

# GUANYU XU

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Ann Arbor, MI - 48105, United States

## EDUCATION

- **University of Michigan** Aug 2024 - May 2026  
*B.S.E. in Computer Engineering (Expected)* Ann Arbor, US
  - **Overall GPA:** 3.97/4.0, **Major GPA:** 4.0/4.0
  - **Core Courses:** *Computer Vision (A), Embedded Control (A+), Intro Machine Learning (A), Intro Embedded System Design (A+), Data Structure & Algorithms (A), Intro Computer Organization (A+)*
- **Shanghai Jiao Tong University** Sep 2022 - Aug 2026  
*B.E. in Mechanical Engineering (Expected)* Shanghai, China
  - **Overall GPA:** 3.63/4.0, **Major GPA:** 3.68/4.0
  - **Core Courses:** *Modeling, Analysis and Control of Dynamic Systems (A), Intro to Circuits (A+), Programming and Elem. Data Structures (A)*

## PUBLICATION & PATENTS

- [1] **Xu, G.,** Wang J. Tong, D. & Huang X. (2026). *Highly Deformable Proprioceptive Membrane for Real-Time 3D Shape Reconstruction*. ArXiv.org. <https://arxiv.org/abs/2601.13574>
- [2] **Xu, G.,** & Liu L. (2024). *A Variable Radius Wheel*. National Intellectual Property Office, Patent No. ZL 2024 2 0506534.0. Registration Date: 2024.03.15, Grant & Publication Date: 2024.09.13.

## RESEARCH EXPERIENCE

- **Proprioceptive Membrane for Real-Time 3D Shape Reconstruction ([Demo](#))** Jun. 2025 - Present  
*Research Assistant, [Hybrid Dynamic Robotics Lab](#), University of Michigan* Instructor: Prof. Xiaonan Huang  
**Objective:** to develop a highly deformable proprioceptive membrane that reconstructs its 3D geometry using an optical waveguide structure and solve the challenge of estimating the state of the soft robot.  
**Contributions:**
  - Implemented a **PointNet-based autoencoder model** using **PyTorch** to reconstruct the surface geometry of the waveguide sensor.
  - Built a data collection pipeline with **depth camera** to capture high-accuracy ground-truth datasets.
  - Programmed **STM32 MCU** to scan LEDs and sample photodiodes via an ADC.
  - Designed and fabricated a multilayer optical waveguide with an embedded stretchable PCB.
  - Achieved high accuracy surface shape reconstruction with **an average chamfer distance of 1.3 mm** while maintaining accuracy for indentations up to 25 mm.
  - **The first-authored research paper in submission to Advanced Robotics Research.**
- **Active Steering Control of Soft Growing Robot** Oct. 2024 - Mar. 2025  
*[Hybrid Dynamic Robotics Lab](#), University of Michigan* Instructor: Prof. Xiaonan Huang  
**Objective:** to build a novel steering joint for soft growing robots and to achieve accurate closed-loop control of omnidirectional steering.  
**Contributions:**
  - Integrated the electrostatic clutch-based steering joint into a functional full-scale robot prototype.
  - Developed a **geometrical model** to characterize the relationship between the steering angle and the clutch actuation pattern.
  - Designed a custom PCB to drive the electrostatic clutch control circuits.

- Achieved omnidirectional steering and delivered a proof-of-concept demo.

- **Lunar Rover with Transformable Wheel ([Demo](#))**

*Jan. 2023 - Oct. 2023*

*School of Aeronautics and Astronautics, Shanghai Jiao Tong University*

Instructor: Prof. Longquan Liu

**Objective:** to design and build a lunar rover model with a transformable wheel and implement real-time sensing for self-adaptive wheel transformation actuation on a Raspberry Pi platform.

**Contributions:**

- Developed a prototype for a variable radius transformable wheel and integrated it into a rover.
- Implemented a **PID controller** with an **IMU feedback** for path stabilization.
- Interfaced with **ultrasonic sensors** and **LiDAR** for wheel transformation control.
- **Awarded a national patent for the project for the innovative design.**

## PROJECT EXPERIENCE

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- **INSIGHT: Smart Assistive Glass for Visually Impaired ([Demo](#))**

*Aug. 2025 - Dec. 2025*

*Course project for [EECS 473: Advanced Embedded System](#) (Major Design Experience).*

Instructor: Prof. Mark Brehob

- Built an **ESP32S3-based smart-glasses system**, integrating microphone arrays, speaker, vibration motors, and OV2640 camera on a custom PCB.
- Implemented **wake-word detection** and an audio pipeline that recorded user commands, streams audio and video to the base station, and plays TTS responses in real time on the **ESP32 platform**.
- Developed real-time obstacle-aware navigation, using **YOLO object detection** on a **Jetson Orin Nano** to identify hazards and drive left or right with vibrotactile feedback.
- Integrated a lightweight **vision-language model** (VLM) for on-device scene description, converting user prompts and captured images into concise spoken descriptions without cloud services.

- **Lumen Grid: Multi-Robot Competitive Parking Game ([Demo](#))**

*Feb. 2025 - Apr. 2025*

*Course project for [EECS 373: Introduction to Embedded System Design](#)*

Instructor: Prof. Junyi Zhu

- Programmed **robot control logic and inter-system communication protocols** in **C++** on an STM32 microcontroller.
- Designed an **IMU-based remote controller** for the **Zumo robot** with vibration feedback reflecting Zumo's speed.
- Interfaced with a camera for real-time position tracking of all robots based on color codes.
- Developed the **playground control algorithm** that scheduled lighting patterns, tracked robot position, and updated the scoring for the game setting.

## TEACHING & COMMUNITY SERVICE EXPERIENCE

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- **Grader, EECS 370: Intro to Computer Organization, University of Michigan**

*Sep. 2025 – Dec. 2025*

- **Student Volunteer, Shanghai Sunflower Community Children's Service Center**

*Sep. 2023 – Dec. 2023*

## HONORS & AWARDS

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- **University Honors, University of Michigan**

*Dec. 2024 & May 2025*

- **Dean's List, University of Michigan**

*Dec. 2024 & Apr. 2025*

- **Undergraduate Excellent Scholarship, Shanghai Jiao Tong University**

*Dec 2023*

## SKILLS

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- **Programming:** C/C++, Python, MATLAB, Bash, CUDA C/C++.
- **Embedded Systems:** STM32, ESP32; Raspberry Pi, Jetson Nano; FreeRTOS; I<sup>2</sup>C/SPI/UART/CAN.
- **AI/ML:** PyTorch, YOLO, Moondream-VLM, Sentence Transformer.
- **Hardware Design:** Altium Designer, EasyEDA, Solidworks, AutoCAD.
- **Tools:** Git, SSH, CMake, Vim, HTML, Markdown, L<sup>A</sup>T<sub>E</sub>X.