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EDUCATION

Carnegie Mellon University, <u>M.S. – Robotics</u>, *3.94/4.00* **Northeastern University**, <u>B.S – Mechanical Engineering</u>, *3.98/4.00*

GRADUATE RESEARCH

Pittsburgh, PA • Aug. 2023 – Aug. 2025 Boston, MA • Sep. 2019 – May. 2023

Redwood City. CA • Jul. - Dec. 2021

Planetary Robotics Lab, Zoë2 Rover – Project Lead Developing ruggedized field research rover platform, encompassing full-stack mechanical, electrical, and software design Architecting ROS2 Control stack in C++, implementing CANOpen for low-level motor and encoder communication, feedforward controller for active kinematic control of passively-articulated drivetrain, and Gazebo for physics simulation Planetary Robotics Lab, Moonranger Lunar Rover – Mobility Lead Pittsburgh, PA • Jan. 2024 – Present Coordinating 9 students to test and improve mobility of lunar micro-rover in anticipation of 2027 launch to the Moon's south pole Conducting 250+ discrete-element-model (DEM) simulations in C++ to analyze rover mobility across 3.5 million simulated terrain particles, utilizing the Pittsburgh Supercomputing Cluster for parallel computation of candidate wheel designs Validating simulation results using gantry test rig, conducting physical wheel slip testing in GRC-1 lunar regolith simulant LeCAR Lab, PINBOT: Self-Playing Pinball Machine – Project Lead

Training AI model to play pinball using reinforcement learning sim-to-real pipeline, custom PCB controller, and three-camera vision stack, averaging 87% of skilled human player scores after training PPO model for 5,000 games

INDUSTRY EXPERIENCE

NASA Jet Propulsion Laboratory (JPL), <u>Graduate Intern</u> Pasadena, CA • May – Aug. 2023 Oversaw design, analysis, fabrication, assembly, wiring, and operation of Mars Sample Return PLANAR testbed, a 160lb, 250+ component instrumented gantry to evaluate lateral footpad interactions with 5 tons of simulant during surface operations

- Managed 4 technicians to operate full-scale footpad impact testing by creating software tools and administering tests
- NASA Jet Propulsion Laboratory (JPL), Spacecraft Mechanical Engineering Co-op
 Composed parameterized kinematics & dynamics model of lander testbed to convert target impact energies and velocities into drop configurations, matching physically achieved results with < 3% error
- Wrapped configuration calculator and post-test data pipeline into GUI-based MATLAB app to streamline technician operation
- Programmed and parallelized procedural rockfield mesh generator for lander simulation team, used for 23,000 landing sims
- Fulfil Solutions Inc, R&D Mechanical Engineering Co-op
- Designed and prototyped 5-axis universal manipulation robot for picking & transferring highly varied inventory consisting of thousands of grocery items ranging in profile, hardness, texture, mass, & volume
- Modeled 350+ part assembly using principles of DFM, DFA, static simulation, tolerance stack-up, & kinematic constraints
- Drafted 25 drawings to ASME Y14.5 GD&T standards for manufacturing via CNC machining, turning, & sheet metal bending

UNDERGRADUATE RESEARCH

RIVeR Lab, BOOST: Battery-Optimized Onsite Swapping Technology – Project Lead Boston, MA • May 2022 – May. 2023

- Led team of 10 to develop novel battery-swapping architecture to continuously sustain multi-agent fleet of field robots, building central hub robot, two mini rovers, and four battery modules, successfully demonstrating autonomous swaps in 98sec on average
- Created iterative physics solver to conduct 10k+ rigid-body docking simulations in MATLAB Simscape Multibody, characterize misalignment compensation, and generate optimal bumper splines, resulting in 260% increase in starting docking poses
- RIVeR Lab, E-ROBOT Retrofit Challenge Design Lead
 Devised mobile robot to navigate crawlspaces and seal uninsulated surfaces, winning \$200k from the U.S. D.O.E. as National Finalist pioneering minimally invasive & low-cost robotic retrofitting solutions to reduce building emissions
- Developed coaxial flipper mobility platform to traverse above sparse attic joists by unfolding and increasing span by 87%

RIVeR Lab, NASA Moon to Mars Ice & Prospecting Challenge – Mechanical Lead Boston, MA • Dec. 2019 – Apr. 2022

• Directed design & manufacturing of two robotic solutions to drill, heat, extract, and purify simulated Martian water ice deposits, earning \$24k awarded by NASA, ranking 2nd at national finals, and achieving Best Technical Paper

TECHNICAL SKILLS

Programming: C++, Python (Numpy, Sklearn, Pytorch), MATLAB, Linux (Ubuntu, WSL, Bash, Slurm), Git, Docker, C#, Julia, Java
Firmware: Robot Operating System (ROS1, ROS2, ros2_control, RViz), NI Labview, Simulink, Arduino, CANOpen
CAD & Sim: Solidworks Certified Professional (CSWP, CSWA), Autodesk Fusion 360, Siemens NX, Gazebo, Simscape, Chrono, Ansys
Design & Fabrication: Parametric modeling, DFA, DFM, FEA, GD&T drafting, Topology optimization, 3D printing, CNC machining