

# Lincoln Roth

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## EXPERIENCE

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### Embedded Firmware Engineer

May 2022 – Present

*Second Order Effects*

*El Segundo, CA, Redmond, WA*

- Led firmware development for diverse consulting projects in deep tech industries, including fusion energy, satellites, medical devices, and rocket propulsion. Contributed to the refinement of firmware team culture and development processes by improving the Software Development Plan, creating technical documentation, and training new engineers.
- Space-Rated SSD Firmware:** Designed and implemented the flash translation layer for a space-grade SSD, achieving sustained read speeds **over 1500 MBps** through a **custom data striping architecture** that **improved throughput by 500%**. Developed a bespoke bad block management algorithm that doubled the speed of conventional methods. Integrated and optimized the **lwIP** stack, reducing BRAM usage to improve FPGA place-and-route performance despite the resource-heavy ONFI IP core. Built a **high-speed test system to benchmark and validate** SSD performance under mission-critical conditions.
- EtherCAT Sensing and Compute Platform:** Led the firmware development for an EtherCAT-based sensing and compute platform, architecting a CLI application for real-time telemetry and command over UART and fiber-based EtherCAT. Drove the project to completion over **two months ahead of schedule**, securing a **follow-on contract** for production support and EtherCAT testing, **saving the company over \$500k** in projected costs. Managed firmware development and team coordination, delivering a robust, production-ready system while **overseeing the full development lifecycle** and acting as the primary firmware contributor.

### Mechatronics Engineering Intern

June 2021 – August 2021

*ASML*

*Wilton, CT*

- Contributed to the development of mechatronic systems for ASML's lithography machines, which manufacture 70% of the world's computer chips.
- Designed and implemented diagnostic tools in MATLAB/Simulink to analyze the dynamic behavior of the Reticle Handling system, enabling faster robot movements while minimizing vibrations.
- Developed and integrated control algorithms into the internal control structure to enhance vibration compensation and improve system response, increasing throughput and system reliability.

### CUDA Research Assistant

Sep. 2020 – May 2021

*Rutgers University Aresty Research Center*

*New Brunswick, NJ*

- Used **parallel processing and CUDA acceleration** with MATLAB to improve processing speed of a 3D insect flight simulator used for development of micro-aerial robots. This allows for **over 50x increases in program speed** greatly reducing computational costs associated with simulation

### MLH Fellow

June 2020 – August 2020

*MLH/Github*

- Supporting Adafruit/Circuit Python, I worked on Glider, a live, mobile code editor using React Native for the app, embedded C for the microcontroller, as well as Bluetooth Low Energy (BLE) for the live code updates. Stubbed out the entire BLE aspect for a **5x decrease in development time** as well as increased the app's accessibility.

## EDUCATION

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### Rutgers University

New Brunswick, NJ

*Bachelor of Science in Mechanical Engineering and Computer Science*

## TECHNICAL SKILLS

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**Software:** C/C++, Python, Rust, MATLAB/Simulink, ROS(2), Linux (Yocto), CMake, Make, Git, CI/CD, Verilog/SystemVerilog

**Embedded:** ARM Cortex (STM, TI, NXP), FPGAs/SoCs (Xilinx, Microchip), RTOS (FreeRTOS, Zephyr), Ethernet (lwIP, UDP/TCP/IP), EtherCAT, Embedded Testing Frameworks

**Electrical:** KiCAD, Altium Designer, Soldering/Rework (SMD), PCB Bring-up, NAND Flash

**Mechanical:** SolidWorks, FEA/FEM, CFD, ANSYS, COMSOL