Zhuowei Xu

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Education

Carnegie Mellon University   Pittsburgh, United States
Master of Science in Mechanical Engineering   Sept 2024 – May 2026(Expected)
QPA: 3.92/4.0
Relevant Coursework and Grades: *Mechanics of Manipulation (A), Robot Dynamics and Analysis (A), Machine Learning and Artificial Intelligence for Engineers (A), Numerical Methods in Engineering (A)*
Current Coursework: *Modern Control for Robotics*

Shanghai Jiao Tong University   Shanghai, China
Bachelor of Mechanical Engineering   Aug 2020 – Jul 2024
GPA: 3.5/4.0
Relevant Coursework and Grades: *Calculus I (95.2), Introduction to Engineering (96), Theoretical Mechanics (96), Engineering Material (90), Introduction to Robotics (95), Mechanical Dynamics (91)*
TOEFL: *Total 105 (Reading 30, Listening 25, Speaking 23, Writing 27)*

Publications

- Yongzhou Long, Zhuang Zhang, **Zhuowei Xu**, Enlin Gu, Qiujie Lu, Hao Wang, Genliang Chen. "Lightweight and Powerful Vacuum-Driven Gripper with Bioinspired Elastic Spine." [IEEE Robotics and Automation Letters. https://ieeexplore.ieee.org/document/10287554].

- **Zhuowei Xu**, Zilin Si, Kevin Lee Zhang, Moonyoung Lee, Shashwat Singh, Oliver Kroemer, Zeynep Temel. "A Low-Cost Tactile Fingertip Design for Dexterous Robotic Hands." [ICRA 2025 Workshop "Handy Moves: Dexterity in Multi-Fingered Hands". https://openreview.net/forum?id=5kj8uifi2w].

- **Zhuowei Xu**, Zilin Si, Kevin Lee Zhang, Oliver Kroemer, Zeynep Temel. "A Multi-modal Tactile Fingertip Design for Robotic Hands to Enhance Dexterous Manipulation." [Under review. https://arxiv.org/pdf/2510.05382].

Research Experience

Tactile-Augmented Diffusion Policy for Fine-Grained Manipulation   May 2025 – Present
Advisors: Zeynep Temel, Oliver Kroemer, Robotics Institute, Carnegie Mellon University

- Equipped a multi-finger robotics hand with multi-modal tactile fingertips and developed a diffusion policy based imitation learning framework for dexterous manipulation tasks integrating vision, force, and vibrotactile sensing.

- Implemented automated grasping of fragile objects; showed that integrating force sensing enables more direct contact perception and improved decision-making compared with a vision-only policy when pinching non-deformable objects such as chips.

Multi-modal Tactile Fingertip Design for Robotic Hands   Oct 2024 – Sept 2025
Advisors: Zeynep Temel, Oliver Kroemer, Robotics Institute, Carnegie Mellon University

- Developed a low-cost, easy-to-make, adaptable, and compact multi-modal fingertip integrating strain gauges for force sensing and a contact microphone for vibrotactile sensing; capable of sensing 2D planar force (0–5 N) and classifying different materials.

- Evaluate across three manipulation tasks with different visual occlusion levels, showing that tactile sensing overcomes occlusion, runs efficiently on lightweight hardware, and captures object properties unreachable to vision based models.

Bionic Vacuum-Driven Gripper with a Sense of Touch   Sept 2022 – Nov 2023
Advisors: Genliang Chen, School of Mechanical Engineering, Shanghai Jiao Tong University

- Developed a lightweight and powerful vacuum-driven actuator inspired by snakes' spine and ribs; achieved response time of 320 ms and maximum grasp force > 50 N.

- Designed and 3D-modeled the spine–rib structure and the actuator; devised an integral forming technique by 3D printing PLA ribs on TPU skin, reducing single-chamber manufacture time to < 40 minutes; built a three-fingered gripper and a wireless handheld mobile gripper.

TCP Calibration for Co-work System of "Galvo Mirror–Robot"   Nov 2023 – May 2024
Advisors: Jianhua Wu, School of Mechanical Engineering, Shanghai Jiao Tong University

- Built a galvo mirror and 6-DoF robot co-work system to replace planar motion platforms with robotic arms, expanding the galvo's workspace for 3D surface processing.

- Introduced a kinematic model with an error matrix for the co-work system, projecting the eight-dimensional joint space onto a 2D plane; identified parameters from planar images and established a mapping function with the error matrix.

Underactuated Hand with Dexterous Manipulation   Jun 2023 – Sept 2023
Advisors: Hao Wang, Genliang Chen, School of Mechanical Engineering, Shanghai Jiao Tong University

- Built a tablet-enhanced underactuated finger driven by a pouch motor and face actuator; a single finger can lift 200 g under 0.1 MPa.

- Added an exoskeleton to enhance actuator stiffness; introduced tablets to improve pouch motor efficiency; designed variable-stiffness joints enabling different bending modes.

Course Project

Model-Based Trajectory Control and Planning for a Whiteboard Robot   Feb 2025 – May 2025
Leading the software development

- Built real-time control and dynamics for a whiteboard-erasing robot; build visual tracking system for target track.

- Implemented a 2D simulation environment and benchmarked PID, MPC, and TVLQR under noise; validated on hardware, with MPC delivering the best tracking.

Design and Simulation of Six-DoF Robot with High Load-to-Weight Ratio   Mar 2023 – Jun 2023
Leading the simulation system development

- Designed six-DoF serial robots with a high load-to-weight ratio; implemented control, path planning, and obstacle avoidance using RRT.

- Conducted Simulink–SolidWorks co-simulation; developed a packaged Simscape simulation platform for various environments and loads; implemented an inverted pendulum demo controlled by double-loop PID; selected motors and verified moment requirements.

Honors and Awards

- Outstanding Undergraduate Scholarship of SJTU, 2021

- Second Prize, National Physics Competition for College Students in China, 2021

- Second Prize, RoBoMaster "YunHan Cup" Competition of SJTU, 2021

Leadership and Responsibilities

- Co-director of the publicity department of the student union (2021–2022)

- Volunteer for freshman registration (Sept 2021, Sept 2022)

- Volunteer teaching during vacations (2020–2023)

Skills

Programming: C++, Python, MATLAB, Julia
Hardware Tools: CAD Design, 3D printing, Robot Operation System(ROS), Finite Element Analysis, Single-chip