Zachary W. Zhao

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Objective

Seeking PhD position in Robotics & AI. My research focuses on multimodal perception, causal reinforcement learning, and embodied intelligence, with applications in human–robot interaction and vision–language–action (VLA) systems. I aim to develop generalizable AI agents that learn from human guidance and adapt to real-world environments.

Education

- **Worcester Polytechnic Institute** — *Jan 2025 - Present*
  Ph.D. Robotics Engineering — Worcester, USA
  ◦ GPA: 4.00/4.00
- **University of Washington** — *Sep 2022 - Jun 2024*
  M.S. in Electrical and Computer Engineering — Seattle, USA
  ◦ GPA: 3.84/4.00

Patents and Publications

C=Conference, J=Journal, P=Patent, S=In Submission, T=Thesis

*See my Google Scholar for an always up-to-date list and manuscripts under review.

[S.3] **W. Zhao**, et al. (2025). A Distributed Multimodal Robotic Framework for Emotion-Aware Reminiscence Dialogue in Dementia Care. *ICRA 2026*. *under review.*

[S.2] **W. Zhao**, et al. (2025). Speaking Memories: Speaking Memories: A Multimodal Adaptive Dialogue Framework for Reminiscence Robotics. *IEEE Transactions on Robotics (T-RO)*. *under review.*

[C.2] **W. Zhao**, et al. (2025). Causal Reinforcement Learning based Agent-Patient Interaction with Clinical Domain Knowledge. *AAAI 2026 W3PHIAI workshop*.

[J.3] **W. Zhao**, et al. (2025). Multimodal Perception-Driven Decision-Making for Human-Robot Interaction: A Survey. *Front. Robot. AI*, Vol. 12

[C.1] **W. Zhao**, et al. (2025). PARTNER: A Multimodal Emotion-Aware Robot System for Personalized Reminiscence Exercise. *NHCGNE 2025*.

[S.1] K. Gangaraju, **W. Zhao**, et al. (2025). Multimodal Feedback in Human-Robot Interaction: State-of-the-Art, Limitations, and Future Directions. *ACM Transactions on Human-Robot Interaction (THRI)*. *under review.*

[J.2] **W. Zhao**, et al. (2022). Interval Short-Term Traffic Flow Prediction Method Based on CEEMDAN-SE Nosie Reduction and LSTM Optimized by GWO. *Wireless Communications and Mobile Computing*, Vol. 2022.1

[J.1] **W. Zhao**, et al. (2022). Accurate non-stationary short-term traffic flow prediction method. *arXiv*, 2205.00517

[P.4] **W. Zhao** et al. (2022). A method for fruit recognition based on deep learning neural network. Patent No. 114677672A. Publication Date: Jun 2022.

[P.3] **W. Zhao** et al. (2020). A Self-adapting Wind-driven Generator. Patent No. 212106125U. Publication Date: Dec 2020.

[P.2] **W. Zhao** et al. (2019). Multi-Parameter Measuring Device for Solid-Liquid Two-Phase Flow. Patent No. 208818259U. Publication Date: May 2019.

[P.1] **W. Zhao** et al. (2020). A dust protection device for rail tracks. Patent No. 212000399U. Publication Date: Nov 2020.

Experience

- **Worcester Polytechnic Institute [🌐]** — *Jan 2025 - Present*
  Research Assistant - Multimodal perception, Embodied AI - VLA, VLM - HRI — Worcester, USA
  ◦ Directed the development of the LLM-driven multimodal perception–decision framework, applied to domains such as robotics, healthcare, and HRI.
  ◦ Implemented causal reinforcement learning (CRL) algorithms with safety constraints for embodied AI.
  ◦ Led projects resulting in submissions to NeurIPS, T-RO, etc.
- **UW RAIVN Lab [🌐]** — *Oct 2024 - Jan 2025*
  Robotics Research Assistant - Multimodal perception for Embodied AI — Seattle, USA
  ◦ Advanced Vision-Language-Action (VLA) frameworks using diffusion policy for embodied reasoning.
  ◦ Demonstrated robots that can perceive, reason, and act in unstructured real-world tasks.

- **AUTEV LLC [🌐]** *Jun 2024 - Aug 2025*
  Lead Robotics & Computer Vision Engineer - Autonomous robots for hassle-free EV charging Seattle, USA
  - Led the development of the DL-based (StrongSORT with OSNet) vision-guided pipeline (Intel RealSense & NVIDIA Jetson), enabling precise and autonomous connection of the robotic arm charging gun to the EV charging port.
  - Led the design and deployment of full-stack app solutions (React & FastAPI) for user interaction with the robotic system.
  - Directed perception, localization, and SLAM pipelines in NVIDIA Isaac Sim for real-world prototyping.
- **UW Information Processing Lab [🌐]** *Jun 2023 - Mar 2024*
  ML Research Assistant - Advanced CV research in Autonomous Driving Domain Seattle, USA
  - Mitigated offset issues for provided datasets by designing and implementing advanced 3D constrained multi-core image algorithms, contributing to the improvement of driving datasets with a focus on detection accuracy in complex scenarios.
  - Established a baseline for the CMKD method on a custom dataset using OpenPCDet framework, laying the foundation for further model improvements and application-specific tuning.
- **NASA JPL & UW ENGINE Capston [🌐]** *Jan 2023 - Jun 2023*
  ML Student Research Assistant - Machine Learning for Extreme Traverse Lunar Explorer Seattle, USA
  - Developed and applied 2D machine learning algorithms in Python and Linux to semantically segment real-world on-field datasets from JPL's EELS and IceNet, enabling hazard identification in harsh subterranean conditions on Earth and the Moon.
  - Implemented non-supervised domain adaptation for robust semantic segmentation in unknown environments. Evaluated and compared unsupervised, semi-supervised, and non-deep learning methods to determine the most deployable approach for extraterrestrial missions.
  - Pioneered a flexible zero-shot data generation pipeline, automating pixel-perfect semantic labeling without manual human annotations.

Skills

- **Programming Languages:** Python , C/C++, Java, SQL , MATLAB
- **Web Technologies:** HTML5, CSS, React, D3.js, Node.js
- **Database Systems:** SQL, AWS RDS
- **Data Science & Machine Learning:** TensorFlow, PyTorch, Machine Learning (ML), Deep Learning (DL), Computer Vision (CV)
- **Cloud Technologies:** Azure, AWS, Google Cloud
- **DevOps & Version Control:** Git
- **Specialized Area:** Isaac Sim, ROS, Rviz, Gazebo, LabVIEW, PCB Design, 3D Printing
- **Mathematical & Statistical Tools:** MATLAB, R, Tableau
- **Other Tools & Technologies:** NVIDIA Jetson, Arduino, STM32, Raspberry Pi (RPi), Keil, Catia, AutoCAD, CUDA, Unreal Engine (UE), Linux
- **Research Skills:** Robotics, Embedded Systems, Control Systems, Simulation, Visualization

Honors and Awards

- **Provincial Outstanding Graduate** *Jun 2021*
  Chinese Ministry of Education [🌐]
  - Top 1% of graduates recognized for academic excellence and leadership
- **2X National Encouragement Scholarship** *Jun 2020 & Jun 2019*
  Chinese Ministry of Education [🌐]
  - Awarded to the top 3.5% of students in recognition of academic excellence
- **Postgraduate Academic Scholarship** *Jun 2021*
  Chinese Ministry of Education [🌐]
  - Awarded to the top graduate students in recognition of academic excellence
- **Others National or sub-national awards**
  Awarded by organizations at various levels
  - Grand Prize (provincial) & Third Prize (national) in *"Challenge Cup" National College Student Academic Science and Technology Works Competition* (2021)
  - First Prize & Best Innovation Award in *China Agricultural Robot Competition* (2021)
  - Merit Student (2021)
  - CUMCM Provincial First Prize (2019)

Academic Service

- **2025**: Reviewer for ICRA 2026, ACM/IEEE HRI 2026, NeurIPS 2025; Member, IEEE Robotics & Automation Society, IEEE Young Professionals; Financial Chair of IEEE RAS at WPI
- **2024**: SAI Conferences Technical Program Committee
- **2022**: Member, IEEE

Teaching Service

- **2025**: TA for Introduction to Robotics
- **2021**: TA for Fluid Mechanics, Hydraulic and pneumatic transmission

Certifications

Machine Learning, Deep Learning Specialization, Self-Driving Cars Specialization, Reinforcement Learning Specialization, Data Structures & Algorithms, and more (20+ certifications completed), see My-LinkedIn for full list.

References

1. **Prof. Fiona Yuan**
   Assistant Professor, Dept. of Robotics Engineering
   Worcester Polytechnic Institute
   Email: fyuan3@wpi.edu
   Relationship: Supervisor

2. **Prof. Ran Zhang**
   Assistant Professor, Dept. of Electrical and Computer Engineering
   University of North Carolina at Charlotte
   Email: rzhang8@charlotte.edu
   Relationship: Collaborator

3. **Prof. Wei Xiao**
   Assistant Professor, Dept. of Robotics Engineering
   Worcester Polytechnic Institute
   Email: weixy@mit.edu
   Relationship: Collaborator