Tsung-Chi Lin, Ph.D.

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Johns Hopkins University
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Research Overview

My research focuses on advancing human-robot interaction to enable seamless integration of robots into people's everyday lives. I develop human-centered interfaces that empower users with diverse abilities and backgrounds to interact effortlessly with robots of varying capabilities in real-world settings. My scientific work contributes to the future of adaptive, collaborative, and large-scale coexistence of robots.

Current Position

Postdoctoral Fellow 2023–Present
Johns Hopkins University, Department of Computer Science Baltimore, MD, USA
Malone Center for Engineering in Healthcare
Intuitive Computing Laboratory, PI: Chien-Ming Huang

Education

Ph.D. in Robotics Engineering 2018–2023
Worcester Polytechnic Institute Worcester, MA, USA
Advisor: Jane Li

M.S. in Biomedical Engineering 2012–2014
National Taiwan University Taipei, Taiwan
Advisor: Tung-Wu Lu

B.S. in Mechanical Engineering 2008–2012
Yuan Ze University Taoyuan, Taiwan

Prior Employment

Postdoctoral Fellow 2023
Worcester Polytechnic Institute, Robotics Engineering Department Worcester, MA, USA
Robots and Sensors for Human Well-being (ROSE-HUB), PIs: Jing Xiao, Jane Li

Associate Researcher 2014–2018
Industrial Technology Research Institute, Service Robot Department Hsinchu, Taiwan
Mechanical & Mechatronics Systems Research Laboratories

Awards and Honors

John C. Malone Postdoctoral Fellowship 2023
Johns Hopkins Malone Center for Engineering in Healthcare, USA

Postdoctoral Fellowship 2023
WPI Robotics Engineering, USA

Graduate Student Travel Award 2022
WPI Robotics Engineering, USA

Best Poster Award 2020
WPI Graduate Research Innovation Exchange (GRIE) poster competition, USA

The R&D 100 Award 2016
The R&D 100 Awards Committee and R&D Magazine, USA

Outstanding Research Award 2015
Industrial Technology Research Institute, Taiwan

Excellent Award 2015
Prospective Creative Competition, Industrial Technology Research Institute, Taiwan

Research Scholarships 2013–2014
Ministry of Science and Technology, Taiwan

Best Poster Award 2013
Annual Symposium on Biomedical Engineering & Technology, Taiwan

Excellent Award 2012
Creative Application of Solar Energy Competition, Ministry of Education, Taiwan

Publications

Journal Articles

[J5] **Tsung-Chi Lin**, Juo-Tung Chen, and Chien-Ming Huang. Understanding Whole-Body Robot Teleoperation Under Task Constraints. *IEEE Robotics and Automation Letters (in review)*, 2024.

[J4] **Tsung-Chi Lin**, Achyuthan Unni Krishnan, and Zhi Li. Perception and Action Augmentation for Teleoperation Assistance in Freeform Tele-manipulation. *ACM Transactions on Human-Robot Interaction*, 13(1):1-40, 2024.

[J3] **Tsung-Chi Lin**, Achyuthan Unni Krishnan, and Zhi Li. The Impacts of Unreliable Autonomy in Human-Robot Collaboration on Shared and Supervisory Control for Remote Manipulation. *IEEE Robotics and Automation Letters*, 8(8): 4641-4648, 2023.

[J2] **Tsung-Chi Lin**, Achyuthan Unni Krishnan, and Zhi Li. Perception-Motion Coupling in Active Telepresence: Human Behavior and Teleoperation Interface Design. *ACM Transactions on Human-Robot Interaction*, 12(3):1-24, 2023.

[J1] **Tsung-Chi Lin**, Achyuthan Unni Krishnan, and Zhi Li. Intuitive, Efficient and Ergonomic Tele-Nursing Robot Interfaces: Design Evaluation and Evolution. *ACM Transactions on Human-Robot Interaction*, 11(3):1-41, 2022.

Peer-Reviewed Full Conference Papers

[C8] **Tsung-Chi Lin**, Yichen Xie, and Chien-Ming Huang. Egocentric Control for Whole-Body Robot Teleoperation. In *2025 IEEE International Conference on Robotics and Automation (ICRA) (in review)*.

[C7] **Tsung-Chi Lin**, Juo-Tung Chen, and Chien-Ming Huang. Reducing Performance Variability and Overcoming Limited Spatial Ability: Targeted Training for Remote Robot Teleoperation. In *Proceedings of the 2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).* IEEE, 2024.

[C6] Achyuthan Unni Krishnan, **Tsung-Chi Lin**, and Zhi Li. Human Preferred Augmented Reality Visual Cues for Remote Robot Manipulation Assistance: from Direct to Supervisory Control. In *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 7034-7039, IEEE, 2023.

[C5] **Tsung-Chi Lin**, Achyuthan Unni Krishnan, and Zhi Li. Comparison of Haptic and Augmented Reality Visual Cues for Assisting Tele-manipulation. In *2022 IEEE International Conference on Robotics and Automation (ICRA)*, pages 9309-9316, IEEE, 2022.

[C4] Achyuthan Unni Krishnan, **Tsung-Chi Lin**, and Zhi Li. Design Interface Mapping for Efficient Free-form Tele-manipulation. In *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 6221-6226, IEEE, 2022.

[C3] **Tsung-Chi Lin**, Achyuthan Unni Krishnan, and Zhi Li. How People Use Active Telepresence Cameras in Tele-manipulation. In *2021 IEEE International Conference on Robotics and Automation (ICRA)*, pages 3808-3815, IEEE, 2021.

[C2] **Tsung-Chi Lin**, Achyuthan Unni Krishnan, and Zhi Li. Shared Autonomous Interface for Reducing Physical Effort in Robot Teleoperation via Human Motion Mapping. In *2020 IEEE International Conference on Robotics and Automation (ICRA)*, pages 9157-9163, IEEE, 2020.

[C1] **Tsung-Chi Lin**, Achyuthan Unni Krishnan, and Zhi Li. Physical Fatigue Analysis of Assistive Robot Teleoperation via Whole-body Motion Mapping. In *2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 2240-2245, IEEE, 2019.

Refereed Short Conference Papers

[S5] Jia-Da Li, Mei-Ying Kuo, **Tsung-Chi Lin**, Yu-Huan Wu, and Tung-Wu Lu. Skin Movement Artifacts Affect Calculated Knee Kinematics and Kinetics During Cycling. In *International Scientific Meeting on Biomechanics*, 2014.

[S4] Jia-Da Li, Mei-Ying Kuo, Tung-Wu Lu, **Tsung-Chi Lin**, Yu-Huan Wu, and Horng-Chaung Hsu. Differences of Skin Movement Artifacts during Loaded and Unloaded Cycling Exercise on the thigh and shank Using 3D Fluoroscopy. In *The 1st Global Conference on Biomedical Engineering (GCBME) conjunction with 9th Asian-Pacific*, 2014.

[S3] Jia-Da Li, Tung-Wu Lu, Mei-Ying Kuo, Yu-Huan Wu, **Tsung-Chi Lin**, and Horng-Chaung Hsu. Effects of Skin Movement Artifacts on Kinematics and Kinetics of the Knee During Cycling. In *The 1st Global Conference on Biomedical Engineering (GCBME) conjunction with 9th Asian-Pacific*, 2014.

[S2] Jia-Da Li, Tung-Wu Lu, Yu-Huan Wu, Mei-Ying Kuo, **Tsung-Chi Lin**, Cheng-Chung Lin, Yen-Hung Liu, and Horng-Chaung Hsu. Effects of Soft Tissue Artifacts on the Calculated Kinetic Variables of the Knee during Cycling. In *13th International Symposium on 3D Analysis of Human Movement*, 2014.

[S1] Jia-Da Li, Yu-Huan Wu, Tung-Wu Lu, **Tsung-Chi Lin**, Mei-Ying Kuo, Cheng-Chung Lin, Yen-Hung Liu, and Horng-Chaung Hsu. Comparisons of Knee Joint Loading Between Forward and Backward Pedaling on an Instrumented Cycling Ergometer Using 3D Fluoroscopy Method. In *7th World Congress of Biomechanics*, 2014.

Patent

[P1] **Tsung-Chi Lin**, Jyun-Liang Pan, Kai-Jen Pai, Zhong-We Liao, Yen-Chung Chang, Szu-Han Tzao, and Ching-Yi Liu. Muscle training equipment, muscle training system and muscle training method. *U.S. Patent No. 11,065,506,* 2021.

Theses

[T2] Ph.D. Dissertation

Tsung-Chi Lin. Human-Robot Interfaces to Enable Effective and Effortless Control for Remote Manipulation of Tele-nursing Robot. *Robotics Engineering Department, Worcester Polytechnic Institute,* 2023.

[T1] M.S. Thesis

Tsung-Chi Lin. Three-Dimensional Finite Element Analysis of the Knee Ligaments During Cycling in Normal Young Subjects. *Department of Biomedical Engineering, National Taiwan University,* 2014.

Research and Work Experience

Postdoctoral Fellow 2023–Present
Johns Hopkins University, Department of Computer Science
Intuitive Computing Laboratory, PI: Chien-Ming Huang

Developed effective training protocols for diverse users to control varying robots
[Published and submitted to: IROS'24, RA-L'24, ICRA'25]

Postdoctoral Fellow 2023
Worcester Polytechnic Institute, Robotics Engineering Department
Robots and Sensors for Human Well-being (ROSE-HUB), PIs: Jing Xiao, Jane Li

Deployed adaptive robot autonomy for real-world applications
[Industry-University Cooperative Research]

Research Assistant 2020–2023
Worcester Polytechnic Institute, Robotics Engineering Department
Human-inspired Robotics Lab, PI: Jane Li

Designed versatile human-robot interfaces for diverse assistive robots
[Published to: IROS'19, ICRA'20, ICRA'21, ICRA'22, IROS'22, IROS'23, THRI'22, THRI'23, RA-L'23, THRI'24]

Associate Researcher 2014–2018
Industrial Technology Research Institute, Service Robot Department
Mechanical & Mechatronics Systems Research Laboratories

Designed wearable walking assistive exoskeleton robot to regain fundamental abilities
[Won an R&D 100 Award in 2016]

Graduate Researcher 2012–2014
National Taiwan University, Department of Biomedical Engineering
Orthopaedic Engineering and Movement Analysis Lab, PI: Tung-Wu Lu

Enhanced bio-signal processing to improve the quality of physical therapy
[Hospital-University Cooperative Research]

Teaching Experience

Guest Lecturer — Fall 2020
Worcester Polytechnic Institute, Graduate
RBE 526 Human-Robot Interaction

Teaching Assistant — Spring 2020
Worcester Polytechnic Institute, Graduate
RBE 595 Special Topic: Humanoid Robotics

Co-Head Teaching Assistant and Lab Instructor — Fall 2019
Worcester Polytechnic Institute, Undergraduate
RBE 3001 Unified Robotics III: Manipulation
RBE 3002 Unified Robotics IV: Navigation

Teaching Assistant — Spring 2019
Worcester Polytechnic Institute, Graduate
RBE 502 Robot Control

Project Leader — Spring 2019
Worcester Polytechnic Institute, Graduate
RBE 550 Motion Planning

Mentoring

Graduate Students

Yichen Xie (Master's Student in Robotics, Johns Hopkins University)	2024–Present
Danyu Liu (Master's Student in Security Informatics, Johns Hopkins University)	2024–Present
Preshit Ameta (Master's Student in Robotics, Johns Hopkins University)	2024
Juo-Tung Chen (Master's Student in Robotics, Johns Hopkins University)	2023–2024
Achyuthan Unni Krishnan (Ph.D. Student in Robotics, Worcester Polytechnic Institute)	2020–2023
Lorena Maria Genua (Ph.D. Student in Robotics, Worcester Polytechnic Institute)	2022
Shuosheng Luo (Master's Student in Mechanical, Worcester Polytechnic Institute)	2019
Nicholas Thomas Sipes (Master's Student in Robotics, Worcester Polytechnic Institute)	2019
Yin Xiao (Master's Student in Aerospace, Worcester Polytechnic Institute)	2019
Yudong Yu (Master's Student in Robotics, Worcester Polytechnic Institute)	2019
Haowei Zhao (Master's Student in Robotics, Worcester Polytechnic Institute)	2019
Nicholas Andres Fajado (Master's Student in Robotics, Worcester Polytechnic Institute)	2019
Yao Zhang (Master's Student in Robotics, Worcester Polytechnic Institute)	2018

Undergraduate Students

Shaye Lane (Nursing School, Worcester State University)	2020
Renee Kay Dorer (ME and BME, Worcester Polytechnic Institute)	2019

Talks

Targeted Training for Remote Robot Teleoperation
Laboratory for Computational Sensing and Robotics, Johns Hopkins University — October 2024
Malone Center for Engineering in Healthcare, Johns Hopkins University — April 2024

Human-Robot Interfaces to Enable Effective Control of Assistive Robots
Intuitive Computing Laboratory, Johns Hopkins University — March 2023

Impact of Unreliable Assistive Autonomy on Human-Robot Interaction
Graduate Research Innovation Exchange (GRIE), Worcester Polytechnic Institute — February 2023

Comparison of Haptic and AR Visual Cues for Assisting Tele-manipulation
Graduate Research Innovation Exchange (GRIE), Worcester Polytechnic Institute — February 2022

How People Use Active Telepresence Cameras in Tele-manipulation
Graduate Research Innovation Exchange (GRIE), Worcester Polytechnic Institute — February 2021

Enhancing Human-Robot Interaction Through Physiological Measurements
FORW-RD NSF Research Traineeship (NRT) Program, Worcester Polytechnic Institute — March 2020

Shared Autonomous Interface for Reducing Physical Effort in Robot Teleoperation
Graduate Research Innovation Exchange (GRIE), Worcester Polytechnic Institute — February 2020

Workload-Adaptive Human-Robot Interfaces for Assistive Robots
Graduate Research Innovation Exchange (GRIE), Worcester Polytechnic Institute — February 2020
RBE Symposium and 10th Anniversary Events, Worcester Polytechnic Institute — October 2019
Nation Biomechanics Day, Delsys — April 2019

Assessment of Muscle Effort and Physical Fatigue in Robot Teleoperation
Graduate Research Innovation Exchange (GRIE), Worcester Polytechnic Institute — February 2019

Academic Service

Organizer
Robotics: Science and Systems Workshop on Social Intelligence in Humans and Robots — 2024

Journal Reviewer
ACM Transactions on Human-Robot Interaction (THRI) — 2020–Present
IEEE Robotics and Automation Letters (RA-L) — 2021–Present

Conference Reviewer
International Conference on Intelligent Robots and Systems (IROS) — 2024
International Conference on Robotics and Automation (ICRA) — 2022–Present
International Conference on Human-Robot Interaction (HRI) — 2022–Present
International Conference on Ubiquitous Robots (UR) — 2020, 2021

Outreach

TouchTomorrow (K-12 Students)
Worcester Polytechnic Institute, Robotics Engineering Department
Demonstrated research on human-robot interfaces — 2019
Instructed K-12 students on interacting with humanoid robots — 2021
Presented research on intuitive control for general-purpose robotic arms — 2022

Guest Seminar for Nursing Professionals (Nursing Faculty and Students)
Worcester State University, Nursing School
Showcased human-centered interfaces for future nursing robots and healthcare workers — 2021

Technical Skills

Development: Python, C++, C, C#, ROS, MATLAB, Unity, Vicon, OpenSim, EMGworks, SolidWorks, ABAQUS
Robotic Systems: TIAGo OMNI++, Atlas, Baxter, Stretch 3, Kinova Gen3, UR5, Fetch100, Double 3