Zhaohan(Chester) Pan

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Research Interests

- Human-Computer Interaction
- Spatial Computing and Augmented Reality Interfaces
- 3D Computer Vision
- Multi-modal, Embodied, Ubiquitous Interaction
- Computational Design & Fabrication

Education

Stanford University, M.S. in Mechanical Engineering   Stanford, CA
GPA: 3.8/4.0   Sep. 2023 – Jun. 2025
Depth in Automatic Controls, Breadth in Data Science

University of Washington, B.S. in Civil Engineering, Magna Cum Laude   Seattle, WA
GPA: 3.9/4.0   Sep. 2020 – Mar. 2023

Stonybrook University   Stonybrook, NY
Civil Engineering   Aug. 2018 – May 2020

Affiliations

[0] CRAFT^2 Lab | Director, Principal Investigator
SHAPE Lab ↗ | Researcher   Stanford, CA
Boeing Advanced Research Collaboration ↗ | Student (Former)   Seattle, WA
The illimited Lab ↗ | Researcher (Former)   Seattle, WA

Publications

[4] rulAR: Spatial Measurement in Indoor Scenes via Intelligent Labeling and Immersive Visualization
Pan, Zhaohan
In press: *ACM International Conference on Human-Engaged Computing (ICHEC) '25*

[3] mARker: hybrid-interfaced spatial sketching via iPad AR, Apple Pencil, and an instantly crafted tracker
Pan, Zhaohan
IEEE International Symposium on Mixed and Augmented Reality (ISMAR) '25 ↗

[2] karP: an experiential prototype for Kinesthetic Augmented Reality on mobile — Playful, Portable, Producible
Pan, Zhaohan, Ge, G., Lu, H., Meng, Z., Wu, H., Yang, Q., Liang, J.
ACM Designing Interactive Systems Conference (DIS) '25 ↗

[1] Tangible Compass: An Affordable and DIY-Friendly Handheld Kinesthetic Device for Haptic Accessible Navigation
Pan, Zhaohan, Ge, G., Jiang, Z., Meng, Z., Wang, L., Wu, H., Wang, L., Liang, J., Wen, H.
ACM International Symposium of Chinese CHI (CHCHI) '24 ↗

Selective Academic Projects

[4] rulAR   China
                                                                   Sep. 2025 – Present

- Developed on Apple Vision Pro, rulAR highlights low-manual to zero-manual task operation on an intelligent, scene-aware spatial interface: it intelligently labels critical points in the scene for selection, or automatically delivers comprehensive visualized dimensions immersively.
- A robust backend pipeline of geometric scene reconstruction and rendering is implemented based on PlanDetection data and multi-stepped customize optimization

algorithms.

- rulAR presents a re-imagination of indoor digital measurement paradigm that is suitable for architectural design and engineering construction context.

Cognitive POMDP modeling for sonifing graph exploration
<div align="right">Stanford, CA
Mar. 2025 – Present</div>

- The project aims to investigate how BLV users explore sonified graphs, and use these behavioral patterns to train cognitive models that can inform future interface guidance strategies. Our modeling approach leverages anti-reinforcement learning principles, using data-driven fitting and hyperparameter tuning based on specific decision-making processes (e.g., Gaussian Process).
- I built an iPad study platform with a separate Python backend for real-time graph updates, interaction logging, and visualization, allowing researchers to fully monitor participants' tasks.
- On plan for CHI '26 EA submission.

[3] Multi-fiducial markers tracking spatial sketching on iPad ecosystem
<div align="right">Stanford, CA
Apr. 2025 – Jun. 2025</div>

- The project aims to bring hardware standardization and ease-of-access of spatial sketching by developing a tool on iPad ecosystem, with (1) minimized accessory fabrication setup and (2) following Apple's Human Interface Guideline for natural gesture interactions.
- I designed a multi-fiducial marker tracking cube and leveraged OpenCV framework for basic stylus pose tracking. Several frames-window filters and one-euro filters are used to stabilize and smooth the tracking-to-render pipeline. Interactive gestures are programmed with iPad and Apple Pencil's APIs.

Defect Detection via 3D Point Clouds
<div align="right">Stanford, CA
Apr. 2025 – Jun. 2025</div>

- We propose a novel method for anomaly detection, based on a combination of unsupervised learning and spatially aware patch comparison.
- We use contrastive learning to train a neural net-based feature extractor that learns rich features of patches. We employ an algorithm that effectively detects anomalies by comparing features of these patches in a spatial-aware manner.

[2] karP
<div align="right">China
Jan. 2025 – Apr. 2025</div>

- karP is an experiential prototype for the concept of integrating kinesthetic systems with MAR, embodied our vision for kinesthetic design in MAR that is playful, portable, and producible.
- karP's device features a 2-DoF manipulandum-exoskeleton design supporting kinesthetic I/O for striking gestures. karP's iOS App acts as both the visual-spatial interface and spatial tracker, coordinating with the device to control avatar interactions in virtual environments.

A 3D-games AI Assistant for BLV Players
<div align="right">Stanford, CA
Jan. 2025 – Mar. 2025</div>

- We designed "echo" to enhance BLV user's perception in 3D virtual environment, specifically in gaming context. We used multimodal approach by applying spatial audio and designed kinesthetic feedback joy-sticks, helping BLV users perceive path clearance and turning angles.

[1] Tangible Compass
<div align="right">China
Aug. 2024 – Nov. 2024</div>

- We introduce Tangible Compass, a handheld haptic device as an add-on for smartphone navigation functions, providing force guidance in various accessible navigation scenarios.
- Its functionality is achieved through smartphone sensor data streaming, scenario-based algorithmic force rendering, and a compact one Degree of Freedom (1-DoF) kinesthetic device transmitting forces.

Calligraphy Training Device
<div align="right">Stanford, CA
Apr. 2024 – Jun. 2024</div>

- Our team developed an innovative calligraphy training device incorporating haptic feedback technology.
- The hardware setup features a pantograph mechanism that allows free movement of the pen across a 2D plane, and our software utilizes a Python-based pipeline to

generate dynamic feedback aligned with digital stroke patterns.

Presentations & Invited Talks

[4] ACM International Conference on Human-Engaged Computing	Singapore (Nov. 2025)
[0] Fab Lab Asia Network 2025	Shenzhen, CN (Nov. 2025)
[3] IEEE International Symposium on Mixed and Augmented Reality	Daejeon, KR (Oct. 2025)
[2] ACM Designing Interactive Systems Conference	Funchal, PT (Jul. 2025)
[1] ACM International Symposium of Chinese CHI	Shenzhen, CN (Nov. 2024)
[1] 2024 STEM Expo at UW (Mentor)	Seattle, US (Nov. 2024)
[1] Fab City Challenge China, demo talk in Shenzhen Library	Shenzhen, CN (Aug. 2024)
[0] 2 in 1 Art Studio	Guiyang, CN (Jul. 2024)
[0] China Construction Bank, Guiyang Branch	Guiyang, CN (Jul. 2024)
UW Undergraduate Research Symposium 2024 (Mentor)	Seattle, US (May 2024)
UW Undergraduate Research Symposium 2023 ☑	Seattle, US (May 2023)
Boeing Annual Capstone ☑	Everett, US (May 2022)

Employment History

FCC High School Mentor	China
Litchee Lab	Nov. 2025 – Present
Professional staff, full time	Seattle, WA
Department of Civil & Environmental Engineering, UW	May. 2023 – Jul. 2023
Student assistant, part time	Seattle, WA
William E. Boeing Department of Aeronautics & Astronautics, UW	Sep. 2022 – Mar. 2023
Undergraduate research assistant, part time	Seattle, WA
Department of Civil & Environmental Engineering, UW	Jun. 2022 - Sep. 2022

Outreach & Tutoring

Fab City Challenge High School, 2025	Mentor	China
• Mentoring Accessible Personal Fabrication project.	Present
[1] Fab City High School, 2024 ☑	Mentor	Shenzhen, CN
• Mentoring Tangible Compass project.	Aug. 2024

Technical Skills

Programming Languages: Python, C++, C#, Swift, Java, Matlab

Frameworks: iOS/iPadOS/visionOS development, ARKit, RealityKit OpenCV, Arduino, Pytorch, git, LaTeX, gcode

Software Tools: Reality Composer Pro, Blender, Unity, Solidworks, OpenSCAD, Figma

Other (Special Skills): human subject research, tutoring robotic haptics with Hapkit ☑ framework, building VR device

Scholarship & Honors

Fred H. Rhodes Endowment Scholarship	Year 2021
Wan-Shen & Hai-Tsao Huang Endowed International Scholarship	Year 2020
Dean's List at University of Washington	8 quarters, 2020 - 2023
Dean's List at Stonybrook University	3 semesters, 2019 - 2020