

Lincoln M. Roth

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EDUCATION

Rutgers University—New Brunswick

New Brunswick, NJ

B.S. in Mechanical Engineering and Computer Science (Double Major), minor in Mathematics

May 2023

» GPA: **3.5** | Dean's List | Engineering Honors Academy

» Special Coursework: Robot Learning (**Graduate**), Computational Robotics, AI, Dynamics Systems & Controls

EXPERIENCE

Second Order Effects | *Engineering Intern*

May 2022 — August 2022

» Implemented I2C and SPI drivers for both FPGAs and MCUs to bringup PCBAs, as well as performing electrical testing and verification on various subsystems. Wrote and reviewed requirements to ensure boards delivered to customer met all expectations.

» Developed internal tooling for managing wifi network. Had features to generate, manage, and revoke EAP certs, as well as automatically change and distribute guest wifi passwords.

» Layed out PCB 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. Worked on the internal robot arms (SCARA and standard) as well as all Reticle Handling components, both in vacuum and out of vacuum.

» 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

» Contributed to Adafruit's CircuitPython, a Python for microcontrollers, through the inaugural class of MLH Fellows.

» 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 — Present

» Lead the subteam responsible for designing, analyzing, validating, and manufacturing the mechanical components for a solar race car. Taught members the fundamentals of design and analysis in addition to engineering responsibilities.

PROJECTS

SuperServo - Robotics-specific prototyping actuator

August 2020

» 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/phsrc/ogrebot

February 2020

» 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*

ML Basketball | <https://github.com/lincolnmroth/basketball-RL>

May 2021

» Used Q-Learning and Neural Fitted Q iteration to have a robot arm teach itself how to shoot a basketball into a hoop. Used a Epsilon-Greedy approach for exploration, and neural network for Q-Value estimation | *Reinforcement Learning, Python*

SKILLS

Mechanical Engineering: SolidWorks, FEA/FEM, CFD, Control Theory, ANSYS, Fusion360, COMSOL

Electrical Engineering: Altium Designer, Microcontrollers (STM32, ESP32, Atmega), Xilinx MCUs/FPGAs (Artix7, ZYNQ+), Soldering (SMD)

Computer Engineering: MATLAB/Simulink, Python, C/C++, ROS/Gazebo, Reinforcement Learning, Machine Learning, PyTorch, TensorFlow, Keras, Git/GitHub, Swift/iOS, Embedded Systems, Linux, Vivado, Vitis