ALISA ALLAIRE

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RESEARCH INTERESTS

I'm interested in robot learning and confronting the challenges of applying learning methods to real-world systems. The focus of my current research is enabling robots to learn about and interact with physical processes in the real world. A general theme in my work is leveraging decomposition and abstraction, either in both time and space, to make planning and learning more efficient.

EDUCATION

PhD Student in Robotics, Carnegie Mellon University — Aug. 2019 - *Present*
Advisor: Chris Atkeson

Bachelor of Science in Computer Engineering, Georgia Institute of Technology — Aug. 2014 - Dec. 2018
Minor in Robotics
Graduated with Highest Honors

TECHNICAL SKILLS

Graduate Coursework: Math Foundations for Robotics (16-811), Computer Vision (16-720), Machine Learning (10-701), Optimal Control and Reinforcement Learning (16-745), Statistical Techniques in Robotics (16-831), Kinematics, Dynamics, and Control (16-711), Integrated Intelligence in Robotics (16-785), Deep Learning for Robotics (16-884)

Programming: Python, C/C++, MATLAB, VHDL/Verilog, assembly

Embedded Systems: Raspberry Pi, Arduino, ARM and TI microcontrollers, Intel FPGA

Software: Linux/Windows OS, ROS, OpenCV, PyTorch, Git, Altera Quartus

Prototyping Tools: oscilloscope, logic analyzer, multi-meter, soldering, 3D printing

RESEARCH EXPERIENCE

Graduate Research Assistant — Aug. 2019 - *Present*
Dr. Chris Atkeson
Robotics Institute, Carnegie Mellon University — *Pittsburgh, PA*

Learning and Reasoning about Physical Processes in the Real World

- Investigating computational methods that enable robots to autonomously diagnose problems in physical processes, propose possible remedies, and evaluate the results after applying the best candidate(s).
- Designed and built a custom robot to autonomously assemble marble runs as a platform for evaluating learning algorithms on real-world physical reasoning tasks.

Undergraduate Research Assistant — Jan. 2018 - Dec. 2018
Intelligent Vision and Automation Lab, Dr. Patricio Vela
School of Electrical and Computer Engineering, Georgia Institute of Technology — *Atlanta, GA*

Marsupially-Aided Robotic Snake Exploration and Navigation of Cluttered Environments

- Worked in a small team to develop a marsupial system, composed of a TurtleBot platform and snake robot, for robotic snake exploration and navigation through obstacle-strewn environments.

- Ported an existing control architecture, which defines a wandering behavior for the snake robot, from MATLAB to software architecture supported by the Robot Operating System (ROS).
- Designed and 3D printed a bracket to mount a stereo camera to the robotic snake's head to enable exploration with simultaneous localization and mapping (SLAM).

Shape-Based Robotic Snake Traversal of Uneven Terrain

- Refined motion primitive behaviors for a snake robot to enable autonomous traversal over varying planar obstacle configurations.
- Developed a behavioral software architecture to coordinate and schedule the execution of distinct motion primitive behaviors for a snake robot.
- Won the Peer Review Award for best poster at the Opportunity Research Scholars Program's annual research competition.

INDUSTRY EXPERIENCE

Astrobotic Jan. 2019 - Aug. 2019
Robotics Research Engineer, Future Missions and Technology *Pittsburgh, PA*

- Led software development for the SoundSee device as part of a partnership with Bosch. The SoundSee device is an acoustic monitoring system for detecting and diagnosing equipment failure in the International Space Station (ISS). It mounts to NASA's Astrobee robot which autonomously flies around the ISS. Marking Astrobotic's first time in space, SoundSee launched on Nov. 2, 2019 with Northrup Grumman's CRS-12 resupply mission and is currently aboard the ISS.
- Designed and developed the SoundSee device's software system from the ground up over the course of 8 months. Critical components of the software system include
  - high-frequency (ultrasonic) streaming from 40 microphones simultaneously via an FPGA to a single-board computer (SBC) running Linux
  - communication protocol and pipeline to transfer data between the ground station on Earth and the device in the ISS
  - push-button and LED user interface for astronauts to initiate and monitor audio recording
- Led efforts to prepare SoundSee for launch including electronics and cable assembly for flight hardware, software integration testing with the Astrobee robot at NASA's Ames Research Center, and EMI testing at NASA's Johnson Space Center.

Intel Corporation May 2017 - Dec. 2017
Firmware Engineering Intern, Non-Volatile Memory Solutions Group *Folsom, CA*

- Led a team of 5-6 engineers to merge the firmware validation frameworks of two solid-state drive (SSD) technologies into a common repository for maximum code reuse.
- Increased project productivity by leading daily meetings to track progress and allocate project tasks.
- Efficiently implemented firmware and test fixes while consulting with industry experts to maintain high quality standards.

PUBLICATIONS

A. Allaire and C. G. Atkeson, "Learning Exploration Strategies to Solve Real-World Marble Runs," *International Conference on Robotics and Automation (ICRA)*, 2023.

C. Bauer, D. Bauer, **A. Allaire**, C. G. Atkeson and N. Pollard, "Learning to Navigate by Pushing," *International Conference on Robotics and Automation (ICRA)*, 2022, pp. 171-177.

TEACHING

Teaching Assistant, CMU 16-720, Computer Vision Sept. 2022 - *Present*
Teaching Assistant, CMU 16-362, Mobile Robot Programming Sept. 2021 - Dec. 2021
Lead Teaching Assistant, Georgia Tech ECE 2031, Digital Design Lab Jan. 2018 - Jul. 2018
Teaching Assistant Georgia Tech ECE 2031, Digital Design Lab Aug. 2016 - Apr. 2017

OUTREACH

Peer Instructor Mar. 2018 - Dec. 2018

Interdisciplinary Design Commons

School of Electrical and Computer Engineering, Georgia Institute of Technology *Atlanta, GA*

- Volunteered 4 hours/week as a peer instructor with the Hive, a student organization that runs an electrical engineering focused makerspace called the Interdisciplinary Design Commons (IDC).
- Trained to operate common electrical benchtop equipment and 3D printers.
- Provided technical assistance to students from all disciplines, backgrounds, and skill levels to complete electronics projects.