Zelin Shen

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[Personal Website] [Github] [LinkedIn] [Google Scholar]

EDUCATION

University of Michigan, Ann Arbor, MI. Aug 2025 - Present

- M.S. in Robotics Expected Graduation: May 2027

Cumulative GPA: 3.98/4.00

Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, VA. Aug 2021 - May 2025

- B.S. in Mathematics (*Summa Cum Laude*)
- B.S. in Computational Modeling and Data Analytics (*Summa Cum Laude*)
- Minor in Computer Science

Cumulative GPA: 3.85/4.00

Relevant Courses: Robot Control, Robot Kinematics and Dynamics, Robot Manipulation and Mobile Robot Navigation, Java/C/C++/Qt Large-scale Software Design, Data Structures, Algorithms, Computer Organization, Linux Systems, Real-Time Systems, Data Analysis, Signal Processing, Machine Learning, Numerical Methods, Linear Systems Theory, Calculus of Variations and Optimal Control Theory, Real Analysis.

RESEARCH EXPERIENCE

Agile Robot Control and Design (ARCaD) Lab, University of Michigan Sept 2025 - Present

Research Assistant (Sept 2025 - Present)

Graduate Student Research Assistant (May 2026 - Aug 2026)

Advisor: Prof. Yanran Ding

[Lab Website]

PUBLICATIONS

Arcadian: Open-Source Humanoid Ecosystem for Accessible and Customizable Research and Education

Zelin Shen, Gabriel Ramos Salinas, Qiyu Zhang, Yue Qin, Chen Qian, Yanran Ding.

Under review at IEEE International Conference on Robotics and Automation (ICRA), 2027.

[Video] [Documentation]

Mobile Pedipulation for Object Sliding via Hierarchical Control on a Wheeled Bipedal Robot

Yue Qin, Yulun Zhuang, **Zelin Shen**, Yanran Ding.

Accepted to IEEE Robotics and Automation Letters (RA-L), 2026.

[Paper] [arXiv] [Video] [Website]

SurGE: Surrogate Gradient-guided Evolution for Co-design of Legged Robots with Parallel Elasticity

Yulun Zhuang, Yue Qin, Justin Lu, **Zelin Shen**, Yichen Wang, Sicheng He, Yanran Ding.

Accepted to IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2026.

[Paper] [arXiv] [Video] [Website]

PROJECTS & ACTIVITIES & HONORS

RoboGrinder at Virginia Tech Aug 2021 - July 2025

Virginia Tech's robotics team, competing in the RoboMaster robotics competition hosted by DJI.

ECE & Embedded Control Branch Lead (Aug 2022-July 2025).

- Leading control team to accomplish all technical development objectives efficiently.

- Responsible for developing robotics control programs, focusing on embedded systems, sensors, and hardware integration. The robot has a 4-wheel chassis, a 2-axis turret, and a shoot mechanism; fully autonomous or controlled by a human driver.
- Large-scale C/C++ embedded software programs; construction of a control framework, peripheral drivers, algorithm design, communication(serial UART, CAN, I2C, SPI, etc.), circular buffer-based serial UART communication with mini PC(for computer vision auto-aiming systems), sensors(gyroscope, encoder, etc.), robot debugging, and team collaboration.
- Developed supercapacitor module's corresponding chassis power control algorithm. This will prevent the robot from being overly high-powered for a short period.
- Developed a collinear mecanum-drive balancing robot using PID control.
- Implemented LQR-based controller for a wheel-legged balancing robot.

Competition awards achieved

- 1st Place, **RoboMaster University League Robotic Competition-North American 3v3 Confrontation**. At University of California, San Diego, CA, June 24~28, 2025.
- 2nd Place, **RoboMaster University League Robotic Competition-North American 3v3 Confrontation**. At University of Colorado Boulder, CO, June 13~18, 2024.
- 4th Place, **RoboMaster University League Robotic Competition-North American 3v3 Confrontation**. At University of Washington, Seattle, WA, July 5~10, 2023.
- 4th Place, **RoboMaster University League Robotic Competition-North American 1v1 Standard Confrontation**. At University of Washington, Seattle, WA, July 5~10, 2023.
- 2nd Place, **RoboMaster University League Robotic Competition-North American 1v1 Standard Confrontation**. At Texas A&M University, College Station, TX, June 24~28, 2022.
- 1st Place, **RoboMaster 2022 University AI Challenge. At Philadelphia(PA), International Conference on Robotics and Automation (*ICRA*)**, May 23~27, 2022.

Undergraduate Research at Virginia Tech, advisor Dr. Lizette Zietsman (lzietsma@vt.edu) Fall 2022

- Topic: Exploration of control strategies through case studies.
- Modern control theory study(including state space representations, transfer function, pole–zero plot, etc.) and numerical simulation.

Independent Study at Virginia Tech, advisor Dr. Lizette Zietsman (lzietsma@vt.edu) Spring 2023

- Topic: LQR and PID control for self-balancing robot.
- Matlab simulation of controlling inverted pendulum.

LISP Interpreter with GUI Fall 2023

Course info: ECE 3574 Applied Software Design. Instructor: Dr. Sook Ha (sook@vt.edu).

- Large C++ software program, using QT5 for GUI development. The implemented interpreter will output the result of the LISP codes or the corresponding errors.
- Extends the syntax of LISP to allow it to draw plots and display graphical results using this interpreter.

Robotic Path Planning Fall 2023

Course info: MATH 3134 Applied Combinatorics and Graph Theory. Instructor: Prof. Kelli Karcher (kkarcher@vt.edu).

- This study delves into multiple optimal path-planning algorithms for robotics that move on a 2D plane with obstacles.
- Using MATLAB's Robotics System Toolbox, implemented and tested A* graph search and Probabilistic Road Methods.

Micro-ROS used in Robotic Embedded Control Program Spring 2024

Course info: ECE 5550G(4550) - (Advanced) Real-Time Systems. Instructor: Dr. Tam Chantem (tchantem@vt.edu).

- Porting Micro-ROS into a control program for RoboMaster competition robots and utilizing its functionality to communicate with the host computer(mini-PC, for computer vision, path planning, etc.).
- The program runs on an STM32F4 development board, using arm gcc + makefile toolchain for development(NOT relying on any Arduino, Raspberry Pi development boards, NOT relying on any IDEs).

INTERNSHIPS

DJI Technology Co., Ltd, Shenzhen, China **-** *Embedded Systems Internship* July 2019 - August 2019

- Embedded code for STM32 microcontroller, FreeRTOS-based application, CAN, UART communication, etc.

SKILLS

Coding Languages: C++, C, Java, Python, R.
Design & Simulation Toolkits: LTspice, SolidWorks, MATLAB.
Others: Qt, FreeRTOS, Linux, ROS 2, micro-ROS, LaTeX, Beamer, Adobe Photoshop, Adobe Premiere Pro.