

Matthew Fernandez

+1 (813) 848-4069 | mfernandez64@gatech.edu | linkedin.com/in/fernandez-matt

EDUCATION

Georgia Institute of Technology – Atlanta (GA)
Bachelor of Science in Mechanical Engineering; Robotics Minor

August 2021 – May 2025
GPA: 4.00/4.00

RESEARCH

Complex Rheology and Biomechanics Lab | Georgia Tech (US)

August 2023 – Present

Advisor: Prof. Daniel I. Goldman

Marine Robotic Limbless Locomotion

- Leading the design and testing of an amphibious undulatory limbless robot investigating the role of mechanical intelligence in open-water navigation and three-dimensional obstacle traversal
- Assisting the testing of surface-swimming undulatory locomoting robotic models and the effect of body compliance on surface water obstacle navigation

Terrestrial Robotic Limbed and Limbless Locomotion

- Designed and integrated proprioceptive sensing joints in a 5-segment centipede-inspired robot using Python run on Raspberry Pi to interpret joint positions for closed-loop control
- Assisted in the experimental design and testing of a cord-driven snake-inspired robotic model investigating the application of body compliance and mechanical intelligence in serpentine sidewinding

Soft Robotics Lab | ETH Zurich (Switzerland)

May 2025 – Present

Advisor: Prof. Robert Katzschmann

- Leading the design and testing of an autonomous untethered underwater fish platform for biological surveillance and swarm-based monitoring
- Optimizing the hydrodynamic properties and cable-driven actuation methods to maximize thrust and create a replicable and robust untethered platform.

Fabrication Integrated Design Lab | MIT (US)

June 2024 – August 2024

Advisors: Prof. Kaitlyn Becker, co-advised by Prof. Ellen Roche (TTDD Lab)

- Characterized and developed a wireless control system for a propellant-powered oscillatory robot
- Designed and tested a hydrogen peroxide reaction chamber to prove the energetic benefits of relative pressure systems in feeding this fuel for robotic actuation

PUBLICATIONS & PRESENTATIONS

Patents

- [1] **M. Fernandez**, T. Wang, D. I. Goldman. Compact buoyancy control assembly for underwater robotic systems or equipment (*filed patent application 2024*)

Peer-Reviewed Publications

- [1] **M. Fernandez**, T. Wang, G. Tunnicliffe, D. Dortilus, P. Gunnarson, J.O. Dabiri, D. I. Goldman. AquaMILR+: Design of an untethered limbless robot for complex aquatic terrain navigation. (*accepted ICRA 2025*)
- [2] S. D. Gollob, A. Comoretto, Q. Yu, **M. Fernandez**, K. O. Adebajo, J. T. B. Overvelde, K. Becker, E. Roche. An Actuator-Scale, Pressure-Amplifying, Monopropellant Engine for Untethered Pneumatic Systems (*accepted Robosoft 2025*)

- [3] T. Wang, N. Mankame, **M. Fernandez**, V. H. Kojouharov, D. I. Goldman. AquaMILR: Mechanical intelligence simplifies control of undulatory robots in cluttered fluid environments (*accepted ICRA 2025*)
- [4] V. H. Kojouharov, T. Wang, **M. Fernandez**, J. Maeng, D. I. Goldman. Anisotropic body compliance facilitates robotic sidewinding in complex environments. *IEEE International Conference on Robotics and Automation (ICRA)*, 2024.

Conference Abstracts

- [1] **M. Fernandez**, T. Wang, G. Tunnicliffe, D. Dortilus, D. I. Goldman. Design of an untethered limbless robot for aquatic locomotion in complex environments. *American Physical Society Meeting, March 2025*.
- [2] T. Wang, **M. Fernandez**, G. Tunnicliffe, D. Dortilus, D. I. Goldman. Mechanical and computational intelligence enable agile and robust limbless robotic locomotion in complex aquatic environments. *American Physical Society Meeting, March 2025*.
- [3] **M. Fernandez**, T. Wang, G. Tunnicliffe, D. Dortilus, D. I. Goldman. Design of an untethered underwater limbless robot for complex aquatic terrain navigation. *SICB Annual Meeting, January 2025*.
- [4] T. Wang, **M. Fernandez**, G. Tunnicliffe, D. Dortilus, D. I. Goldman. Mechanically intelligent undulatory robotic locomotion in complex aquatic environments. *SICB Annual Meeting, January 2025*.
- [5] N. Mankame, T. Wang, **M. Fernandez**, C. Pierce, D. I. Goldman. Mechanical intelligence aids limbless locomotion in cluttered aquatic environments. *American Physical Society Meeting, March 2024*.
- [6] V. H. Kojouharov, T. Wang, **M. Fernandez**, J. Maeng, D. I. Goldman. Anisotropic body compliance facilitates robotic sidewinding in complex environments. *American Physical Society Meeting, March 2024*.

Presentations

- [1] Design of an untethered limbless robot for complex aquatic terrain navigation. *IEEE International Conference on Robotics and Automation (ICRA)*, 2025.
- [2] Design of an untethered limbless robot for aquatic locomotion in complex environments. *American Physical Society Meeting, March 2025*.
- [3] Mechanically intelligent undulatory robotic locomotion in complex aquatic environments. *College of Science Undergraduate Research Showcase, February 2025*.
- [4] Design of an untethered underwater limbless robot for complex aquatic terrain navigation. *SICB Annual Meeting, January 2025*.
- [5] Monopropellant Powered Self-Oscillating Limbs for Untethered Locomotion. *MIT Digital Poster Showcase, November 2024*
- [6] A Controllable Propellant-Based Power Source for Untethered Soft Robots. *MIT Summer Research Program Poster Showcase, July 2024*
- [7] Anisotropic body compliance facilitates robotic sidewinding in complex environments. *IEEE International Conference on Robotics and Automation (ICRA)*, 2024.

PROFESSIONAL EXPERIENCE

NASA Jet Propulsion Laboratory | Robotic Manipulation Intern

January 2023 – August 2023

Developed architecture and prototypes of an ultra-lightweight manipulation system on the Sample Recovery Helicopter (SRH) as part of the Mars Sample Return (MSR) mission

- Prototyped and presented primary architectures to senior board selected for SRH mission implementation
- Conceptualized and prototyped more than 8 unique end-effectors for mission concept proposals and testing
- Prototyped and presented a 3-DOF robotic arm for helicopter integration using Python for inverse kinematics and control, SOLIDWORKS for design, and MATLAB for force analyses

- Created automated robotic arm sequences for iterative gripper testing, writing a Python class library for motor control and using ROS for communication and sequencing

Procter & Gamble | *Manufacturing Process Engineering Intern*

May 2022 – August 2022

- Used SOLIDWORKS to design, optimize, and manufacture universal grippers enabling transport vehicles to grip multiple bottle sizes eliminating line stoppage and resulting in over \$100,000 in annual savings
- Developed program using RSLogix in which the PLC dynamically calculates and notifies technicians when the manufacturing line needs to switch product eliminating over \$50,000 in wasted product annually
- Designed an automated pneumatic fluid transportation system saving \$150,000 annually on material waste

PROJECT TEAMS

URC Mars Rover Team (RoboJackets) | *Mechanical Lead*

September 2021 – July 2024

Led 25 engineers in the design and manufacture of a semi-autonomous rover for complex missions in simulated Martian terrain to compete in the University Rover Challenge

- Utilized SOLIDWORKS for the development of full carbon fiber-based rocker-bogie drive train and chassis, high-precision arm, manipulator, and scientific sampling device
- Designed and assembled 5 degree of freedom robotic arm capable of lifting a 5 kg payload
- Created a soft precision gripper for intricate and sensitive manipulations of unknown geometries

Antarctic Marine Vehicle | *Mechanical Engineer*

August 2022 – December 2022

Co-led the designing, prototyping, and manufacture of the next iteration Autonomous Underwater Vehicle (AUV) for observation of polar-cap degradation at the Antarctic grounding line

- Redesigned the syntactic foam rear cone and thruster shroud in SOLIDWORKS to improve hydrodynamics
- Designed an onboard electronics module with efficient heat dissipation via passive cooling with the surrounding ocean waters
- Designed and manufactured mechanical ground support equipment for rapid field assembly and testing

Phoenix Robotics | *CEO/Pilot – Competitive Marine Robotics*

August 2017 – August 2021

Led 15 engineers to construct an underwater Remotely Operated Vehicle (ROV), placing 3rd globally in the Marine Advanced Technology Education marine robotics competition

- ROV consisted of dual 2 DOF manipulation system, vectored thrust, variable buoyancy, and six cameras
- Developed onboard electrical system with autonomous driving and image recognition using Python

FIELD VOLUNTEERING

Robotic Marine Environment Recovery | *Pilot & Engineer*

January 2020 – February 2020

- Designed and operated an underwater ROV equipped with lights, cameras, and end effector to help collect over 22 kg of beaded necklaces in Tampa Bay in collaboration with Calypso Divers

National Geographic | *SEDNA Project*

May 2018 – July 2018

- Created and waterproofed 12 camera systems for use by Inuit women performing research in the Arctic Ocean for the SEDNA (Safe Maritime Operations Under Extreme Conditions: The Arctic Case) project

AWARDS

- **ThinkSwiss Scholar:** 1 of 25 students selected internationally as a student researcher at a Swiss Institute
- **Astronaut Scholar (ASF):** 1 of 71 students nationwide for a merit-based research scholarship
 - Selected as 1 of 2 Georgia Tech seats for the award
- **Presidents Undergraduate Research Award (Georgia Tech):** 1 of 114 students chosen for project funding
- **Godbold Scholar (Georgia Tech – Merit):** 1 of 8 students in the Southeast selected for a full scholarship

- **Provost Scholar** (Georgia Tech – Merit): Top 1% of students selected for a waived tuition cost
- **Intelligent Ground Vehicle Competition 2022:** Ranked 3rd globally in autonomous navigation competition
- **MATE Marine Robotics Competition 2021:** Ranked 3rd globally in underwater ranger class
 - 1st place technical documentation and presentation; published in the Journal of Ocean Technology
- **Valedictorian** (High School): Highest GPA in class of 150 students (Unweighted 4.00/4.00)

SKILLS

Technical Software	SOLIDWORKS, Siemens NX, Autodesk Inventor, Finite Element Analysis, Topological Analysis, AutoCAD, Fusion 360
Hardware Experience	FDM/SLA 3D-Printing, Waterjet, Laser-cutter, Soldering, Arduino, Raspberry Pi
Programming	MATLAB, Python, C++, ROS, Arduino, RSLogix
Relevant Coursework	Dynamics, SOLIDWORKS, C++, MATLAB, Signal Processing, Linear Algebra, Differential Equations, Fluid Mechanics, Mechanics of Materials