ZHIAN (ARIA) RUAN

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EDUCATION

Stanford University 09/2026-now
M.S. in Electrical Engineering, Advisor: Prof. Shuran Song

Northwestern University 09/2022-06/2025
B.S. in Mechanical Engineering, Concentration in Robotics, Magna Cum Laude *GPA 3.947/4.0*

University of Illinois Urbana-Champaign 08/2020-05/2022
B.S. in Mechanical Engineering, transferred to Northwestern University *GPA 4.00/4.00*

RESEARCH INTEREST

My research lies at the intersection of robot learning and system integration. I focus on synergizing hardware–software–learning co-design, multimodal model architectures, and reinforcement learning to enable robust, adaptive, and generalizable robot policies, tightly integrating sensing, learning, and control into efficient, reliable, ready-to-deploy robotic systems for the real world.

PUBLICATIONS

1. *Whole Body Control.* Under review.
2. *Multi-Agent Systems.* Under review.
3. Simon Sinong Zhan, Philip Wang, Yao Liu, Yiyan Peng, Yiqi Lyu, Zinan Wang, Qineng Wang, **Zhian Ruan**, Xiangyu Shi, Xinyu Cao, Frank Yang, Zhenyang Ni, Kangrui Wang, Ruohan Zhang, Huajie Shao, Manling Li, Qi Zhu, *SENTINEL: A Multi-Level Formal Framework for Safety Evaluation of Foundation Model-based Embodied Agents.* Neural Information Processing Systems, Evaluations & Datasets Track (NeurIPS 2026). [Paper]
4. **Zhian Ruan**, Yizhi Zhou, *Distributed Invariant Unscented Kalman Filter based on Inverse Covariance Intersection with Intermittent Measurements.* American Control Conference (ACC 2026). [Paper]
5. Simon Sinong Zhan, Qingyuan Wu, **Zhian Ruan**, Frank Yang, Philip Wang, Yixuan Wang, Ruochen Jiao, Chao Huang, Qi Zhu, *Inverse Delayed Reinforcement Learning.* arXiv preprint (2024). [Paper]

RESEARCH EXPERIENCE

Robotics and Embodied Artificial Intelligence Lab (REAL), Stanford University 03/2026-now
Advisor: Prof. Shuran Song *Stanford, CA*

· Force-sensing UMI data collection and diffusion policies for whole-body mobile manipulation

Design Automation of Intelligent Systems (IDEAS) Lab, Northwestern University 06/2024-06/2025
Advisor: Prof. Qi Zhu *Evanston, IL*

· LLM embodied-agent safety evaluation, inverse delayed RL, and quiet multi-agent planning

Neurorehabilitation and Neural Engineering Lab, Shirley Ryan AbilityLab 06/2023-08/2023
Advisor: Dr. José L. Pons *Chicago, IL*

· Transparency control for a lower-limb exoskeleton, later part of a Science Robotics paper

Center for Robotics and Biosystems, Northwestern University 03/2023-08/2023
Advisor: Prof. Malcolm MacIver *Evanston, IL*

· 4 m/s embedded line-following robot with PID control and a Wi-Fi command link

Center for Bionics, Shirley Ryan AbilityLab 08/2022-06/2023
Advisor: Dr. R. James Cotton *Chicago, IL*

· Gait analysis from EMG muscle synergies via non-negative matrix factorization

Human Dynamics and Controls Lab, University of Illinois Urbana-Champaign 07/2021-07/2022
Advisor: Prof. Elizabeth T. Hsiao-Wecksler *Urbana, IL*

· EMG database and quantitative measures of abnormal muscle behavior in MATLAB

PROFESSIONAL EXPERIENCE

RoboForce 10/2025-now
Member of Technical Staff, Robotics *Milpitas, CA*

· Led end-of-arm tooling (EOAT) and data collection system design for model training, reducing camera latency and enabling cross-platform time synchronization
· Validated and brought up perception and localization sensors, including cameras, LiDAR, motion capture, and VIO, across lighting and terrain conditions
· Selected and tested joint motors, and led robot bringup with ROS 2 device drivers in C++ over RS485, CANopen, and EtherCAT (CiA 402) with a thread-safe, real-time communication stack
· Built a force-torque sensing (FTS) embedding for a $\pi_{0.5}$ torquing policy: a causal TCN/GRU encoder over 2 s of native 200 Hz wrench, aligned across asynchronous sensor, camera, and action clocks, compressing contact into a bounded 6-D embedding that reaches 0.90 macro recall on contact phase (+0.17 over a no-memory baseline) across 1,900+ sessions

Tesla, Energy R&D Test Infrastructure 07/2025-10/2025
Test Hardware Controls Engineer *Palo Alto, CA*

· Engineered a centralized Python resource manager for test infrastructure, automating testing across 3 energy product lines with multi-site coordination
· Designed a full-stack system with a REST API frontend for remote control of test setups and a real-time PLC backend over Modbus, unifying manual and automated workflows

Internships: Ginkgo Bioworks, system integration & computer vision (06/2024-09/2024); Tesla Power Electronics, software automation (01/2024-05/2024)

SELECTED PROJECTS

Robotic Dexterity Hand, Embedded Control Software 01/2025-06/2025
Advisor: Prof. Kevin Lynch, HAND ERC

· Led control software for an 8-DOF tendon-driven hand (20-student team): SPI Hall-effect sensing and CAN across 9 MCUs, enabling 10 kHz field-oriented BLDC control with space-vector PWM
· Built motion-control libraries with forward/inverse kinematics and null-space optimization, reaching <2 mm positioning accuracy, <0.05 s force settling time, and 10 Hz position bandwidth on series-elastic actuators
· Created a MediaPipe hand-tracking teleoperation GUI with ROS 2 and a URDF digital twin in RViz

AWARDS

Magna Cum Laude, Northwestern University 06/2025
McCormick School of Engineering High Honors, Northwestern University 2023-2024
McCormick School of Engineering Honors, Northwestern University 2022-2023
Durabird Eastern Collegiate Badminton Championships, Division 2B Winner 2023

Edmund J. James Scholar & Dean's List, Grainger College of Engineering, UIUC 2020-2022
Tau Beta Pi, National Engineering Honor Society 2021
Alpha Lambda Delta, National Honor Society of First-Year Success 2021

SERVICES

Reviewer of IEEE ICRA 2027

Reviewer of CoRL 2026 Workshop on Scaling H2R

Reviewer of IEEE RO-MAN 2026

Grader of GEN_ENG 205-3: Engineering Analysis 3 (Modeling and Dynamics), Northwestern (Spring 2025)

Course assistant of CS 111: Fundamentals of Computer Programming I, Northwestern (Fall 2023)

Student consultant for Chicago Field Studies, Student Internship Program (Fall 2023)

Executive of the Northwestern Badminton Club, 300+ members (2023)

Executive board of the Tau Beta Pi District Conference, 30+ chapters (2022)

Mentor for FRC Team 6487 (2020-now)

TECHNICAL SKILLS

Computer Languages	Python, C/C++, Java, MATLAB/Simulink, SQL
Robotics	ROS 2, MuJoCo, IsaacGym, Gazebo, RViz, forward/inverse kinematics, SLAM, PID
Tools & Libraries	PyTorch, TensorFlow, NumPy, SciPy, OpenCV, Git, Docker, Linux
Hardware	CAD, 3D printing, PCB design, PLC, microcontrollers (ARM Cortex-M4/M7), CAN, EtherCAT, RS485, SPI, I2C, UART