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.

sectionExperience

- **R&D Controls Systems Engineer Co-op** Jan. 2025 - Dec. 2025
  SharkNinja *Needham, MA*
  - Researched and tested methods from AI, robotics, aviation, and finance to develop smart appliances with advanced autonomy.
  - Deployed real-time nonlinear programming with first-order methods on hardware-limited platforms, improving robustness over previous algorithms.
  - Developed system models using rapid prototyping, spectral analysis, and statistical methods, yielding more responsive and input-efficient controls.
  - Applied 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, ensuring smooth resource allocation and version control across internal software 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, 3D printing, Machine shop operations.

Education

- **Worcester Polytechnic Institute** — Worcester, MA
  M.S. Robotics Engineering — *Aug. 2023 - May 2025*
- **Washington University in St. Louis** — St. Louis, MO
  B.S. in Mechanical Engineering, minor in Robotics — *Aug. 2019 - May 2023*