Bruke Baraki

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EDUCATION

MS **University of Pennsylvania**, Robotics — Sept 2022 - May 2024

- GPA: 3.85/4.0
- **Coursework**: Computer Vision, Advanced Robotics, Feedback Control, Mechatronics, Control and Optimization in Robotics, Design of UAVs

BS **University of Pennsylvania**, Mechanical Engineering and Applied Mechanics — Sept 2020 - May 2024

- GPA: 3.91/4.0
- **Honors/Academic Recognition**: Victor W. K. Ku Memorial Award, Rachleff Scholarship, Herbert J. and Selma W. Bernstein Class of 1945 Internship

EXPERIENCE

DAIR Lab, Research Assistant — Philadelphia, PA
DAIR Lab develops algorithms for real-time planning and control of robots in contact-rich environments, using a model-based approach through perception modalities — July 2024 - Present

- Contributed to the haptic exploration project, enabling robots to **perceive objects through touch**
- Used a model-based approach to estimate the properties (e.g., geometry, trajectory, and coefficient of friction) by **minimizing the loss function** from our learning framework, ContactNets
- Researched **optimal model selection** that executes subsequent actions with the highest expected information gain (EIG)
- Implemented a force estimation algorithm for the DenseTact 2.0 optical tactile sensor
- Validated methods using in simulation with **Drake** (robot physics sim) and hardware experiments

Astrobotic Technology, Hardware Development Intern — Pittsburgh, PA
Astrobotic is a space robotics company specializing in lunar payload delivery services and space tech — May 2023 - Aug 2023

- Built essential hardware to assist in the integration of and test on a hardware-in-the-loop platform
- Designed a PCB featuring four distinct heat emulation designs and conducted a comprehensive trade study comparing each design in terms of efficiency, heat output, complexity, and cost
- Developed an embedded software driver to facilitate TCP packet transmission through Ethernet from a PC to the ”backplane,” enabling seamless data collection from the emulation hardware

Sung Lab, Research Assistant — Philadelphia, PA
Feb 2021 - May 2023

- Improved the design of a robotic swimmer that utilizes jet propulsion for locomotion
- Designed a custom PCB featuring an ATSAMD21 MCU, 9-axis IMU, current sensor, motor, encoder.
- Developed in C++ to facilitate robotic actuation, real-time IMU sensor fusion, and data collection
- Designed and fabricated models of the robot’s body and enclosure using CAD software
- Spoke at a symposium about this research and presented findings at a poster presentation

ACADEMIC PROJECTS

For more detail, regarding these projects and research: (https://bbaraki.github.io)

- Path-Planning for Panda Franka Emika (Pick-and-Place)
- Educational Robotics Kit to teach AI
- Ultrasonic Radar Detector
- Trajectory Optimization for a Unicycle
- PCB for a rechargeable flashlight
- Controller for Quadcopter

TECHNICAL SKILLS

Programming	MATLAB, C, C++, SIMULINK, Python (NumPy, SciPy, PyTorch), Deep Learning, ROS, Git, Linux
Mechanical	CAD (SolidWorks), 3D printing, laser cutting, mechanical prototyping
Electrical	Altium Designer, digital electronics (SPI, I2C, UART, CAN Ethernet), analog electronics, embedded systems (actuators, sensors), optical tactile sensors

OTHER

- **Teaching Assistant**: Graded lab reports, held office hours, and designed lab assignments for a Design of Mechatronic Systems course with 120 graduate/undergraduate students from various engineering disciplines
- **Volunteering**: Prepared, packaged, and cooked meals for those with nutritional deficiencies (50 hours) and worked as an instructor for Philadelphia elementary schools in first LEGO League robotics
- **Research Peer Advisor**: Helped first-year undergraduates find research opportunities and provided mentorship
- **NSBE**(National Society of Black Engineers) Member