Shih-Yu (Leo) Ma

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Research Interests

Human-Centered AI & Embodied Intelligence, Multimodal Interaction, Robot Learning & Teleoperation, Extended Reality (XR), and Haptics

Education

University of Colorado Boulder Sep 2024 – Present
PhD Student in Computer Science

- Advisors: Prof. Tom Yeh and Prof. Ellen Do.
- Institute of Cognitive Science Triple PhD Program: Computer Science, Cognitive Science, and Neuroscience.

National Taiwan University of Science and Technology Sep 2020 – June 2023
Master of Design in Information Design

- Advisor: Prof. Neng-Hao Yu.
- Thesis: Reducing Cybersickness in Virtual Reality Driving Experiences Using Head-Mounted Vibrational Feedback Device. Co-advisor: Prof. Mike Y. Chen.

National Taiwan University of Science and Technology Sep 2016 – June 2020
Bachelor of Science & Design

- Double major: Electrical Engineering and Industrial Design.

Honors & Awards

Figueroa Family Fellowship ($1,500) 2026
University of Colorado Boulder

CSEN Annual Research Expo — Top 6 Winner 2026
Department of Computer Science, University of Colorado Boulder

Selected Academic Partner, Project Aria Research Partnership Program Sep 2025
Meta (Project Aria)

Selected as an academic research partner with access to the Project Aria Research Kit (ARK) and associated research tools.

Student Travel & Research Award ($800) 2025
Institute of Cognitive Science, University of Colorado Boulder

5G+ Industry Rising Stars Set Sail Scholarship 2021
Taiwan Institute for Information Industry

Full-time Graduate Research Scholarship 2020
National Taiwan University of Science and Technology, Department of Design

Young Pin Design Award in Social Design 2020
Taiwan Design Research Institute

Parallel Vacation — Industrial Design graduation project.

Research & Industry Experience

Intelligent Robotics Vision Intern Jan 2026 – Sep 2026
Industrial Technology Research Institute (ITRI), TW

- Developed a real-time teleoperation pipeline for dexterous robotic hands using MANUS motion-capture gloves, including hand-pose retargeting and robot-control integration.
- Built and integrated a ROS 2 and Meta Quest interface for remote teleoperation of the SO-101 robotic arm, enabling interactive control and demonstration-data collection.
- Trained, evaluated, and deployed machine-learning and robot-learning models in NVIDIA Isaac Sim/Isaac Lab using Run:ai for scalable GPU experimentation.

- Analyzed robot-learning model behavior with explainable-AI methods to identify failure modes and translate findings into algorithmic and system-level improvements.

Visiting Researcher Feb 2023 – Aug 2023
University of Colorado Boulder, Center for the Brain, AI, and Child, CO

- Led the design of a mixed-reality driver-warning study in Unity, including a 30-minute experimental protocol with fNIRS measurements to investigate cognitive and behavioral responses.
- Led development of a vibrotactile neurofeedback prototype using Python and ESP32 to communicate neural activity to Blind and Low-Vision users, informed by stakeholder interviews at the Colorado Center for the Blind.

Graduate Research Assistant Sep 2020 – Aug 2023
National Taiwan University of Science and Technology, Intelligent User Interfaces (IUI) Lab, TW

- Designed, developed, and evaluated head-mounted vibrotactile systems for virtual-reality driving across three prototype generations and a 70-participant user study; feedback significantly improved perceived realism, immersion, and enjoyment ($p < .01$).
- Redesigned the wearable hardware and custom PCB, reducing device weight by approximately 80% and volume by 70% relative to the previous prototype.
- Developed the Unity, Arduino, and custom-electronics stack used to reproduce inertia-related physical sensations and investigate cybersickness reduction in VR driving.
- Conducted 20 on-site stakeholder interviews and translated more than 1,000 paper-based maintenance instructions into structured digital workflows for an industrial maintenance system.

Mixed Reality Developer Dec 2021 – Sep 2022
Corma New Media, TW

- Developed an AR-assisted industrial maintenance application for HoloLens, iPad, and Android, including step-by-step guidance, in-situ instruction editing, device catalog management, and object tracking.
- Designed and implemented a VR career-exploration application for people with disabilities in collaboration with the New Taipei City Government.
- Developed an MR driver-assistance system for bus drivers that received the People's Choice Award and Best Presentation Award among 52 finalist projects.

Publications

Editing Reality: Designing In-Situ Co-Creation with Generative AI in Mixed Reality.
S. Che-Chuan Weng, **S.-Y. Ma**, S. Reinig, P. Kadam, A. Y. Zhao, A. Banić, R. Suzuki, and E. Yi-Luen Do.
ACM Designing Interactive Systems Conference (DIS 2026). DOI: 10.1145/3800645.3813087

CrowdForge: Effects of Audio and Visual Audience Participation Modalities on Agency, Collaboration, and Engagement in AI-Mediated MR Performances.
T. Hopkins, **S.-Y. Ma**, Z. Trafton-Hancock, E. Yi-Luen Do, and L. Turchet.
IEEE International Symposium on the Internet of Sounds (IS2 2026). *Accepted; forthcoming.*

MR-DAW: Towards Collaborative Digital Audio Workstations in Mixed Reality.
T. Hopkins, **S.-Y. Ma**, S. C.-C. Weng, M.-Y. Pai, E. Yi-Luen Do, and L. Turchet.
IEEE International Symposium on the Internet of Sounds (IS2 2025). DOI: 10.1109/IS264627.2025.11284566

Effects of Limited Field of View on Musical Collaboration Experience with Avatars in Extended Reality.
S. C.-C. Weng, T. Hopkins, **S.-Y. Ma**, A. Banic, and E. Yi-Luen Do.
IEEE International Symposium on the Internet of Sounds (IS2 2025). DOI: 10.1109/IS264627.2025.11284617

BrAIn Jam: Neural Signal-Informed Adaptive System for Drumming Collaboration with an AI-Driven Virtual Musician.
T. Hopkins, R. Sun, S. C.-C. Weng, **S.-Y. Ma**, J. Crum, L. Hirshfield, and E. Y.-L. Do.
Frontiers in Computer Science, 7, Article 1570249. DOI: 10.3389/fcomp.2025.1570249

Investigating the Effects of Limited Field of View on Jamming Experience in Extended Reality.
S. C.-C. Weng, T. Hopkins, **S.-Y. Ma**, C. Tobin, A. Banic, and E. Yi-Luen Do.
IEEE International Symposium on Mixed and Augmented Reality (ISMAR 2023) Adjunct. DOI: 10.1109/ISMAR-Adjunct60411.2023.00107

DrivingVibe: Enhancing VR Driving Experience using Inertia-Based Vibrotactile Feedback around the Head.
N.-H. Yu, **S.-Y. Ma**, C.-M. Lin, C.-A. Fan, L. E. Taglialatela, T.-Y. Huang, C. Yu, Y.-T. Cheng, Y.-C. Liao, and M. Y. Chen.
ACM International Conference on Mobile Human–Computer Interaction (MobileHCI 2023). DOI: 10.1145/3604253

Exploring Mixed-Reality for Enhancing Driver Warning Systems: A Preliminary Study on Attention-Shifting Methods and Hazard Perception.
S.-Y. Ma, N. R. Brady, X. Han, N.-H. Yu, and T. Yeh.
ACM International Conference on Automotive User Interfaces and Interactive Vehicular Applications (AutomotiveUI 2023). DOI: 10.1145/3581961.3609868

Alice in Gravityland: Augmenting Gravity Experiences with Around-the-Head Vibrotactile Feedback and Illusory Tactile Motion.
L. E. Taglialatela, C.-J. Chang, S.-W. Chen, Y.-H. Chang, C.-M. Chen, Z.-H. Yang, T.-M. Lin, **S.-Y. Ma**, N.-H. Yu, and M. Y. Chen.
ACM SIGGRAPH 2023 Immersive Pavilion. DOI: 10.1145/3588027.3595591

InertiaVibe: Low-Fidelity Simulation of Inertia using Head-Mounted Vibrotactile Feedback to Reduce Cybersickness and Enhance VR Experience.
S.-Y. Ma, C.-M. Lin, C.-W. Wang, N.-H. Yu, and M. Y. Chen.
ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the ACM International Symposium on Wearable Computers (UbiComp/ISWC 2022) Adjunct. DOI: 10.1145/3544793.3561319

Exploring the Experience of Traveling to Familiar Places in VR: An Empirical Study Using Google Earth VR.
P.-K. Hung, R.-H. Liang, **S.-Y. Ma**, and B.-W. Kong.
International Journal of Human–Computer Interaction. DOI: 10.1080/10447318.2022.2114141

Demos, Posters, & Performances

CrowdForge: AI- and MR-Mediated Audience Participation in Musical Performance
T. Hopkins, **S.-Y. Ma**, Z. Trafton-Hancock, E. Yi-Luen Do, and L. Turchet.
IEEE International Symposium on the Internet of Sounds (IS2 2026) — Performance / Music Installation; accepted for presentation

Feel My Focus: Gaze-Triggered Digital Twin Creation for Remote Collaboration
S.-Y. Ma, S. Che-Chuan Weng, M.-Y. Pai, T. Yeh, and E. Yi-Luen Do.
IEEE International Conference on Artificial Intelligence and eXtended and Virtual Reality (AIxVR 2026) — Demo

From Flat Screens to Immersive Space: Rethinking Multimodal Learning of Complex Systems
S.-Y. Ma, S. S. Bae, E. Yi-Luen Do, T. Yeh, and E. Bradley.
Taiwan Human–Computer Interaction Symposium (TAICHI 2025) — Poster

MRDAW: Towards Collaborative Digital Audio Workstations in Mixed Reality
S.-Y. Ma, T. Hopkins, M.-Y. Pai, S. C.-C. Weng, E. Yi-Luen Do, and L. Turchet.
Taiwan Human–Computer Interaction Symposium (TAICHI 2025) — Demo

Leadership & Service

Invited Speaker, CU Boulder Datathon 2025 Nov 2025
University of Colorado Boulder, CO

- Delivered a hands-on workshop on computer-vision fundamentals, dataset design, and model development, including classification, detection, and segmentation workflows.
- Guided participants in building custom datasets and training and deploying computer-vision applications using LandingLens and Python APIs.

AI Tutor & Workshop Instructor, AI by Hand Jul 2025 – Aug 2025
Global (Online)

- Designed and taught 18 math-first deep-learning workshops covering neural-network fundamentals and Transformer architectures.
- Developed coding-free instructional exercises illustrating matrix operations, neural-network components, attention mechanisms, and model training.

Chair Aug 2020 – Aug 2021
OpenHCI 2021 Workshop

- Led a 53-member organizing team for a student-led interdisciplinary HCI workshop involving 40 participants and attracting more than 500 attendees to the final exhibition.
- Coordinated partnerships with academic, industry, and government organizations, including the American Innovation Center and the American Institute in Taiwan.
- Oversaw organizational teams responsible for programming, human resources, information technology, event hosting, and media production.

Technical Teaching Assistant Aug 2018 – Aug 2019
OpenHCI 2019 Workshop

- Mentored interdisciplinary teams through the Double Diamond design process and supported rapid prototyping using 3D printing, laser cutting, electronics, and fabrication tools.
- Provided hardware and software development guidance to a team whose project received the Best Technical Award among five finalist projects.

Teaching

Graduate Teaching Assistant Sep 2024 – Present
University of Colorado Boulder, CO

- CSCI 5722 Computer Vision: Developed instructional materials on core computer-vision methods and designed PyTorch-based laboratory assignments and course projects involving data pipelines, model implementation, training, and evaluation; provided technical mentoring through office hours.
- CSCI 2270 Data Structures: Developed instructional materials and programming exercises on fundamental data structures; designed assignments and projects; held office hours and provided individualized technical support.

Graduate Teaching Assistant Feb 2021 – Dec 2022
National Taiwan University of Science and Technology, TW

- DT2634 Creative Programming: Supported students in developing interactive projects with Processing; managed assignments through a customized GitHub Classroom workflow.
- DT5423 Interactive Storytelling in Mixed Reality: Supported Unity-based mixed-reality development and co-curated the final student exhibition, which attracted more than 100 attendees.

Technical Skills

Robotics & Simulation: ROS 2, NVIDIA Isaac Sim, Isaac Lab, robot teleoperation, hand-pose retargeting, demonstration data collection
Machine Learning & Robot Learning: PyTorch, multimodal learning, representation learning, computer vision, model training and evaluation, explainable AI (XAI)
XR & Prototyping: Unity, Meta Quest, Project Aria, HoloLens, MANUS gloves, Arduino, ESP32, PCB prototyping
Programming: Python, C++, C#, MATLAB

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