Tao, Yiran (Elaine)

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Research Interests

Robot learning, human-robot interaction (HRI), assistive healthcare robotics, computer vision

Education

Carnegie Mellon University (CMU), Pittsburgh, PA — Aug. 2023 - Aug. 2025 (expected)
- **Master of Science in Robotics (MSR)** — GPA: 4.0/4.0
  Advisor: Prof. Zackory Erickson, Prof. Dan Ding (University of Pittsburgh)

Wuhan University (WHU), Wuhan, China — Sept. 2019 - Jun. 2023
- **Bachelor of Engineering in Computer Science and Technology** — GPA: 3.87/4.0
  Thesis Advisor: Prof. Zhenzhong Chen
- **Bachelor of Arts in English** — GPA: 3.86/4.0

Harvard College, Cambridge, MA — Jan. 2022- May. 2022
- **Visiting Undergraduate Student Program (Concentration: Computer Science)** — GPA: 4.0/4.0
- **Cross-registered at Massachusetts Institute of Technology (MIT)** — GPA: 5.0/5.0

Publications

- **Yiran Tao**, Guixiu Qiao, Dan Ding, Zackory Erickson. "Incremental Learning for Robot Shared Autonomy". submitted to ICRA 2025.
- **Yiran Tao**, Jehan Yang, Dan Ding, Zackory Erickson. "LAMS: LLM-Driven Automatic Mode Switching for Assistive Teleoperation". accepted to HRI 2025.
- **Yiran Tao**, Yaosi Hu, Zhenzhong Chen. "Memory-Guided Representation Matching for Unsupervised Video Anomaly Detection". Journal of Visual Communication and Image Representation, 2024.
- Weijian Ruan*, **Yiran Tao***, Linjun Ruan, Xiujun Shu, Yu Qiao. "Temporal Weighting Appearance-Aligned Network for Nighttime Video Retrieval". IEEE Signal Processing Letters, 2022.
- **Yiran Tao**, Yaosi Hu, Zhenzhong Chen. "Learn to Look Around: Deep Reinforcement Learning Agent for Video Saliency Prediction". IEEE International Conference on Visual Communications and Image Processing, 2021.

Research Experience

RA, Robotic Caregiving and Human Interaction Lab, CMU — Pittsburgh, PA, US
Advisor: Prof. Zackory Erickson, Prof. Dan Ding (University of Pittsburgh)

Project 1: Incremental Learning for Robot Shared Autonomy — Oct. 2023-Jul. 2024
- Developed an incrementally learned shared autonomy framework that improves an imitation learning-based shared control policy through user interaction, eliminating the need for expert demonstrations.
- Implemented the method on a Kinova robotics arm.
- Organized and conducted a user study subject to a university-approved IRB protocol with 20 participants.
- Submitted a first-author paper to ICRA 2025.

Project 2: LLM-Driven Automatic Mode Switching for Assistive Teleoperation — May 2024-Sep. 2024
- Developed an LLM-driven framework for automatic mode switching that eliminates the need for task-specific demonstrations or predefined rules and continuously improves through user interaction.
- Implemented the method to control a Kinova robotic arm using a single joystick.
- Organized and conducted a user study subject to a university-approved IRB protocol with 10 participants.
- Had a first-author paper accepted to HRI 2025.

RA, Visual Computing Group, Harvard University Cambridge, MA, US
Advisor: Prof. Hanspeter Pfister
Semi-supervised Edge-Guided Cell Instance Segmentation for Embryo Images Mar. 2022-Oct. 2022
- Implemented baseline methods to analyze key morphokinetic features of human embryo images.
- Developed a semi-supervised edge detection model that aligns edges in unlabeled images with edge patterns captured from labeled images, enhancing embryo cell segmentation performance.

RA, Intelligent Information Processing Lab, Wuhan University Wuhan, China
Advisor: Prof. Zhenzhong Chen
Project 1: Representation Matching for Unsupervised Video Anomaly Detection Dec.2021-Jun. 2022
- Developed a novel unsupervised model to detect video anomalies by capturing normal event representation patterns and identifying anomalies based on mismatches in event representations.
- Published a first-author paper in Journal of Visual Communication and Image Representation.

Project 2: Crowd Counting for UAV RGB-T Images (ICCV 2021 Challenge) May 2021-Jul. 2021
- Designed a novel model to extract multi-scale features from RGB-T modalities and generate adaptive crowd density maps for crowd counting.
- Ranked 1st and 2nd on two metrics in the Crowd Counting Track of VisDrone 2021 Challenge at ICCV 2021, receiving the Runner-Up team award.

Project 3: Video Saliency Prediction with Deep Reinforcement Learning Aug. 2020-Jun. 2021
- Developed a reinforcement learning agent with deep Q-learning to identify frames with the most correlated information, enhancing temporal information extraction and saliency prediction accuracy.
- Published a first-author paper in IEEE VCIP 2021.

RA, Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences Shenzhen, China
Advisor: Dr. Weijian Ruan
Nighttime Video-based Person Re-identification Aug. 2021-Dec. 2021
- Built a dataset for video-based person re-identification during nighttime.
- Developed a novel person re-identification model that enhances video representations by aligning features across video frames and weighting frames based on quality.
- Published a co-first author paper in IEEE Signal Processing Letters.

Teaching Experience

Tutor of High School Mathematics, Wuhan, China May 2019- May 2021
- Tutored high school students twice a week for two academic years, fostering a genuine interest in mathematics.
- Organized key concepts and tailored problem sets to each student's academic level, providing personalized guidance through the solution process.

Scholarships & Awards

Luojia Excellent Overseas Communication Scholarship of Wuhan University 2022
First-class Excellent Student Scholarship of Wuhan University (top 5%) 2021
Yugang-Songxiao Special Scholarship of Wuhan University (top 1%) 2021
Runner-up, Crowd Counting Track, ICCV 2021 VisDrone Challenge 2021

Skills

Programming: Python, C/C++, Java, Matlab, R
Libraries/Frameworks: Pytorch, Tensorflow, ROS, MuJoCo
Robots: Kinova, xArm, Stretch
Languages: English (Advanced), Chinese (Native), Japanese (Intermediate), French (Intermediate)