

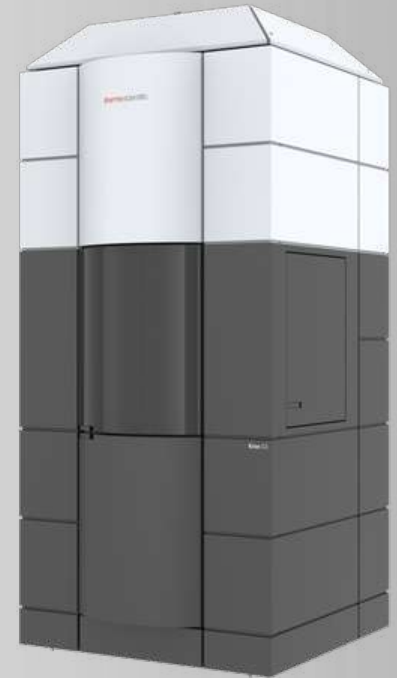
# 2022 NCCAT Single Particle Short Course

March 14, 2022

# CryoVR

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# Background & Goal

- Funded by National Institute of Health (NIH) common fund - Transformative High Resolution Cryo-Electron Microscopy (CryoEM): *“Cultivating a skilled workforce through the development and implementation of cryoEM training material”*
- **CryoVR:** Pre-training to save per-trainee time on the physical instruments, reduce cost and the risk of impairing the expensive cryoEM instruments, and increase the training efficiency and capacity of the cryoEM facilities.
- The true potential of VR is to provide the students with the *“learn by doing”* experience which is often difficult to implement in lectures/videos.

# Introduction to CryoVR System

Purdue CryoVR Team

March 14 2022

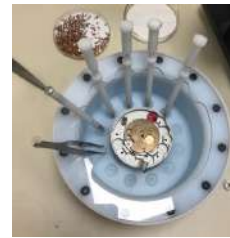
# Single Particle CryoEM – Hands-on Operations



**Glow Discharge**  
PELCO easiGlow



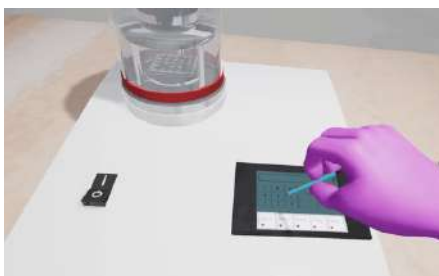
**Plunge Freezing**  
Vitrobot Mark IV  
Gatan CP3



**Autogrid Clipping**

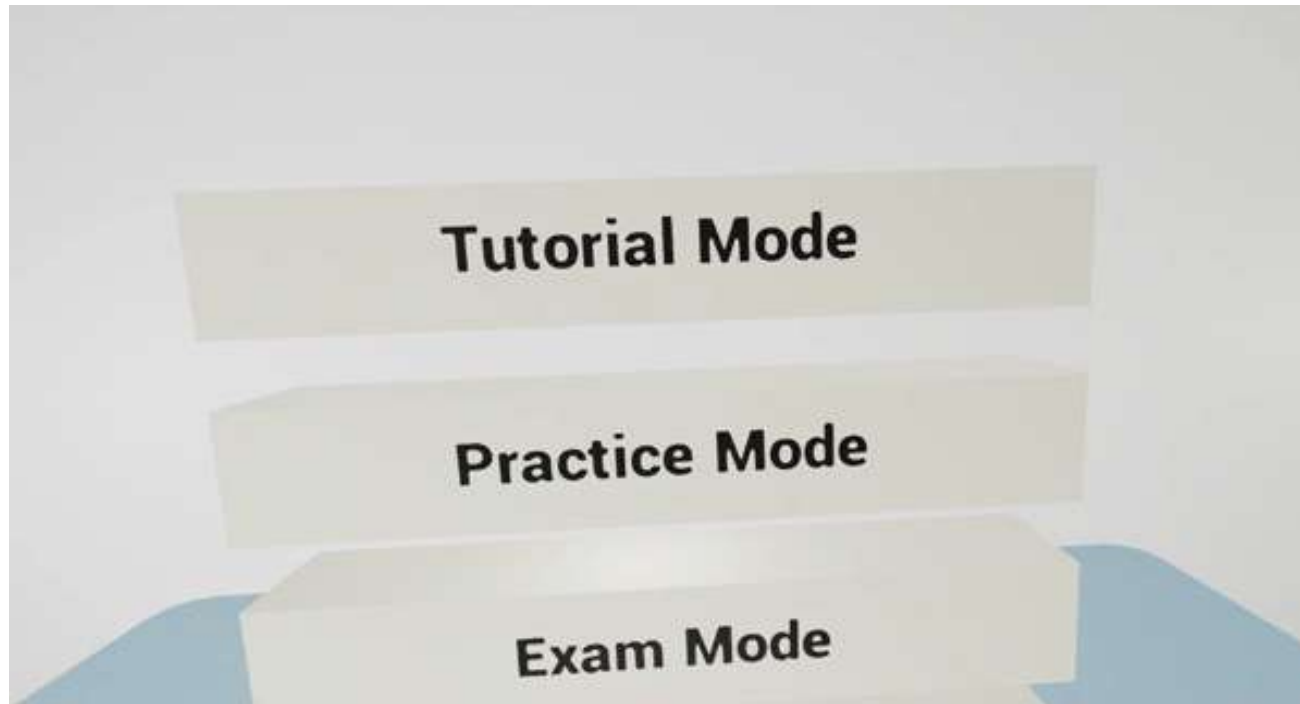


**Autogrid Loading**

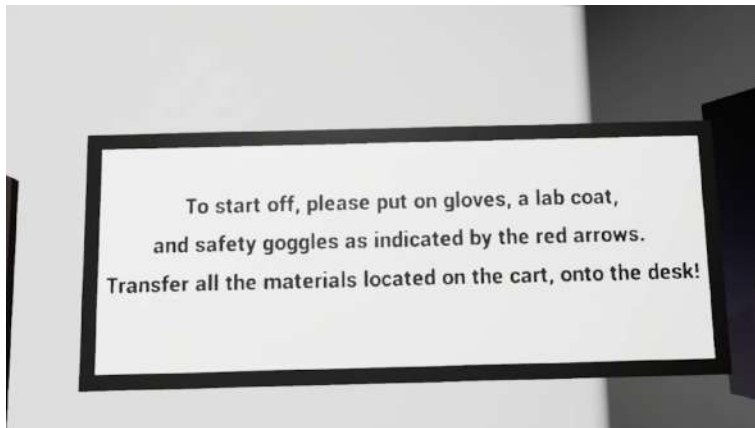


*Available on Windows and Linux*

# Different modes are available



# Tutorial Mode



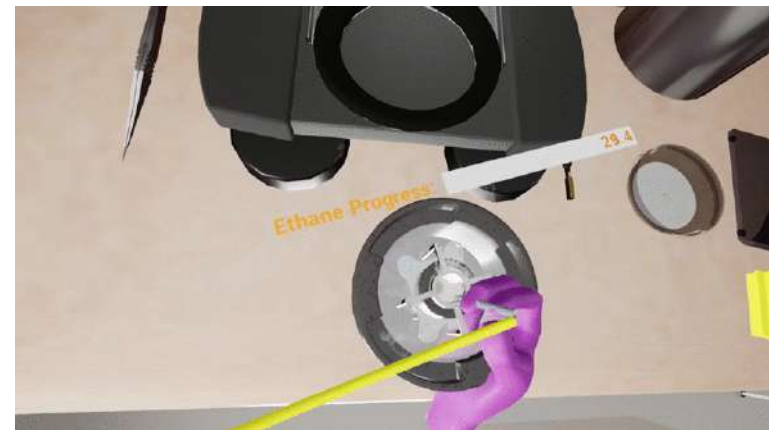
Text/audio instructions



Embedded video clips



Visual cues



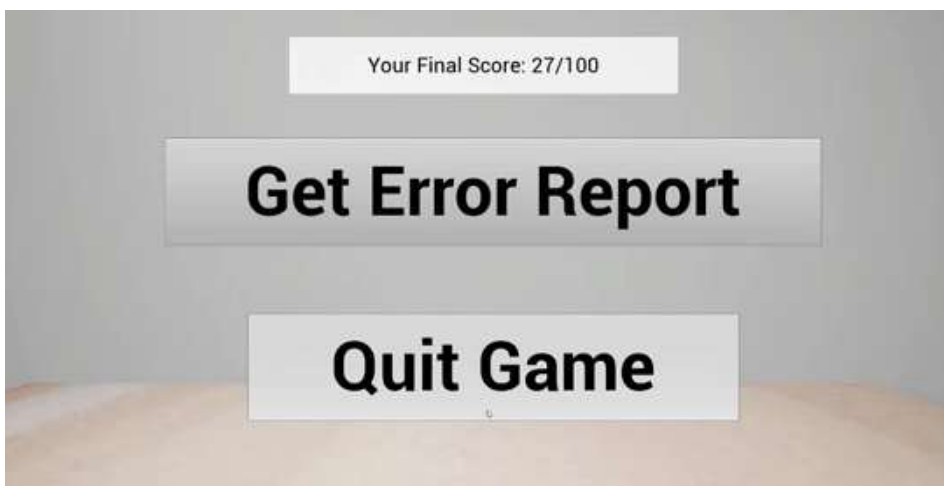
Progress bars

# Exam Mode

- No instruction text, audio, or visual guidance
- User operations scored against SOPs developed by the CryoEM Merit Badge working group
- Target: 100% correct



# Exam Mode - Failure



CryoVR will report errors



Playback function to exam mistakes

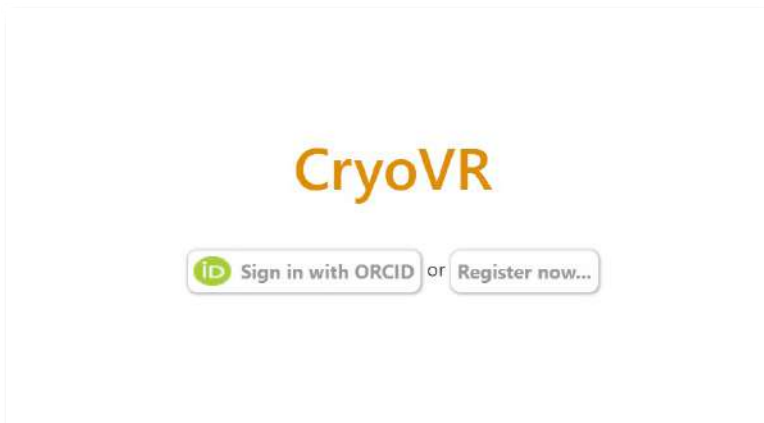
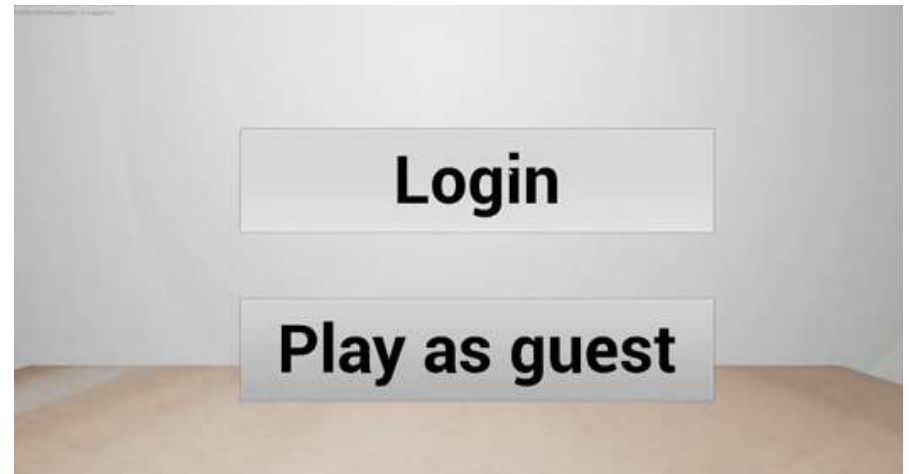
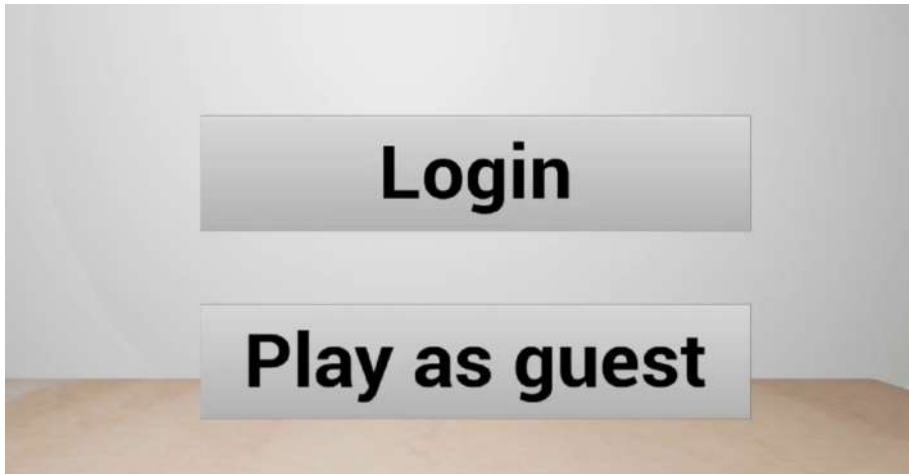


# Exam Mode - Certificates



- CryoVR will generate a certificate for the module
- Certificates can be verified by the CryoVR web server
- Verification link and QR code.

# User Management System



- The user can login with his/her ORCID
  - Or play as a guest
- Users can track their certificates

# Safety Hazard Simulation



- Simulation of dangerous conditions
- Help users learn the importance of safety procedure

# Non-VR Version (PC Game)

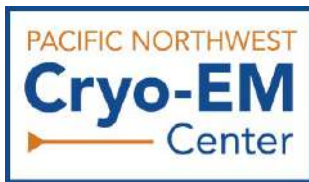


- No barrier to entry, no VR equipment or special computer hardware required
- A standalone PC application
- Easy keyboard & mouse control

# Collaborations



**S<sup>2</sup>C<sup>2</sup>** | Stanford-SLAC  
Cryo-EM Center



Frederick National Laboratory  
for Cancer Research

sponsored by the National Cancer Institute



Vitrobot SOP



Autogrid Clipping SOP



- In collaboration with the CryoEM Merit Badge working group, we have developed SOP versions of the Vitrobot and Autogrid Clipping
- Users receive certificates upon passing the SOP Exam mode

# Supported Devices: HTC Vive

- Better hardware performance in rendering virtual environment
- High refresh rate (120Hz)
- Runs CryoVR with the best visual effects



# Supported Devices: Oculus Quest

- Lighter, smaller, and wireless: provides mobility and simplicity
- Relatively affordable (\$299- \$399)



Oculus Quest 2 (Meta)

# Currently in development: Leica GP2 plunge freezer





# Dissemination

Free downloads from CryoVR website

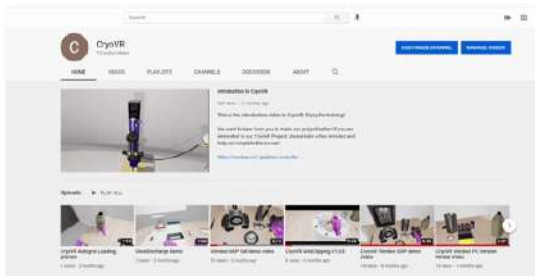
<https://www.purdue.edu/CryoVR>



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

CryoVR Twitter account

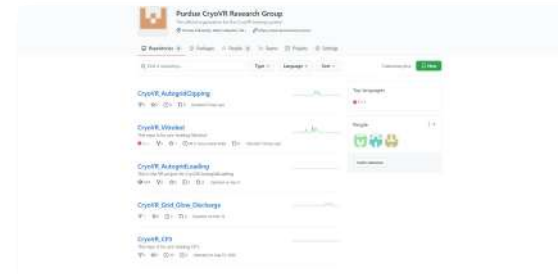
- 37K + impressions
- 168 followers



CryoVR YouTube channel

~1,600 views

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

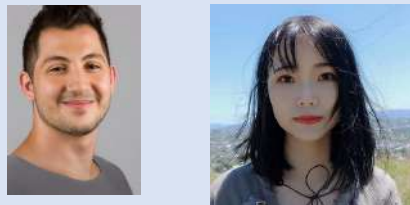
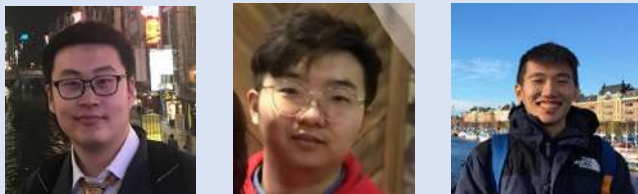


CryoVR GitHub repositories

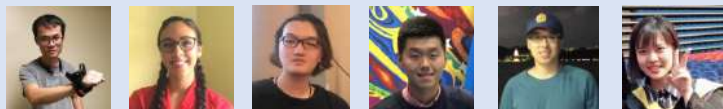


<https://github.com/CryoVR>

# CryoVR Team



Alumni:



**PURDUE**  
UNIVERSITY®



National Institutes  
of Health

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

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

**CryoVR Demo**  
**By**  
**Daoyi Li and Kadir Ozcan**