

# GUANYU XU

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Ann Arbor, MI - 48105, United States

## EDUCATION

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- **University of Michigan** *Aug 2024 - May 2026*  
Ann Arbor, US  
*B.S.E. in Computer Engineering (Expected)*
  - **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), Into Computer Organization (A+)*
  
- **Shanghai Jiao Tong University** *Sep 2022 - Aug 2026*  
Shanghai, China  
*B.E. in Mechanical Engineering (Expected)*
  - **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

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- [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

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- **Hybrid Dynamic Robotics (HDR) Lab, University of Michigan** *Oct 2024 - present*  
*Research Assistant, Supervisor: Prof. Xiaonan (Sean) Huang*  
**Stretchable Optical Waveguide Sensor for Shape Reconstruction** (Independent)
  - **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 firmware** in C 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 is in submission to Advanced Robotics Research.**

### Active Steering Control of Soft Growing Robot (Group Work)

- **Objective:** to build a novel steering joint for soft growing robots and to achieve accurate closed-loop control of omnidirectional steering.
- **Contributions:**
  - \* Collaborated with PhD researchers on the fabrication of the electrostatic clutches.
  - \* 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.

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

*Feb 2023 - Aug 2024*

*Research Assistant, Supervisor: Prof. Longquan Liu*

**Transformable wheel for Lunar Rover**

- **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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• **Major Design Project: AI-Enabled Smart Glass for Visually Impaired**

*Aug 2025 - Present*

*Course project for Advanced Embedded System (EECS 473) at the University of Michigan* 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 & 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**

*Feb 2025 - Apr 2025*

*Course project for Introduction to Embedded System Design (EECS 373)*

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 – Present*

• **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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• **Embedded Systems and Hardware:** STM32, ESP32, Circuit Design, IMU, LiDAR, ultrasonic sensors, Depth Camera, SolidWorks, Abaqus, AutoCAD, Raspberry Pi, Arduino, Circuit & PCB Design.

• **Interested Area:** Vision-Language Model, Computer Architecture.

• **Artificial Intelligence and Machine Learning:** PyTorch, VLM, YOLO, PointNet.

• **Programming:** C/C++, Python, MATLAB, Verilog, ARM assembly.