

CHIH-HAO (ANDY) TSAI

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Github Portfolio: <https://github.com/andytsai104/my-portfolio>

Education

M.S. in Robotics and Autonomous Systems
Arizona State University, Tempe, Arizona, United States

Aug. 2024 – May 2026
GPA: 3.5/4.0

Study Abroad Program in Electrical Engineering
Aachen University of Applied Sciences, Aachen, Germany

Mar. 2023 – Aug. 2023
GPA: 3.3/4.0

B.S. in Mechanical Engineering
National Taipei University of Technology, Taipei, Taiwan

Sep. 2019 – Jun. 2023
GPA: 3.03/4.0

Technical Skills

- **Programming:** Python (Advanced – PyTorch, TensorFlow, OpenCV), C/C++ (Embedded C), MATLAB (Intermediate – kinematics, control), Bash (Intermediate – HPC automation)
- **Robotics & Systems:** ROS 2 (Intermediate), Nav2, URDF/xacro, Multi-Robot Systems, Path Planning & Motion Control, PID/PI Control, Odometry/IMU Integration, Arduino
- **Tools & Simulation:** Linux, Git, RViz, Gazebo (Fortress), Simulink, CARLA, SolidWorks
- **Machine Learning:** Deep Learning, Reinforcement Learning, General ML Techniques (Intermediate)

Professional Experience

BELIV Lab, Arizona State University

Jun. 2025 – Present
Mesa, Arizona

Research Assistant

- Designing a multi-agent pedestrian controller in CARLA with Python using a pre-trained Social LSTM model and an RL-based model to simulate realistic and aggressive behaviors.
- Extracted BEV features with Vision Transformer and trained the RL model via a Twin Delayed Deep Deterministic Policy Gradient (TD3) pipeline.
- Integrating the pedestrian model into reinforcement learning (RL) pipelines to improve autonomous vehicle behavior and safety.

Test Research Inc.

Jul. 2022 – Sep. 2022

Intern

Taipei, Taiwan

- Assembled and performed troubleshooting of main AOI machines, ensuring compliance with operational standards.

Academic Projects

Multi-Robot Warehouse Navigation & Task Allocation (Team Leader)

Aug. 2025 – Dec. 2025

- Built a distributed task-allocation method using Max-Consensus auctions with distance-based bidding and sequential winner removal (one task per robot).
- Implemented a multi-robot warehouse demo in ROS 2 Humble + Gazebo Fortress with URDF/xacro differential-drive robots and 2D LiDAR.
- Bridged allocations to execution by dispatching Nav2 goals and monitoring task completion status.
- Verified finite-time convergence (bounded by communication-graph diameter) and conflict-free assignments under capacity constraints in simulation.

Pololu 3pi+ 2040 Embedded Robotics (Individual Project)

Aug. 2025 – Dec. 2025

- Built autonomous behaviors by integrating IMU (pitch/roll), encoders, gyroscope, IR line sensors, and bump sensors, with telemetry displayed on the LCD.
- Implemented line/track following with IR calibration, weighted lateral-error estimation, and P control + differential steering with speed scheduling for curves vs. straights.
- Developed ramp edge-detection and recovery logic: classified edge position (left/center/right) and executed backup/turn maneuvers.

Vision-Based Maze Solving & Path Planning with MyCobot Pro 600 (Team Leader)

Mar. 2025 – Apr. 2025

- Developed a ROS 2-based pipeline to control a 6-DOF robotic arm using camera-captured paths.
- Built a digital twin (URDF) with SOLIDWORKS for simulation in RViz and Gazebo.
- Applied OpenCV in Python to process maze images, including path extraction and skeletonization.
- Executed joint trajectories on both simulation and physical robot via TCP/IP, optimizing motion smoothness.

Robot Forward/Kinematics (ROS2 & Gazebo & MATLAB) (Team Leader)

Feb. 2025 – Mar. 2025

- Built a simulation model in ROS2, Gazebo and Solidworks for the Dobot Magician Lite robotic arm.
- Simulated a SCARA robot and performed motion control in Simulink.
- Validated forward and inverse kinematics using MATLAB and Python scripts.

Control Systems Design and Implementation (Individual Project)

Feb. 2025 – Apr. 2025

- Designed and implemented digital control systems in MATLAB/Simulink (cruise control, liquid level, pendulum stabilization) on Arduino Due.
- Derived plant models and performed controller design/tuning to meet stability and tracking requirements.
- Validated PID/PI controllers via HIL testing and iterative tuning for robust performance.

Autonomous Mobile Vehicle and Robotic Arm (Team member)

Feb. 2022 – Nov. 2022

- Built an autonomous mobile vehicle with a robotic arm for object relocation in a 4-person team.
- Led webcam-based object detection using TensorFlow + OpenCV (Python).
- Designed the vehicle/arm in SolidWorks for 3D printing and integrated motor/arm control on Arduino (C).