Nathan Chun

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EDUCATION

University of Southern California — Los Angeles, CA

Bachelor of Science in Mechanical Engineering, Minor in Artificial Intelligence Applications — *Aug. 2022 – Dec 2025*

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

USC Dynamic Robotics and Control Lab | Provost & CURVE Fellow — May 2025 – Present

Humanoid Pose Optimization | [Demonstration Video](#) — *Los Angeles, CA*
- 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](#) — *Los Angeles, CA*
- Developed **ROS2** & Gazebo 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](#) — *Los Angeles, CA*
- 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 — *Los Angeles, CA*
- Engineered robotic arm in **SolidWorks** for manipulation of large objects prioritizing manufacturability
- Fabricated with 3D printing and laser cut aluminum; simple to assemble with minimal parts
- Collaborated with PhD team to ensure arm design met task requirements; finalized in 2 weeks

Wheelchair Stabilizer | [Demonstration Video](#) — *Los Angeles, CA*
- 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 with low-cost components
- Proved concept with **Simulink** and **MATLAB** to model control system and simulate stabilizer triggering

USC Viterbi Baum Family Makerspace — May 2024 – Present

CNC Machinist/Student Worker/Roboticist — *Los Angeles, CA*
- Operating & programming manual & HAAS **CNC mills** & **lathes** using **MasterCAM** for USC design teams
- Using **waterjet** and **bandsaw** for efficient fabrication of loose tolerance components
- Creating **GD&T** drawings in **NX** for custom fixtures and tooling to allow replication by other machinists
- Proposing design for manufacturing (**DFM**) practices & designed tools (e.g. fixtures) to facilitate machining
- Mentoring electric FSAE team design of suspension system parts to optimize machinability
- Using indicators, granite tables, calipers, pins, and bore gauges to validate high precision parts

USC John O'Brien Nanofabrication Lab — June 2025

SURF Intern & Fellow — *Los Angeles, CA*
- Used **photolithography**, wet & dry **etching**, **chemical deposition**, etc. to fabricated novel MEMS devices

PUBLICATIONS

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

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

Projects

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

Technical Skills

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