# Xinyun Cao

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## Research Interest

My research focuses on **interactive** and **agentic systems** for **multi-modal accessibility** in **immersive and 3D** environments. I conduct mixed-methods work, where I **design, build, and evaluate** end-to-end systems using a combination of technical implementation, rigorous quantitative study, and human-centered qualitative analysis.

## Education

PhD - University of Michigan, Ann Arbor (Cum. GPA: 3.916 / 4.0000) Aug, 2023-May 2028 (expected)

❖ Program: Computer Science Engineering, Advanced to Candidacy
❖ Advisor & Lab: Prof. Dhruv Jain, Soundability Lab
❖ Graduate Coursework: Human Computer Interaction, Machine Learning, Immersive Media, AI in Education, Engineering Interactive Systems, Advanced Accessibility, Advanced Compiler.

Bachelor's - University of California, Berkeley (Cum. GPA: 3.972 / 4.000) Aug, 2018-May, 2022

❖ Program: Computer Science, Cognitive Science. Minor: Music
❖ Honors in Computer Science, High Distinction in General Scholarship.
❖ Honors Thesis: Split Embodiment Interactions, Mentored by Bjoern Hartmann and James Smith.

## 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. The system is built in **Unity** and powered by **GPT-4o**.
❖ Published paper at CHI 26. Preliminary work published as late breaking work in CHI 2025, and a demo in ASSETS 2025, which won the **Best Demo Award (1st of 22)**.

PreView: Rehearsing Real Routes in VR to Support Independent Navigation with Low-Vision

❖ Authors: Yotam Sechayk*, ***Xinyun Cao****, Dhruv Jain†, Takeo Igarashi† (*Equal contribution, †Equal advising).
❖ Summary: Developed PreView, a system that turns real 360-degree route imagery into a **VR** rehearsal of a route that highlights landmarks, layers an imagery-derived **soundscape**, and answers questions through an **AI agent** grounded in the user's current view. Developed in **WebXR** using HTML and Python, and powered by **Gemini Live API**.
❖ Preliminary work accepted to UIST 26 as Demo.

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 open sourced a **Unity** toolkit evaluated 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***, Adolfo G. Ramirez-Aristizabal, Bjoern Hartmann.
❖ Summary: Conducted an **empirical VR study** on **dual-body bimanual coordination**, designing interaction tasks, analyzing user strategies, embodiment, and body schema. The interaction methods are developed in **C# (Unity 3D)**.
❖ Published as paper in DIS 2023.

## Manuscript

AutoTailor: Automatic, User-Aligned Capability Selection and Adaptation for Web Agents

❖ Authors: ***Xinyun Cao***, Adriana Szekeres, Fazle Faisal.

❖ Summary: Developed AutoTailor, a **meta-agentic framework** for constructing and maintaining a compact set of trajectory-derived Model Context Protocol (**MCP**) APIs for **Web Agents**. Evaluations with WebArena show that our combined workflow of static filtering and dynamic reselection reduce average total request-token cost by 57.8% and latency by 29.4%.

❖ Manuscript Submitted. See ArXiv link for details.

## Employment Experience

Research Intern - Microsoft Research — June 2026 - Aug 2026

❖ Mentor - Fazle Faisal

❖ Project - AutoTailor: Automatic, User-Aligned Capability Selection and Adaptation for Web Agents

❖ Developed and evaluated a novel agentic framework that improves web agent efficiency and user alignment, resulting in reduced average total request-token cost by 57.8% and latency by 29.4%.

❖ Presented the work in cross-disciplinary contexts, including with HCI researchers and company-wide presentations.

❖ Completed and submitted an academic research paper, currently under review. (See Manuscript section for details)

Graduate Researcher - University of Michigan, Soundability Lab — May 2023 - present

❖ Led multiple research agenda designing, developing, and studying multi-modal, AI-driven (e.g., gpt API) systems for virtual 3D accessibility using mixed research methods, including error analysis, interpreting statistical results, design probes, qualitative user studies, and thematic analysis. Collaborated with multi-disciplinary teams of students and mentors.

❖ Published and presented research papers, demos and posters in top HCI and Accessibility conferences, including CHI, UIST, and ASSETS, and open-sourced systems. (See Publications section for details)

Graduate Student Instructor, University of Michigan — Aug, 2024-present

Courses: *UI Development, HCI, Human AI Interaction, Elementary Programming Concepts, Human-Centered SWE*

❖ Guided 30+ groups of students on their open-ended final project, led them through qualitative and quantitative evaluations of their project prototypes.

❖ Developed a long-term course project in Python, focused on the pandas library and machine learning concepts.

❖ Led weekly discussion sections of 10+ students. Taught guest lectures about Virtual Reality.

❖ Arranged logistics of sections, exams, and quizzes, including publishing, grading, and accommodation.

Software Engineer (Mobile) - NimbleRX — Aug, 2022-May, 2023

❖ Developed a patient-facing mobile app for a pharmacy platform, accumulating 200k+ downloads.

❖ Utilized Dart (Flutter), HTML API and various Flutter packages like Retrofit to achieve code optimization.

❖ 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 — June, 2021-Dec, 2021

❖ Developed game features in C# (Unity) and implemented gameplay debug tools for developers.

❖ Migrated parameters from Unity Editor to CSV files automatically using editor scripting.

❖ Deployed builds in Jenkins, participated in company playtests, and gave constructive feedback.

## Leadership Service

❖ President/ Computer Science Engineering Graduate Student organization — May, 2024-May, 2025

❖ External VP, Internal VP, Social Chair/ Upsilon Pi Epsilon (CS Honor Society) — Dec, 2019-May, 2022

## Honors and Scholarships

ASSETS 2025 Audience Choice Best Demo Award
Berkeley EECS Honors Program - Class of 2022
Upsilon Pi Epsilon (Computer Science Honor Society) - Initiated Fall 2019

## Skills

Programming: Claude Code, Copilot, C#, Python.
Technology: Git, Unity, OpenCV, Tensorflow, Pytorch, ASR, Maya, Adobe Audition, Max MSP.