

ELIZABETH FOX, PhD

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RESEARCH AND WORK EXPERIENCE:

Research Scientist, Applied Research Associates, Randolph, VT

August 2023-Present

- Developed system health and data recording protocols to interface sensors and machine learning processes with ground vehicle platform
- Integrated 6-DOF Fanuc arm onto robotic vehicle platform using ROS and MoveIt to create autonomous motion control schemes and guarded teleoperation with custom controller and hook end effector

Doctoral Research Assistant, Georgia Institute of Technology, Atlanta, GA

2017-2023

- Compliant Underactuated Grasping
 - Designed soft robotic mechanism for controllable-stiffness gripper joints
 - Created underactuated hand prototype with optimized controllable synergies
 - Wrote computer vision software to track robotic fingers in 3D space
 - Developed methodology for characterization of soft nonlinear devices
 - Characterized soft devices to estimate kinetics from known device kinematics
 - Built simulator add-on to accurately simulate motions of soft compliant underactuated hand
 - Optimized gripper design based on grasp performance
- Wearable Devices
 - Integrated EMG and ultrasound sensors to control prosthetic devices
 - Characterized motions of pneumatic artificial muscles (PAMs) in cable-driven system
 - Developed strategies to use PAMs in wearable device in parallel with human motions
 - Characterized stretch and slip in system and designed controller to mitigate effects
 - Built pneumatic controllers to achieve desired actuator motions
 - Designed device to assist finger flexion and extension while minimizing grasp interference
- General Lab Work/ Smaller Projects
 - Developed 3D printing methods for simultaneous printing of flexible and rigid components
 - Mentored undergraduates on research projects

Graduate Intern, RightHand Robotics, Somerville, MA

Summer 2022

- Created motion tracking algorithm to allow steerable cameras to follow the path of piece-picking robot
- Integrated steerable camera into the main robot state machine
- Decreased cycle time by modifying robot manipulator motion path to allow data to be captured in motion with steerable camera

Graduate Intern, Nvidia Robotics Research Lab, Seattle, WA

Summer 2020

- Simulated newly designed fully-actuated robotic hand with soft finger pads using soft materials simulator
- Helped debug novel simulator incorporating both soft and rigid structures
- Refined machine learning process to control hand and virtual arm trajectories during grasping
- Developed control strategies to pick up flat objects by leveraging soft finger pad properties

Teaching Assistant, Georgia Institute of Technology, Atlanta, GA

2019-2023

- Lead weekly lab sections for ME 4056: Systems Laboratory and ME 4405: Fundamentals of Mechatronics
- Ensured student safety and understanding of the material
- Consulted on mechatronics project feasibility and methodology

Undergraduate Research, University of Rochester, Rochester, NY 2016-2017

- Updated and created GUIs to calibrate and interface with opto-mechanical machines
- Built and managed database interface for lab testing data
- Investigated transient effects of laser writing on hydrogel

Robotics in the Real World REU, Oregon State University, Corvallis, OR Summer 2016

- Researched fluidic ankle actuation for bipedal walking and running robot
- Designed gerotor pump and designed actuation test setup to prove concept of offset-mass hydraulic actuation

Summer Intern, Alcoa, New Kensington, PA Summer 2015

- Designed components for continuous pressure casting machine
- Observed and learned about different additive manufacturing processes

OTHER EXPERIENCE:

Robograde, Georgia Institute of Technology: Treasurer 2018-2020

- Created and managed budget for organization of graduate students performing research in robotics field
- Planned lectures and various social events

Baja SAE, University of Rochester: Club Member and Head of Manufacturing 2013-2017

- Led frame and suspension manufacturing for club-designed all-terrain vehicle
- Instructed new members in tool use and safety measures
- Designed gear webbing to reduce weight
- Met with sponsors and convinced them to continue supporting team

EDUCATION:

Georgia Institute of Technology, Atlanta, GA 2017-2023

- Ph.D in Robotics, *Characterization of Soft Structures for Synergy-Based Performance Optimization in Robotic Grasping and Other Manipulation Tasks*, GPA 3.91

University of Rochester, Rochester, NY 2013-2017

- B.S. Mechanical Engineering, Minor in Computer Science; Magna Cum Laude, GPA 3.91

PUBLICATIONS AND PRESENTATIONS:

- “Contact Force and Synergy Matrix Estimation for Compliant Underactuated Soft Robotic Hands” [submitted], E. Fox and F. L. Hammond, *Soft Robotics Journal*, Spring 2023
- “Soft Variable Stiffness Joints for Controllable Grasp Synergies in Underactuated Robotic Hands,” E. Fox and F. L. Hammond, *IEEE International Conference on Soft Robotics (RoboSoft)*, 2020
- “Towards Sonomyography-Based Real-Time Control of Powered Prosthesis Grasp Synergies,” K. Bimbraw, E. Fox, G. Weinberg and F. L. Hammond, *International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, 2020
- “Sonomyography-Based Real-Time Hand Grasp Configuration Identification via Supervised Learning to Control a Soft Robotic Gripper” [poster presentation], K. Bimbraw, E. Fox, G. Weinberg and F. L. Hammond, *International Symposium on Medical Robotics*, 2019

SKILLS:

- Programming: MATLAB, Python, C, C++
- Software/OS: ROS/ROS2, Git, Docker, Linux
- Simulation: PyBullet, Isaac sim
- Computer vision
- Data analysis
- CAD and FEA: Solidworks, NX
- Mechanical testing
- Prototyping, Fabrication, and 3D printing