

# Nathan Chun

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## EDUCATION

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### University of Southern California

Los Angeles, CA

*Bachelor of Science in Mechanical Engineering, Minor in Artificial Intelligence Applications* Aug. 2022 – May 2026

### Relevant Coursework

GPA: 3.95

*Linear Control Systems, Mechanics of Materials & Structures, Materials Behavior & Processing, Applied Natural Language Processing & Gen AI, Measurement & Instrumentation Lab, MEMS, Optimal Control*

## EXPERIENCE

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### USC Dynamic Robotics and Control Lab | Provost & CURVE Fellow

Los Angeles, CA

*Humanoid Pose Optimization* | [Demonstration Video](#) May 2025 – Present

- Implemented kinodynamic pose optimization and MPC with 6 ROS2 packages to control [HECTOR v2](#)
- Simulated in **MuJoCo** to debug and ensure expected behavior

*Teleoperated Construction Robotics* | [Demonstration Video](#)

Aug 2024 – Present

- Developed **ROS2** & Gazebo robot simulation on Linux with barrier avoidance to demonstrate enhanced user safety
- Implemented 2-stage control framework with **RRT\*** path planning algorithm and joy stick modes
- Explored **LiDAR** sensor configurations & utilized point cloud data for object detection & avoidance
- Investigated encoder integration for joint tracking to transition from simulation to real hardware

*HECTOR Humanoid v2* | [More about HECTOR v2](#)

Aug 2023 - Aug 2024

- Designed 8+ iterations of control board PCB to manage **RS485**, **CAN**, & **ethernet** communication
- Advised on **PCB design** and analyzed data sheets to ensure proper usage of electronics for signal integrity
- Coordinated with electrical and mechanical team members to ensure compatibility between systems
- Tracked and documented iterative design changes using Git version control

*Robotic Quadruped Arm*

June 2024 - July 2024

- Engineered robotic arm mounted on 2 Unitree Go1 quadrupeds for collaborative manipulation of large objects
- Collaborated with PhD team to ensure arm design met research needs; finalized in 2 weeks

*Wheelchair Stabilizer* | [Demonstration Video](#)

Jan 2023- Sept 2024

- Designed 4 prototypes of an automated wheel for wheelchairs, accounting for ease of use, cost, and compactness
- Slashed material cost and weight by 50% using **ANSYS** stress and topology optimization and low-cost sensors
- Specified, tested, and assembled **embedded system** to control motorized wheel using low-cost, efficient components
- Proved concept with **Simulink** and **MATLAB** to model control system and simulating stabilizer triggering situations

### USC Viterbi Baum Family Makerspace

May. 2024 – Present

*CNC Machinist/Student Worker/Robotist*

Los Angeles, CA

- Operating & programming manual & HAAS **CNC mills** & **lathes** using **MasterCAM** for USC design teams
- Identified opportunities to operate **waterjet** and **bandsaw** for efficient fabrication of lower tolerance components
- Created **GD&T** drawings for designed parts including custom fixtures to allow replication by other machinists
- Proposed design for manufacturing (**DFM**) practices & designed tools (e.g. fixtures) to facilitate machining

### USC John O'Brien Nanofabrication Lab

Jun. 2025

*SURF Intern & Fellow*

Los Angeles, CA

- Fabricated MEMS devices with **photolithography**, wet & dry **etching**, **chemical deposition**, etc.

## PROJECTS

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- Cart Pole Pendulum** | *Optimal Control, MATLAB/Simulink, Embedded Systems, Fabrication* July 2025
- Simulated CartPole stabilization after perturbation with **LQR** controller
  - Designed, manufactured, and assembled physical system for \$170 in less than 2 weeks
  - Devised empirical methods to determine conversions between controller outputs and physical system commands
- Desktop CNC Router** | *CNC Milling, Waterjet, CAD* Apr 2025 – May 2025
- Designed structural components based on available scrap metal sizes to simplify manufacturing and cut costs
  - Utilized spare aluminum extrusion and low-cost linear guide rails for rigid, precise travel along y & z axes
  - Programmed and operated HAAS VF-2 and **waterjet** to manufacture and assemble all custom parts
- Analysis of Fin Separation on Heat Transfer** | *LabVIEW, Data Processing* Apr 2025 – May 2025
- Proposed experimental design outlining required data, equipment, theory, and expected results
  - Programmed custom VI in **LabVIEW** to automate **thermocouple** data plotting
  - Applied heat transfer fin theory and compared experimental to real world results
- MEMS Pressure Sensor** | *LabVIEW, Sensor Integration, Data Analysis* Apr 2025 – May 2025
- Employed **strain gauges** to read pressure, achieving accurate readings between 0.5 and 1.5psi
  - Ran multiple trials to empirically determined relation between strain and pressure
  - Presented results and performed **error analysis** to determine root cause of inaccuracy at higher pressure
- Energy-Generating Shoes** | **USC Makers** | *Circuits, MEMS Sensors, Prototyping* Jan 2023 – May 2023
- Investigated energy harvesting technology and boost converters to step up low voltage from piezoelectric effect
  - Experimented with various insole materials & placement of piezoelectric crystals for highest voltage generation

## PUBLICATIONS

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A. Rigo, J. Ma, **N. Chun**, S. Gupta, Q. Nguyen, "Hierarchical Control Framework for Collision-Free Collaborative Loco-manipulation of Large and Heavy Objects," *IEEE International Conference on Automation Science and Engineering (CASE)*, 2025.

## TALKS

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1. USC CURVE Symposium, *Hardware Development for Affordable Humanoid Robots*, 2024.

## TECHNICAL SKILLS

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**Languages:** English (Native), Mandarin (Fluent)

**Software:** C++, Python, MATLAB, Simulink, Wolfram Mathematica, ROS, Julia, GitHub, Excel

**Mechanical:** SolidWorks, NX, ANSYS, FEA, 3D Printing, DFM, GD&T, CNC, Material Selection, Manufacturing

**Electrical:** PCB Design (KiCad), Soldering, Arduino, EPS32, Teensy 4.1, Oscilloscope, Multimeter, Logic Analyzer