Xinyun Cao

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Research Interest

I have extended experience (2+ years) working in **Mixed Reality** and **Accessibility** research. I am interested in developing **multi-modal, AI-driven** tools and systems to make mixed reality and immersive 3D environments more accessible. I conduct evaluations in both **qualitative and quantitative** methods, and strive to support **further deployment** to achieve greater impact for the community.

Education

PhD - University of Michigan, Ann Arbor
2023/8-now
❖ Program: Computer Science Engineering, Advanced to Candidacy
❖ Cum. GPA: 3.916 / 4.0000
❖ Advisor & Lab: Prof. Dhruv Jain, Soundability Lab
❖ Graduate Coursework: Advanced Accessibility, Human Computer Interaction, Machine Learning, Immersive Media, AI in Education, Engineering Interactive Systems, Advanced Compiler.

Bachelor's - University of California, Berkeley
2018/8-2022/5
❖ Majors: Computer Science, Cognitive Science. Minor: Music
❖ Cum. GPA: 3.972 / 4.000.
❖ Honors in Computer Science, High Distinction in General Scholarship.
❖ Honors Thesis: Split Embodiment Interactions, Mentored by Bjoern Hartmann and James Smith.
❖ Honors to Date in 7 out of 7 semesters, Dean's List in 4 out of 7 semesters.

Publications

RAVEN: Realtime Accessibility in Virtual ENvironments for Blind and Low-Vision People
❖ Authors: ***Xinyun Cao***, Kexin Phyllis Ju, Chenglin Li, Venkatesh Potluri, Dhruv Jain.
❖ Summary: Developed and evaluated RAVEN, a **generative AI-powered** system enabling **blind and low-vision** users to query and modify **3D virtual environments** through natural language, integrating accessibility research, system design, and user studies with BLV participants to assess usability, reliability, and trust.
❖ Full manuscript under review. Preliminary work published as Late Breaking Work in CHI 2025 and accepted as demo in ASSETS 2025.

SoundModVR: Sound Modifications in Virtual Reality to Support People who are Deaf and Hard of Hearing
❖ Authors: ***Xinyun Cao***, Dhruv Jain.

❖ Summary: Designed and implemented **18 VR sound modification tools** to improve accessibility for **deaf and hard-of-hearing** users, evaluated them through user studies in diverse VR scenarios, and built a Unity toolkit validated by **developers** - demonstrating expertise in VR system design, accessibility research, and iterative evaluation.
❖ Published as technical paper and poster in ASSETS 2024 and as demo in UIST 2024.

Dual Body Bimanual Interaction in Immersive Environments
❖ Authors: James Smith, ***Xinyun Cao***, Bjoern Hartmann.
❖ Summary: Conducted an **empirical VR study** on dual-body bimanual coordination, designing interaction tasks, analyzing user strategies, embodiment, and body schema, and generating insights into **how people control multiple virtual bodies simultaneously**.
❖ Published as paper in DIS 2023.

Teaching Experience

Graduate Student Instructor - User Interface Development, Human Computer Interaction, Human AI Interaction, University of Michigan
2024/8-now
❖ Guided groups of students on their open-ended final project, led them through qualitative and quantitative evaluations of their project prototypes.
❖ Teach guest lecture about Virtual Reality.
❖ Taught discussion, hosted office hours, and answered questions on the class forum.
❖ Arranged logistics of sections, exams, and quizzes, including publishing, grading, and accommodation.

Undergraduate Student Instructor - Intro to Computer Graphics, UC Berkeley
2022/1-2022/5
❖ Taught discussion sessions of 10+ students and hosted exam review sessions.
❖ Answered questions during office hours and on the class forum.
❖ Helped develop class projects about Rasterization, Mesh Geometry, and Particle Simulation.
❖ Reviewed and scored open-ended final projects.

Research Experience

PhD Student - University of Michigan, Soundability Lab
2023/8-now
❖ Mentored by Prof. Dhruv Jain.
❖ Conducted Related Work searches on different topics regarding sound and visual accessibility and mixed reality.
❖ Made tools in Unity, built scenarios in Meta Quest to evaluate them, and open-sourced the tools on GitHub.
❖ Conducted user studies, and performed interviews and thematic analysis.
❖ Produced work that was published in top HCI and Accessibility conferences like ASSETS, CHI, UIST, DIS.

Undergraduate Researcher - Berkeley Institute of Design
2021/1-2022/5

❖ Mentored by Prof. Bjoern Hartmann and Ph.D. Student James Smith.
❖ Explored how VR can improve the prototyping process by reading related papers.
❖ Participated in the Engineering Design Scholar program and implemented VR programs to explore how modifying VR avatars can lead to design insight.
❖ Help proposed Dual Body Bimanual Interaction in VR, wrote a VR program in Unity 3D as an artifact, and conducted user studies. Finished an Honors Thesis and a research paper submitted to DIS.

Undergraduate Researcher - Tetrachromacy
2021/8-2021/12
❖ Mentored by Ren Ng for the Computational Color graduate-level course.
❖ Worked on a project analyzing the mathematical and biological model of tetrachromacy to study its color space.
❖ Proposed a new color-matching pipeline and used PCA and hyperspectral dataset to find the basis for a Four Color Opponency system.

Undergraduate Researcher - ROAR VR
2020/9-2020/12
❖ Mentored by Allen Yang for the Immersive Computing and Virtual Reality graduate-level course.
❖ Worked on the ROAR (Robot Open Autonomous Racing) VR project.
❖ Implemented and tested localization functionalities for a small car with an intel Realsense camera using OpenCV and Python.
❖ Built a virtual city using C# (Unity) to overlap images collected by car mount cameras, and export them into VR.

Leadership Service

President/ Computer Science Engineering Graduate Student organization
2024/5-2025/5
❖ Work as a connection between the CSE department, officer board, and CSE graduate students.
❖ Represent the CSE graduate student body in events like the CSE national advisory board meeting.
❖ Host events with industry, the CSE department, and other departments and organizations.

External VP, Internal VP, Social Chair/ Upsilon Pi Epsilon (CS Honor Society)
2019/12-2022/5
❖ Planned and organized social events to foster the CS community. Trained new members.
❖ Held academic office hours, academic advising sessions, resume critiques, and mock interviews.

Honors and Scholarships

Berkeley EECS Honors Program - Class of 2022
Berkeley Engineering Design Scholar - Summer 2021 Cohort
Upsilon Pi Epsilon (Computer Science Honor Society) - Initiated Fall 2019

Professional Experience

Software Engineer (Mobile) - NimbleRX
2022/8-2023/5
❖ Developed a patient-facing mobile app for a pharmacy platform, accumulating 200k+ downloads.
❖ Utilize Dart (Flutter), HTML API and various Flutter packages like Retrofit to optimize code and communicate with other systems.
❖ Worked with Content Management Systems like Sanity and Mux to store and retrieve client facing content.
❖ Implemented the design of a new navigation mechanism for the app using GoRouter.
❖ Participated in design review and code review, produced demo and organized playtest. Gained working knowledge with the software development lifecycle.

Software Engineer - Pocket Gems (Adventure Chef)
2021/6-2021/12
❖ Developed game features in C# (Unity) and implemented gameplay debug tools for developers.
❖ Migrated a large number of parameters from Unity Editor to CSV files automatically using editor scripting.
❖ Made builds in Jenkins, participated in company playtests, and gave constructive feedback.

Software Developer - Geopogo
2020/4-2020/8
❖ Implemented User Interface, login, and session system of a cooperative VR building software using C# (Unity).
❖ Incorporated Identification system with Amazon Cognito and multiplayer network using Amazon GameLift.

Personal Projects

Designer, Developer - Gesture-Music Interface
2020/11
❖ Made a hand gesture-music interface built-in Python and Max MSP.
❖ Implemented with OpenCV computer vision module and PyOSC port.

Designer, Developer - Cognitive Training in VR Environment
2019/8-2020/5
❖ Researched by reading paper about Cognitive Training for Traumatic Brain Injury patients.
❖ Developed a Dichotic Listening Training Program in VR using C# (Unity).

Developer - GAN Image Noise Cancellation
2019/5-2019/8
❖ Learned about different Machine Learning deep neural network structures.
❖ Designed and implemented a model using a Generative Adversarial Network in Python using Tensorflow.

❖ Generated a data set, trained the model, and achieved a product that performs noise cancellation on images.

Skills

Research: Literature review, Human-centered design, Qualitative and quantitative study, Thematic analysis.
Programming: Python, Dart, Java, C#, C++, C.
Technology: Git, Unity, OpenCV, Tensorflow, Maya, Adobe Audition, Max MSP.
Language: Chinese (Native), English (Fluent)