Lincoln M. Roth

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EXPERIENCE

Second Order Effects | *Firmware Engineer*   September 2023 — Present
  - » Performed IC and Lead engineer work on various consulting projects for clients spanning many deep tech industries, including **fusion, satellites, medtech, and rockets**
  - » Did **architecture design, wrote HDL, and wrote embedded C** developing the flash translation layer for a space-rated SSD, capable of 1500 MB/s reads and writes. Implemented data striping, block management, and error correction optimizing for the specific application of our customer.
  - » Led the firmware effort developing an **EtherCAT** based sense and compute platform. We created a CLI-based application to receive and command telemetry over UART or fiber-based EtherCAT. I lead the programmatic effort acting as a "scrum master", while also leading the technical development and acting as the largest individual contributor to the project. After brought on as FW lead, the project moved from unprofitable to profitable (delta of ~**$500k**)

Second Order Effects | *Engineering Intern*   May 2022 — August 2022
  - » Implemented I2C, SPI, and GPIO drivers for Xilinx FPGAs and MCUs to bring up PCBAs, as well as performing **electrical testing and verification** on various subsystems. Wrote and reviewed requirements to ensure boards delivered to customers met all expectations.
  - » Performed PCB layout for a rocket engine test rack. The board had **>2500 components** and simulated various sensors seen on engines. Implemented and routed galvanic isolation for each simulated sensor as well as high speed SPI signals.

ASML | *Mechatronics Intern*   June 2021 — August 2021
  - » Developed mechatronics systems for improved reliability and function on machines responsible for manufacturing 70% of the world's computer chips.
  - » Created **diagnostic tools in Matlab/Simulink** to analyze dynamic behavior of the Reticle Handling system which then allowed faster robot movements while minimizing vibrations. Interfaced with internal control structure to create **control systems for vibration compensation and response**.

Rutgers Aresty Undergraduate Research Center | *Undergraduate Researcher*   September 2020 — May 2021
  - » 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 (Major League Hacking) Fellow | *Software Engineering Intern*   June 2020 — August 2020
  - » 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 accessibility of the app to any potential user.

Rutgers Solar Car Club | *Mechanical Lead*   July 2019 — May 2023

EDUCATION

Rutgers University—New Brunswick (Engineering Honors Academy)   New Brunswick, NJ
B.S. in Mechanical Engineering and Computer Science (Double Major)
  - » Special Coursework: Robot Learning (**Graduate**), Computational Robotics, AI, Dynamics Systems & Controls

PROJECTS

SuperServo - Robotics-specific prototyping actuator
  - » Designed and built a high-torque density custom servomotor specifically designed for rapid robotics development. Used hobby BLDC motors in a quasi-direct drive setup paired with a high power motor control platform and FOC control. Allowed for very fast, high precision motion, in a modular form factor greatly reducing the needed work on many other projects. | *Microcontrollers, EAGLE, CAD, C Control Systems*

Firefighting Robot | github.com/phscrc/ogrebot
  - » Built a firefighting robot for the Trinity International Robot Contest. The robot was built to autonomously navigate a maze to find and extinguish a fire. The robot used custom servos for locomotion, a 2D Lidar and an IMU for localization, as well as a host of other sensors and actuators for detecting and extinguishing the flame. | *ROS, Gazebo, Python, Robotics*

SKILLS

Computer Engineering: C/C++, Python, Rust, MATLAB/Simulink, ROS/Gazebo, Embedded Systems, Linux (Yocto, Buildroot), Vivado/Vitis, Git/Github/Gitlab
Electrical Engineering: Microcontrollers (ARM(STM, TI, NXP), ESP32, Atmega), Xilinx MCUs/FPGAs (Artix7, ZYNQ+, Kintex), EtherCAT (100Base-FX and TX), KiCAD, Altium Designer, Soldering (SMD)
Mechanical Engineering: SolidWorks, FEA/FEM, CFD, Control Theory, ANSYS, Fusion360, COMSOL