

Statement of Suitability/Interest in Advancing XR and Education Research

This document serves as an overview of the research endeavors I have pursued during my career so far.

Project 1: Intersections of Education and XR Literature Review


I research innovative ways to redefine distance learning that are more immersive, effective, and engaging than they are currently. Using innovations in XR/VR/AR/HCI, we are able to re-imagine what a learning environment can be. We aim to study the impacts of these new findings with participants to gauge memory retention, subject fluency, instructor presence, learner-engagement, fatigue, etc. We also explore ways to make this content easy for educators to create, which is an established problem in distributing VR/AR education.

- [Our Literature Review](#)
- [Initial Proposal Document](#)
- Along with collaboratively writing the literature review, I created a demo lecture hall environment using the Unity Engine for user studies:



Project 2: Redirected Walking Threshold Detection Study


Uses the Unity Engine and C# to lead software implementation of the UMD GAMMA Labs Redirected Walking Thresholds Experiment administration software.

DEPARTMENT OF
COMPUTER SCIENCE

User CSD Thresholds Experiment Administration Software:
Towards Imperceptible Redirected Walking in Virtual Reality

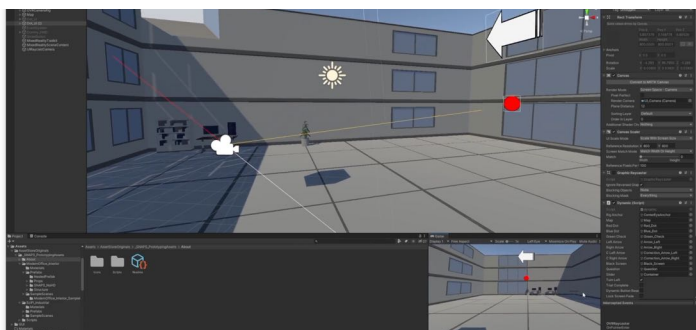
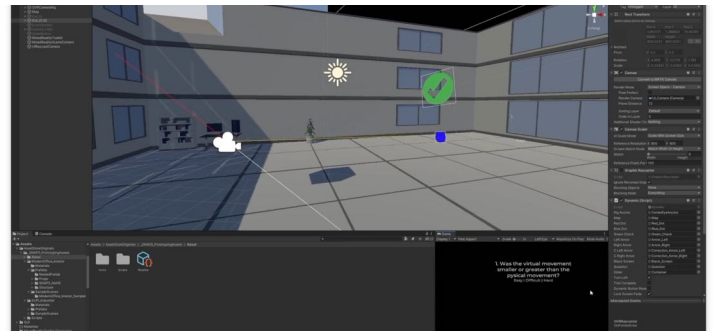
Team Members:

- **Advisors:**
 - Dr. Aniket Bara
 - Dr. Dinesh Manocha
 - Niall Luke Williams
- **Software Implementation:**
 - Logan Stevens

Geometric Algorithms for
Modeling, Motion, and Animation

Software Demonstration of the Project's Administration Software
(Click Image to go to video)

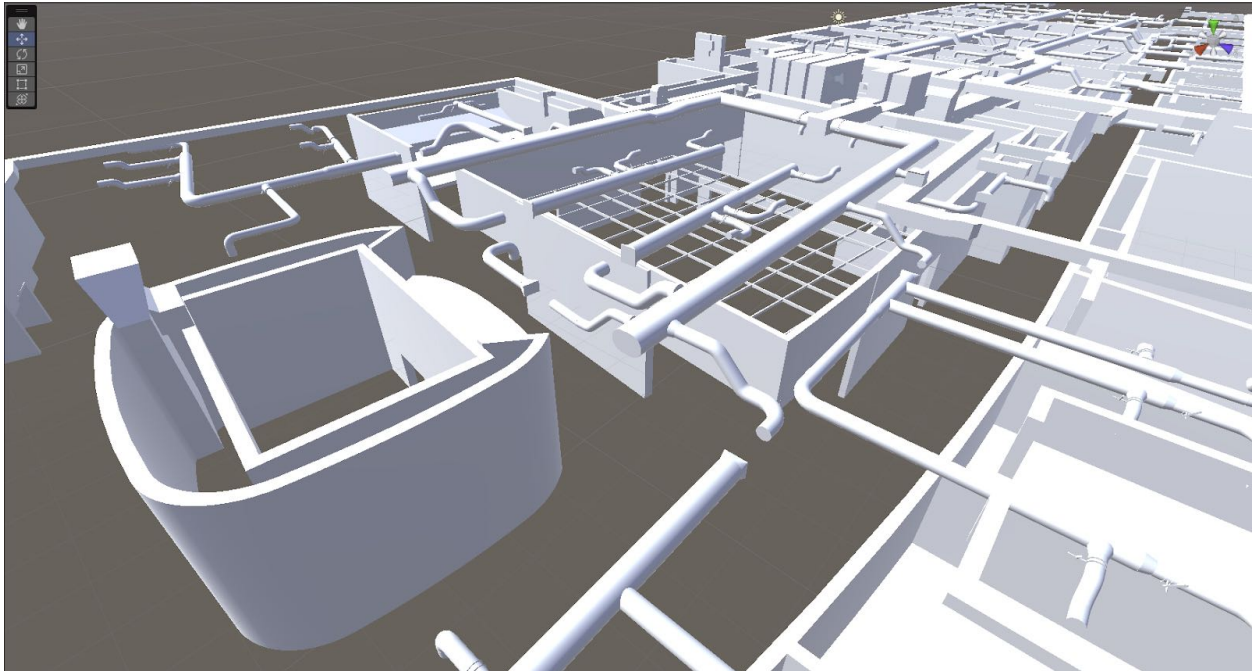
Assorted Screenshots:



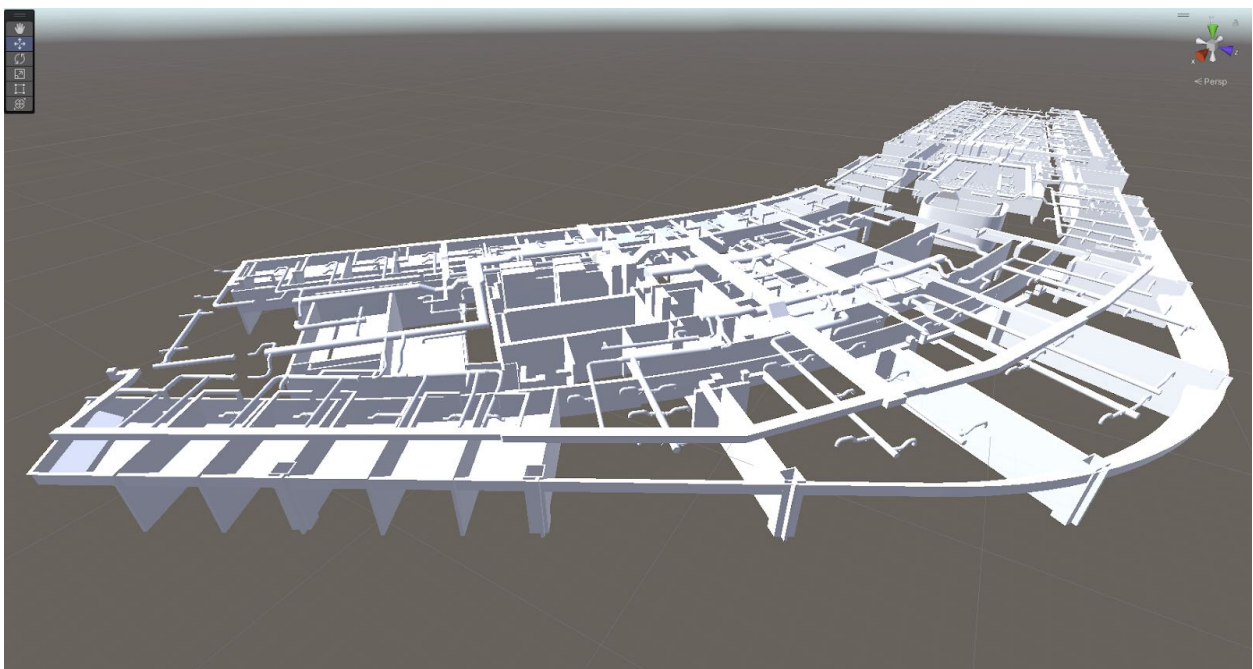
Project 3: AR-Assisted Building Maintenance

Uses the Unity Engine and the Microsoft Mixed Reality Toolkit (MRTK) to implement the UMD MindLab AR-Assisted Building Maintenance Project.

- [Main Project Informational Webpage](#)
- [Final Project Presentation Slides](#)
- [Software Demonstration Video](#)



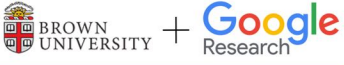
3D Model of the Ductwork and Outline of the Iribe Building (1)



3D Model of the Ductwork and Outline of the Iribe Building (2)

Project 4: Brown University | exploreCSR | "Artificial Intelligence and the Arts: Towards AI-Guided Accessible Learning Spaces in Virtual Reality"

- [My Summary of The 7th Annual Brown Computer Science Research Symposium](#)
- [exploreCSR Program Description](#)



Artificial Intelligence and the Arts: Towards AI-Guided Accessible Learning Spaces in Virtual Reality

A.Weissman, Lucas – Bouabid, Marwa – Stevens, Logan – Steigelman, Joey

Introduction

This research project aims to identify how AI and XR can be used to promote accessibility in learning spaces, and what techniques can improve user perception. First, the project captured details of one's real-life experience in a museum environment, and how senses such as vision, touch, and hearing could be emulated in a virtual space. Then, we researched assistive technologies found in AI (e.g., Image Captioning) and VR (e.g., increased object interactivity, magnification, and color manipulation). Combined, these can enhance perception in a Virtual Environment (VE).

Methodology

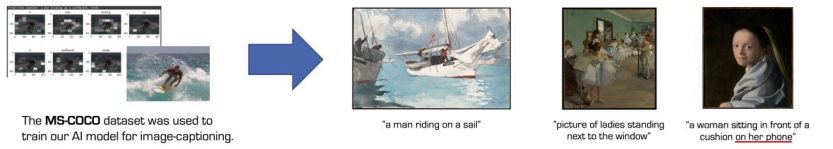
In order to increase access for users, we aimed to develop integrated AI captioning, in addition to our own set of assistive VR tools, in order to help users accurately perceive the VR scene and the artworks within it, regardless of ability.

Findings

We observed that our AI-generated image captions were of inconsistent and often insufficient quality. Realtime AI caption generation was also impractically slow due to cloud-run AI systems.

Acknowledgments

We thank the following groups/individuals for their contributions:
Brown University, Google Research, Dr. James Tompkin, Catherine Chan, Ji Won Chung, and Qian Zhang




The **MS-COCO** dataset was used to train our AI model for image-captioning.


"a man riding on a sail" "picture of ladies standing next to the window" "a woman sitting in front of a cushion on her phone"

Implementation

In the Unity Engine, a VE was created replicating a museum in which users could interact with the artworks in order to summon AI-generated captions to aid in experiencing the visual art. Our goal was to link an API to Unity such that it would take the current piece of art that the user is seeing, and externally run a dedicated AI on that artwork to generate captions in real-time.



Demonstration of real-time AI captioning within the VE



Raycasting elements via multiple cameras to keep track of what the user is seeing

Detailed paintings and 3D artifacts were sourced and placed within the VE. Next, we were able to observe which artwork was being viewed by the user via raycasting. Then, the visual data of that artwork was sent to our AI and analyzed to generate a brief description (caption) of the artwork. Features such as these improve accessibility of artworks for individuals of all abilities.

Conclusions and Future Steps

- With increasingly efficient AI algorithms, specific applicable datasets, and/or more advanced computer hardware, accurate live AI caption generation would be more practical.
- Training the AI on a larger and/or more applicable dataset will improve the quality of the captions.
- Rebuilding and implementing elements from the deprecated SeeingVR Toolset (e.g., magnification, object-outlines, text-to-speech, etc.) will further improve accessibility of the VE and artworks.
- User studies would be beneficial in better adapting such toolsets and VEs to users of all abilities.

The Research Poster for "Artificial Intelligence and the Arts: Towards Accessible Learning Spaces in Virtual Reality"
(Click the picture for higher resolution)



Software Demonstration of "AI and the Arts: Towards AI-G..."




BROWN
Computer Science

and

Google Research present



exploreCSR 2021-2022:
Socially-Responsible AI for Computational Creativity

Watch on  YouTube



Above is a gallery of my trip to Brown University in which my research project placed 3rd among many other innovative projects presented at the symposium. For more information, please see my summary page, linked above.

I hope to continue pursuing research, education, and teaching in the field of computer science. I have a passionate and demonstrated career in this already as an instructional designer, instructor, and XR researcher. I find it essential that LGBTQ+ individuals such as myself are represented in science and academia. I currently pursue multiple research projects in the areas of XR, education, and AI, in addition to working in many educational roles. I find teaching to be one of the most rewarding experiences. Helping others not only in proficiency but also honing their ability to see beauty and simplicity in STEM feels like I have opened an entirely new sense for them, making this world a much better place.

Computing is the backbone of modern society. Pursuing an education in the field of computer science allows me to tackle real-world problems in ways that are not possible in many other majors. When the COVID-19 Pandemic struck in 2020, I was an Instructional Design Intern at my University. Suddenly, we needed to take nearly every course and convert it into a distance learning format. My background in web design and education allowed me to contribute a great deal to this endeavor.