Carlos A. Carrasquillo Torres

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Education

Georgia Institute of Technology | GPA: 3.9 / 4.0 **Aug 2021 – Present**

- PhD, *Robotics* Expected Summer 2026
- Master of Science, *Computer Science*, Machine Learning Specialization May 2025
- Master of Science, *Aerospace Engineering* May 2025

University of Florida | GPA: 3.7 / 4.0 **Aug 2017 – May 2021**

- Bachelor of Science, *Mechanical Engineering*, Magna Cum Laude Honors May 2021
- Bachelor of Science, *Computer Engineering*, Magna Cum Laude Honors May 2021

Research Experience

Graduate Research Assistant **Aug 2021 – Current**

Institution: Georgia Institute of Technology, Institute for Robotics and Intelligent Machines
Location: Atlanta, GA
Lab: DART Lab and EPIC Lab
Advisors: Anirban Mazumdar, PhD, Aaron Young, PhD

Dissertation Research:

- Engineered exoskeleton orthoses and mechatronics.
- Conceptualized and validated exoskeleton controllers:
  - Obstacle avoidance and navigation in low-visibility conditions [J3]
  - Impedance-based controllers for traditional exoskeleton control [J1]
  - End-to-end biological torque exoskeleton controllers
  - Uncertainty-aware exoskeleton torque controllers
- Used deep learning-based methods such as:
  - TCNs for end-to-end exoskeleton biological moment estimators from exoskeleton data
  - VQ-VAEs to construct a human motion primitive library from biomechanical data
  - CNNs for ground reaction force estimation from force-sensing insole data
  - GANs for domain adaption between two distinct exoskeleton sensor datasets
  - Transformers for full-body kinematics estimation from exoskeleton data
  - Proximal Policy Optimization (PPO) to teach AI agents to avoid obstacles
- Led the development of (or made significant contributions to) the following pieces of software:
  - Virtual reality games to simulate unstructured and dynamic environments for obstacle avoidance
  - Machine learning training package for human physiological state estimation
  - Low-level sensor libraries for real-time exoskeleton control
  - Exoskeleton control framework, graphical user interface, and command line tools
  - Bio-feedback mechanisms for the Meta Quest 3S, including an avatar that estimate arm kinematics from hand location (using inverse kinematics) and lower limb kinematics from wearable sensor data
- Conducted human-subject experiments using:
  - Delsys electromyography
  - Vicon motion capture
  - COSMED and Parvo metabolics

Miscellaneous Research Projects:

- *Microprocessor Knee (MPK) Recommendation Algorithm*: Developed an algorithm to identify the best commercial microprocessor knee for a transfemoral amputees. This algorithm aims to assist clinicians in their evaluation in the absence of expensive laboratory equipment [J2].
- *Bioreactor Control Box*: An electronics box designed to interface with all of the necessary pumps and sensors in a closed-loop bioreactor. Control box designed to meet clean room specifications. Enclosure designed in Solidworks. PCB designed in Altium Designer.

Undergraduate Research Assistant **Jan 2019 – Aug 2021**

Institution: University of Florida, Department of Mechanical and Aerospace Engineering
Location: Gainesville, FL
Lab: ADAMUS Lab
Advisor: Riccardo Bevilacqua, PhD

Bachelor's Thesis Work:

- Developed embedded C++ avionics software for the D3 CubeSat, creating custom libraries to interface with the satellite's IMU, antenna, radio, and GPS on a BeagleBone Black microcomputer [C1, C2].
- Engineered a ground station application in Python to manage mission operations, including transmitting telecommands and receiving downlinked data from the satellite.

Publications

[J4] K. L. Scherpereel, M. C. Gombolay, M. K. Shepherd, **C. A. Carrasquillo**, O. T. Inan, A. J. Young. "Deep Domain Adaptation Eliminates Costly Data Required for Task-Agnostic Wearable Robotic Control". Science Robotics. 2025. (Submitted)

[J3] **C. Carrasquillo,** A. Bajpai, D. Iyengar, K. Collins, A. Mazumdar, A. Young. "Enhancing Human Navigation Ability Using Force-Feedback from a Lower-Limb Exoskeleton". IEEE Transactions on Haptics. 2025.

[J2] **C. Carrasquillo**, S. Zhou, W. L. Childers, A. Young, K. Herrin. "A Clinical Decision-Making Algorithm for the Personalized Prescription of Microprocessor-Controlled Prosthetic Knees: An Evidence-Based Approach based on a Randomized Trial". Prosthetics and Orthotics International. 2025.

[J1] A. Bajpai, **C. Carrasquillo**, J. Carlson, J. Park, D. Iyengar, K. Herrin, A. Young, A. Mazumdar. "Design and Validation of a Versatile High Torque Quasi-Direct Drive Hip Exoskeleton". IEEE Transactions on Mechatronics. 2023.

[C2] **C. Carrasquillo**. "A Versatile and Open-Source Radio Framework for the D3 CubeSat Mission". Small Satellite Conference. 2021. Student Competition Best Paper Honorable Mention.

[C1] S. Buckner, **C. Carrasquillo**, M. Elosegui, R. Bevilacqua. "A Novel Approach to CubeSat Flight Software Development Using Robot Operating System (ROS)". Small Satellite Conference. 2020. Poster Presentation.

Presentations

[P6] **C. Carrasquillo**, A. Bajpai, A. Mazumdar, L. Ting, A. Young. "Unsupervised Discovery of Human Motion Primitives from Biomechanical Data". American Society of Biomechanics. August 2025.

[P5] **C. Carrasquillo,** A. Bajpai, D. Iyengar, K. Collins, A. Mazumdar, A. Young. "Enhancing Human Navigation Ability Using an Active Wearable Exoskeleton". IEEE World Haptics. July 2025.

[P4] K. Herrin, **C. Carrasquillo**, S. Zhou, W. L. Childers, A. Young. "A Clinical Decision Equation for the Personalized Prescription of Prosthetic Microprocessor Knees". The American Orthotic and Prosthetic Association. September 2024.

[P3] **C. Carrasquillo**, K. Herrin, S. Zhou, W. L. Childers, A. Young. "Toward data driven prescription personalization of microprocessor prosthetic knees". Military Health System Research Symposium. August 2024.

[P2] **C. Carrasquillo**, "Towards Functional Exoskeleton Control". The National Defense Science and Engineering Graduate Fellowship Conference. July 2024.

[P1] **C. Carrasquillo,** A. Bajpai, D. Iyengar, K. Collins, A. Mazumdar, A. Young. "Enhancing Human Navigation Ability Using an Active Wearable Exoskeleton". American Society of Biomechanics. August 2023.

Industry Experience

Intern—Computer Science / Mechanical Engineering — May 2021 – May 2022

Company: Raytheon Intelligence & Space
Location: Dallas, TX
Supervisors: Chris Bender, Malia Kawamura

- Developed a MERN stack web application to help engineers find components on printed circuit boards by search and mouseover.
- Designed 5 Splunk dashboards and developed 10 process programs for production-grade machinery.
- Engineered a VBA-based desktop application to automate the logging and tracking of material testing data, replacing a manual process.

Teaching Experience

Mentor —Vertically Integrated Projects (VIP) — Aug 2021 – Current

Institution: Georgia Institute of Technology, Institute for Robotics, and Intelligent Machines
Location: Atlanta, GA
Professor: Aaron Young, PhD
Team: Robotic Human Augmentation

Led and mentored a team of 16 undergraduate students performing research in the following areas:

- Designing exoskeleton hardware, including orthosis and mechatronics
- Creating exoskeleton controllers, from traditional impedance control to more recent, deep learning-based strategies
- Conducting human-subject experiments
- Performing biomechanical analysis, including Vicon processing, OpenSim, and data-driven strategies
- Developing virtual reality games for demonstration and experimentation
- Developing energetically optimal path planning algorithms for human navigation

Senior Teaching Assistant—Design and Manufacturing Lab — May 2019 – May 2021

Institution: University of Florida Dept. of Mechanical and Aerospace Engineering
Location: Gainesville, FL
Professor: Mike Braddock

- Instructed over 30 students (in groups of 4-5 each semester) on design for manufacturing (DFM) principles, conducting design reviews and providing feedback on CAD models and technical drawings.
- Trained and certified students on shop equipment, including lathes, mills, welders, waterjets, and CNC machines.
- Managed and supervised a university machine shop, assisting researchers and design teams with part fabrication.
- Held quarterly seminars on advanced manual machining methods.
- Provided mentorship and instruction incoming teaching assistants to prepare them to lead their own sections.

Teaching Assistant—Dynamics and Control Systems Design Lab — Aug 2020 – Dec 2020

Institution: University of Florida Dept. of Mechanical and Aerospace Engineering
Location: Gainesville, FL
Professor: Prabir Barooah, PhD, Shannon Ridgeway, PhD

- Lectured to students on applying classical control theory to real-world systems, guiding them through system identification, PID controller implementation on microcontrollers, and computer vision algorithm development.
- Instructed students on using LabVIEW for the design and control of actuated closed-loop systems.

Teaching Assistant—Thermal Sciences Design and Lab **Aug 2020 – Dec 2020**

Institution: University of Florida Dept. of Mechanical and Aerospace Engineering
Location: Gainesville, FL
Professor: John Abbitt, PhD

- Lectured and instructed students on the thermodynamics and operating principles of internal combustion engines.
- Guided student teams in designing mathematical models for internal combustion engines for the class final project through brainstorming and design review sessions.
- Prepared students for exams by conducting comprehensive in-class review sessions.

Teaching Assistant—Numerical Methods **May 2019 – Aug 2020**

Institution: University of Florida Dept. of Mechanical and Aerospace Engineering
Location: Gainesville, FL
Professor: Jonathan Brooks, PhD, Georges Akiki, PhD

- Lectured on topics including iterative algorithms, linear algebra, numerical derivatives and integrals, Fourier analysis, polynomial regression, and splines.
- Created homework solutions, including answer keys, example software solutions, and grading rubrics.
- Prepared and presented in-class exam reviews.

Fellowships and Awards

- Grad REACH Scholar **Aug 2024 – Current**
- Pathbreakers Fellow (formerly University Center of Exemplary Mentoring) **Aug 2023 – Current**
- National Defense Science and Engineering Graduate (NDSEG) Fellow **Aug 2022 – Aug 2025**
- Florida Academic Scholars Award **Aug 2017 – May 2021**
- SwampHacks VI Infinite Energy's Best Hack Award **Jan 2020**

Extracurriculars

- PADI Advanced Open Water Diver **July 2023 – Current**
- Student Pilot @ Skybound Aviation (90+ hours) **July 2023 – Current**
- Georgia Tech Marching Band/Drumline: Snare Drum **July 2023 – May 2024**

Skills

- *Design & Manufacturing*: Altium Designer (PCB), SolidWorks (CAD, FEA), Fusion 360 (CAD/CAM), Machine Shop Equipment (Lathes, Mills, CNC, Welding), Rapid Prototyping
- *Programming*: Python (NumPy, Pandas, OpenCV, PyTorch, TensorFlow, ROS, OpenMDAO), C/C++, C# (Unity), JavaScript (React.js), MATLAB, Simulink, VBA, VHDL
- *Experimentation:* AR/VR, Electromyography, Metabolics (COSMED, Parvo), Motion Capture (Vicon), OpenSim
- *Personal Projects*: 12-DOF quadruped robot, 3D bioprinter, desktop lathe, MIPS CPU, 5+ websites
- *Certifications*: Amateur Radio Technician (2019, KN4ZUC), SOLIDWORKS Associate (2020), Student Pilot (90+ hours), Advanced Open Water Diver
- *Languages:* English and Spanish

Community Involvement

- 2025 Georgia Tech Robotics Summer Scholars (GTRSS) Summer Camp Organizer **Jan 2025 – Jul 2025**
- 2025 IEEE International Conference on Robotics and Automation Volunteer **May 2025**
- 2024 Georgia Tech Robotics Summer Scholars (GTRSS) Summer Camp Organizer **Jan 2024 – Jul 2024**
- 2023 Georgia Tech Robotics Summer Scholars (GTRSS) Summer Camp Organizer **Jan 2023 – Jul 2023**
- Elementary School Science Fair Judge **Nov 2022, Nov 2023**
- Atlanta Science Festival Volunteer **Mar 2023**
- American Controls Conference Volunteer **Jun 2022**
- National Biomechanics Day Organizer **Feb 2022 - Apr 2022**