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 (IP), Advanced Embedded Systems (IP), Embedded Control (A+), Intro Machine Learning (A), Intro Embedded System Design (A+), Data Structure & Algorithms (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), Discrete Mathematics (A)

PUBLICATION & PATENTS

[1]   **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.

[2]   **Xu, G.**, Wang J. Tong, D. Huang X. (2025). *Highly Deformable Optical Waveguide Sensor for Real-time Surface Shape Reconstruction*. Robotics and Automation Letters (Manuscript in preparation).

RESEARCH EXPERIENCE

- **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 soft optical waveguide sensor that infers its 3D geometry using multiplexed LED-Photodiode (PD) measurements 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 1.4 mm** and a **relative error of 0.82%**.

    ∗ **The first-authored research paper is in preparation**.

  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

- **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

- **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

- **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

- **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