

Zhun Cheng

<https://zhunc.github.io/ZhunCollection/>

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Summary

Controls and Robotics Engineer with experience developing and deploying real-time control algorithms, embedded firmware, and machine learning pipelines for advanced robotic and consumer systems. Skilled in bridging theoretical modeling with hardware-in-the-loop prototyping to deliver robust, efficient, and production-ready solutions. Proven record of improving system performance (efficiency gains up to 50%, cost savings of \$100K+) through innovations in control, optimization, and intelligent sensing. Collaborative in cross-functional environments, with strong communication skills for translating complex engineering concepts to diverse technical and business stakeholders.

Experience

- R&D Controls Systems Engineer Co-op** Jan. 2025 - Dec. 2025
SharkNinja *Needham, MA*
 - Researched and prototyped methods from AI, robotics, aviation, and finance to develop smart kitchen appliances.
 - Deployed real-time nonlinear programming with first-order methods on hardware-limited platforms, improving robustness over previous algorithms.
 - Deployed discrete signal processing and state estimation such as Kalman Filtering that resulted in accurate and user-safe machine auto-recovery from anomalies.
 - Applied probabilistic clustering algorithms for efficient state estimation, reducing required sensors and cutting total estimated production cost by \$100,000.
 - Implemented real-time controllers on hardware-constrained systems, improving efficiency by up to 50% compared to prior generations.
 - Engineered firmware in C for STM32 microcontrollers, optimizing peripheral communication (PWM, ADC/DAC, AC firing angles, GPIO).
 - Coordinated a cross-functional team of 10, managing resource/task allocation and version control across internal tools.
- Learning-accelerated Trajectory Optimization, ELPIS and HURON Lab** Aug. 2023 - May 2025
Worcester Polytechnic Institute *Worcester, MA*
 - Defended thesis research on deep learning warm starts, achieving more than 50% reduction in solve time for new optimization problems.
 - Abstracted robotic trajectories into time-invariant parameter vectors and trained neural networks to capture physical similarity.
 - Maintained reproducible environments by building and managing Docker images for standardized development.
- Glove-driven Manipulator, Human-Robot Interaction** Aug. 2024 - Dec. 2024
Worcester Polytechnic Institute *Worcester, MA*
 - Built a wearable-driven robotic hand manipulator integrated with the Iona mobile robot platform, enabling human-robot interaction.
 - Deployed linear regression to map wearable glove input to manipulator state space, validating with successful grasps of complex objects.
 - Established communication and control link between manipulator and mobile platform MCU through ROS2, enabling integrated operation.
 - Improved manipulator design in Fusion 360, created mounting interface, tuned 3D printing parameters, and assembled the final system.
- Sampling-based Bipedal Footstep Planning, Motion Planning** Aug. 2023 - Dec. 2023
Worcester Polytechnic Institute *Worcester, MA*
 - Designed a bipedal footstep planner using RRT* with kinematic constraints and left/right foot discrimination to generate feasible trajectories.
- UAV Catch-and-return Control, Robotics Control** Aug. 2023 - Dec. 2023
Worcester Polytechnic Institute *Worcester, MA*
 - Implemented a sliding mode controller in MATLAB for underactuated UAVs, enabling capture of intruding flights with unknown trajectories before airspace exit.

Technicals

- **Mathematical Foundations:** Classic and Modern Control, Optimization, System Modeling and Identification, Deep Learning, Reinforcement Learning, Stochastic Processes, Statistics, Computation Geometry.
- **Programming Languages:** C/C++, Python, MATLAB and Simulink.
- **Software Frameworks:** ROS2, PyTorch, TensorFlow (+Lite), CasADi, Eigen, MuJoCo, Drake, OMPL, NumPy, Matplotlib
- **Utilities:** Git, Jira, Docker, Conda, LaTeX, Obsidian, MS Office.
- **Environments:** Windows and WSL2, Linux.
- **Prototyping:** Raspberry Pi, Arduino, Keil, Saleae, SolidWorks, Fusion 360, 3D printing, Machine shop operations.

Education

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| • Worcester Polytechnic Institute | Worcester, MA |
| <i>M.S. Robotics Engineering</i> | <i>Aug. 2023 - May 2025</i> |
| • Washington University in St. Louis | St. Louis, MO |
| <i>B.S. in Mechanical Engineering, minor in Robotics</i> | <i>Aug. 2019 - May 2023</i> |