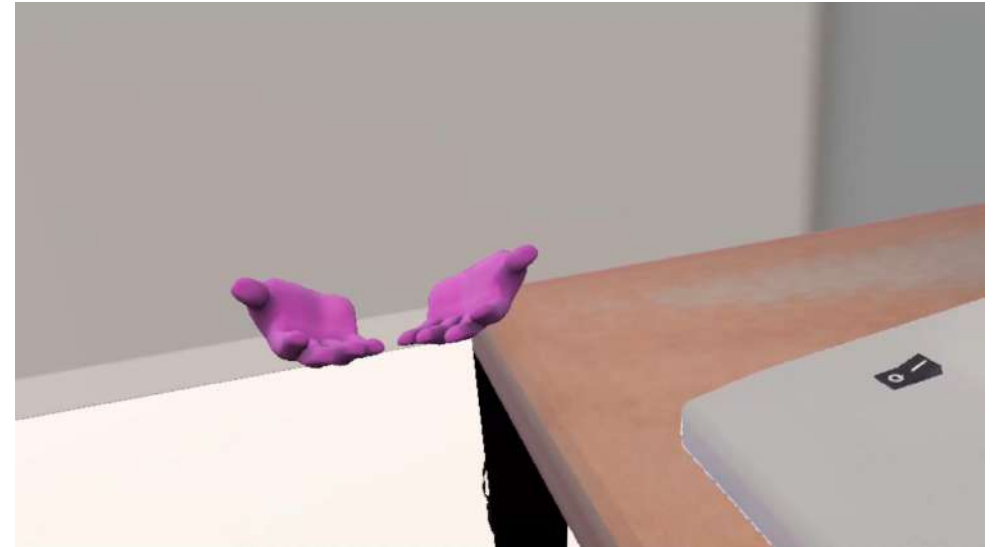
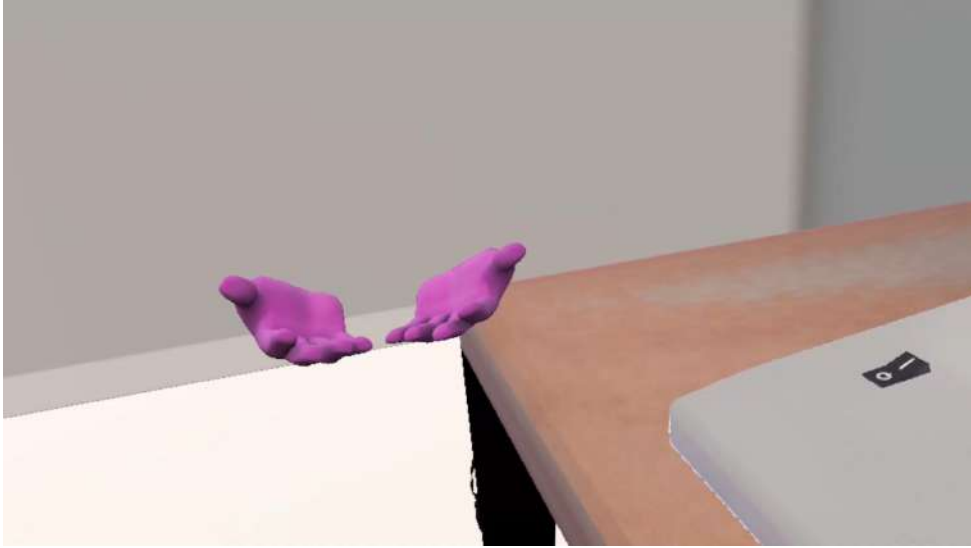
**Simulate hazardous conditions during real experiments  
Train users in CryoVR to avoid real accidents**

# Interaction Improvement - Hand Recognition



**Free the users from the limitations of VR controllers  
More flexible hand gesture support**

# Multi-person CryoVR



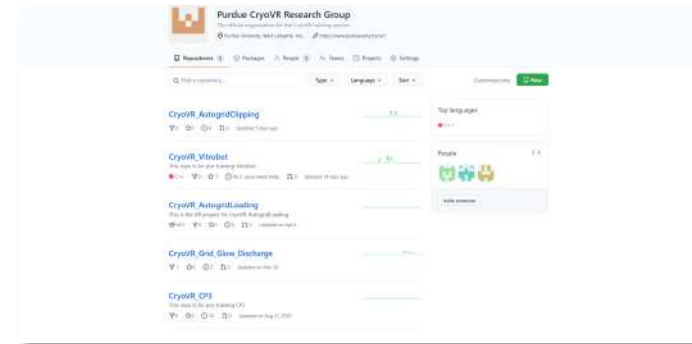
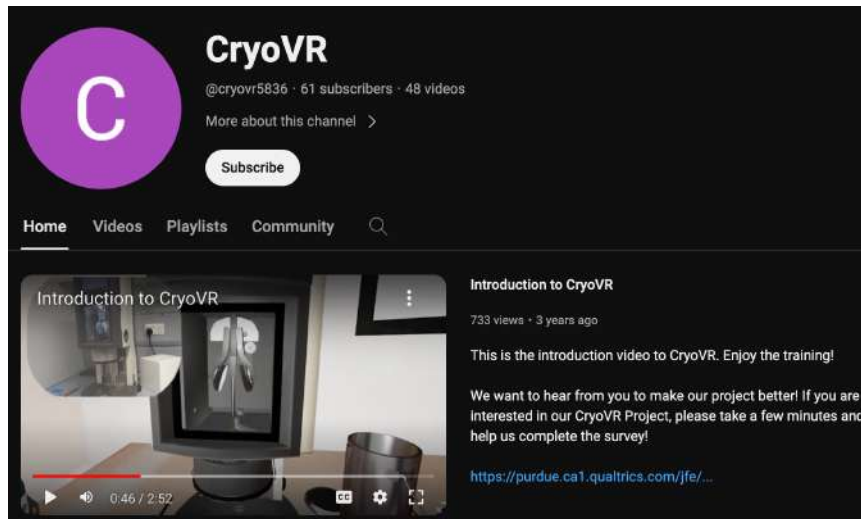
# Follow Us!

Free downloads from CryoVR website

<https://www.purdue.edu/CryoVR>



<https://twitter.com/CryoVR>  
Search "CryoVR" in Twitter



CryoVR GitHub Repositories



<https://github.com/CryoVR>



<https://www.youtube.com/channel/UCZl1-9J1nHSp0VK5aCH3ZFw>

# CryoVR Team

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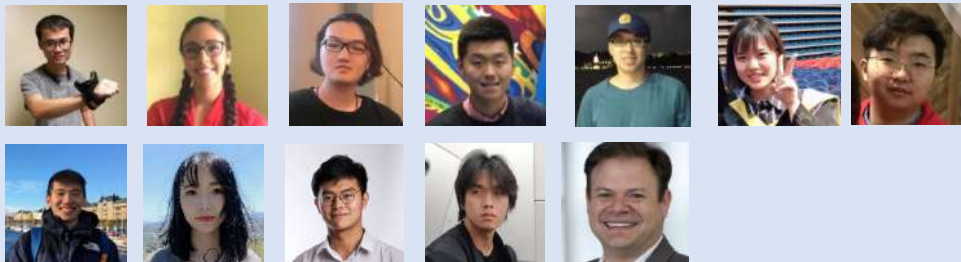


Tansi Zhang



Kadir Ozcan

Alumni:



National Institutes  
of Health

**Transformative High Resolution  
Cryo-Electron Microscopy Program**

<https://www.purdue.edu/CryoVR>

# CryoVR Hands-on Session

14:00 – 17:30

SEMC Conference Room

*Please enjoy and provide feedback!*

