

# 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: 3.47/4.0

### 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), **MATLAB** (Intermediate – robot design & kinematics, control systems), **Bash Scripting** (Intermediate - HPC task automation), **C/C++**
- **Robotics & Systems: ROS 2** (Intermediate – RViz, Gazebo, MoveIt), **Path Planning & Motion Control** (Intermediate), **PID Control, Arduino**
- **Tools & Simulation: Linux** (Intermediate), **Git** (Intermediate), **Simulink** (Intermediate), **CARLA** (Intermediate), **SolidWorks**
- **Machine Learning: Deep Learning, Reinforcement Learning, General ML Techniques** (Intermediate)

## Professional Experience

### BELIV Lab, Arizona State University

Research Assistant

Jun. 2025 – Present

Mesa, Arizona

- 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.

Intern

Jul. 2022 – Sep. 2022

Taipei, Taiwan

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

## Academic Projects

### Vision-Based Maze Solving & Path Planning with MyCobot Pro 600

Team Project (Team Leader)

Mar. 2025 – Apr. 2025

Tempe, Arizona

- 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.

### Control Systems Design and Implementation

Coursework Project

Feb. 2025 – Apr. 2025

Tempe, Arizona

- Developing and implementing control systems (digital, cruise control, liquid level, and pendulum stabilization) using **MATLAB**, **Simulink**, and **Arduino Due**.
- Implementing and testing **PID/PI controllers** through hardware-in-the-loop (HIL) simulations.
- Modeling and linearizing dynamic systems, including vehicle and liquid flow, for controller design.
- Conducting system identification and optimizing control strategies for stability and performance.

### Robot Forward/Kinematics (ROS2 & Gazebo & MATLAB)

Team Project (Team Leader)

Feb. 2025 – Mar. 2025

Tempe, Arizona

- 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.

### Autonomous Mobile Vehicle and Robotic Arm

Bachelor Project (Team member)

Feb. 2022 – Nov. 2022

Taipei, Taiwan

- Designed and built an autonomous vehicle equipped with a robotic arm for object relocation using **object detection** within a team of 4.
- Led the development and implementation of object detection using **TensorFlow** and **OpenCV** in **Python** on a WebCam.
- Created 3D models of the vehicle body and robotic arm using **SolidWorks** for 3D printing.
- Integrated **motor control**, **robotic arm motion**, and object detection functionality using Arduino with **C**.

### Generative AI – Deep convolutional GAN (DCGAN)

Coursework Project

Oct. 2024 – Dec. 2024

Tempe, Arizona

- Developed a **DCGAN model** to generate human face images by training on CelebA dataset.
- Optimized the hyperparameters of DCGAN and implemented image augmentation to **improve model performance by 75%**.
- Trained the model, fine-tuned hyperparameters, and generate other types of images, such as cat faces.

### Image Segmentation with Vision Transformer

Coursework Project

Oct. 2024 – Nov. 2024

Tempe, Arizona

- Fine-tuned a **Vision Transformer model** for **object-background segmentation** tasks.
- Create object-focused images by applying Gaussian blur to the processed image backgrounds.
- Utilized another depth estimation transformer to estimate image depth with different extend of normalization.