

# Jairo Maldonado

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## Education

### Georgia Institute of Technology

Atlanta, GA

*PhD Robotics – Artificial Intelligence, Perception, Mechanics*

2019 – Dec 2024 est.

*MS Mechanical Engineering*

2019 – 2021

- Recipient of NSF ARMS, GEM, Goizueta, and Ford Foundation Graduate Fellowships (\$170K)

### California State University Long Beach

Long Beach, CA

*BS Mechanical Engineering*

2014 – 2019

- Recipient of the CSULB College of Engineering's 2019 Outstanding Graduate Award (1/1000) (article)

## Experience

### Georgia Institute of Technology

Atlanta, GA

*Robotics PhD Candidate – EPIC Lab*

2019 – present

- Developed machine learning algorithms for slope estimation in wearable devices across dynamic environments
- Implemented real-time intent recognition algorithms on a robotic prosthesis to estimate speed, slope, and mode (50Hz)
- Developed real-time continual learning algorithms that improved the performance of deep learning estimators by 30%
- Optimized prosthetic control across walking speeds using reinforcement learning algorithms
- Developed CycleGAN algorithms to generate sim2real and real2sim data and enable device-to-device transfer learning
- Led a team of 13 student researchers and collaborated with industry partners to achieve research goals

### MIT Lincoln Laboratory

Lexington, MA

*Research Intern – Group 77: Rapid Prototyping Group*

Summer 2019

- Employed lidar-based 3D mapping algorithms (SLAM) on a semi-autonomous UGV
- Designed parts for the NASA TBIRD CubeSat to enable laser communication from low earth orbit

### NASA Jet Propulsion Laboratory

Pasadena, CA

*Robotics Intern – Section 347: Mobility and Robotic Systems*

2018 – 2019

- Created a 1-DOF gimbal with a closed-loop control system for attitude control of a camera
- Manufactured a node-dropping mechanism for inner-cave communication between UAVs and UGVs

### Massachusetts Institute of Technology

Cambridge, MA

*Research Intern – D'Arbeloff Laboratory*

Summer 2018

- Fabricated a pair of 2-DOF robotic limbs based on functional requirements and constraints
- Implemented open-loop velocity control of Maxon motors using EPOS motor controllers

### Shirley Ryan Ability Lab (Rehabilitation Institute of Chicago)

Chicago, IL

*Research Intern – Center for Bionic Medicine*

Summer 2017

- Implemented K-means clustering algorithms to classify GPS data of post-stroke individuals
- Assessed physical evaluations on post-stroke participants, while maximizing patient comfort and safety

### California State University Long Beach

Long Beach, CA

*Research Fellow – Robotics and Interactive Systems Engineering Laboratory*

2015 – 2019

- Quantified prosthesis user response time to perturbations imposed by a vibrotactile device
- Engineered real-time gait phase detection algorithms based on 6-axis IMU data

## Projects

- **LLMs for Prosthesis Preference Tuning (present):** Tuned ChatGPT (in-context learning) to expertly suggest changes in prosthetic assistance based on user preference (translated using OpenAi Whisper)
- **Hand-controlled Omnidirectional Vehicle (2020):** Designed and controlled a three-wheeled omnidirectional vehicle using a hand-mounted 6-axis inertial measurement unit

- **Multi-modal sensing and navigation on TurtleBot 3 (2019):** Programmed a TurtleBot to navigate a maze using image classification of signs and lidar-based obstacle avoidance

## Publications

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- *Real-time Continual Learning in Prosthetic Control for Personalized Context Estimation* – **J. Maldonado-Contreras**, S. Zhou, H. Kim, C. Johnson, J. Miller, and A. J. Young (Journal Paper, In Progress)
- *Accelerating Constrained Real-Time Continual Learning with Dynamic Active Learning* – C. Johnson, **J. Maldonado-Contreras**, and A. J. Young (Conference Paper, Under Review)
- *Multi-Context, User-Independent, Real-Time Intent Recognition for Powered Lower-Limb Prostheses* – K. Bhakta, **J. Maldonado-Contreras**, J. Camargo, S. Zhou, W. Compton, K. R. Herrin, and A. J. Young (Journal Paper, Under Review)
- *User- and Speed-Independent Slope Estimation for Lower-Extremity Wearable Robots* – **J. Maldonado-Contreras**, K. Bhakta, J. Camargo, P. Kunapuli, and A. J. Young, *Annals of Biomedical Engineering (ABME)* 2023
- *Adaptive Lower-Limb Prosthetic Control: Towards Personalized Intent Recognition & Context Estimation* – C. Johnson, J. Cho, S. Chaluvadi, **J. Maldonado-Contreras**, and A. J. Young, *Journal of Medical Robotics Research (JMRR)* 2023
- *Nebula: Quest for robotic autonomy in challenging environments; team costar at the darpa subterranean challenge* – A. Agha, K. Otsu, B. Morrell, ..., **J. Maldonado-Contreras**, ..., and J. Burdick, *arXiv* 2021
- *Proprioceptive Improvements of Lower-Limb Amputees under Training with a Vibrotactile Device - A Pilot Study* – **J. Maldonado-Contreras**, P. Marayong, I.H. Khoo, R. Rivera, B. Ruhe, and W. Wu, *IEEE Health Care Innovations and Point of Care Technologies Conference (HI-POCT)* 2017
- *Design Improvements of a Vibrotactile Device for Prosthetic Rehabilitation Training* – P. Marayong, I.H. Khoo, R. Rivera, C. Dunn, **J. Maldonado-Contreras**, and S. Cortez, *IEEE Engineering in Medicine and Biology Society (EMBS) Conference* 2016

## Oral Presentations

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- Podium Presentation (>100 audience) on *User-adaptive walking speed estimation for scaling prosthetic assistance*, *American Society of Biomechanics (ASB)* 2023
- Lightning Talk on *Adaptive Lower-Limb Prosthetic Control: Towards Personalized Intent Recognition & Context Estimation*, *International Symposium on Medical Robotics* 2023
- Podium Presentation on *Proprioceptive Improvements of Lower-Limb Amputees under Training with a Vibrotactile Device - A Pilot Study*, *HI-POCT* 2017

## Teaching Experience

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- Teaching Assistant (Aug 2023 – Dec 2023): Presented Wearable Robotics lectures to classrooms of 30+ GT students
- Tutor (Aug 2017 – May 2019): Assisted undergraduate students in fundamental mechanical engineering courses

## Leadership and Outreach Activities

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- RobotArts (Sep 2022 – present): Led a \$100k robotics + art initiative between GT and Colombian Universities
- FOCUS Panel (Jan 2022): Shared my graduate school experience with graduate school applicants
- ROBOGrad Panel (Sep 2021): Shared my graduate school experience with undergraduate students
- FIRST Robotics Club Mentor (Sep 2019 – Sep 2020): Mentored high school students in robotics
- BUILD Alumni Panel (Sep 2019): Provided graduate application advice to undergraduate researchers
- CAMP Alumni Panel (Jan 2019): Shared my path to graduate school with undergraduate students
- MATLAB Workshop Leader (Feb 2018): Presented an introduction of MATLAB to SHPE members
- Grad School Workshop Leader (Oct 2018): Presented information about graduate school to students
- Tutor (Aug 2017 – May 2019): Assisted college students in mechanical engineering courses
- SHPE Workshop Leader (Aug 2016 – May 2019): Led biannual STEM workshops at K-12 schools
- President of Men's Soccer Club (Aug 2017 – May 2019): Managed 4 officers, 22 players, and club logistics
- CAMP Peer Mentor (Aug 2016 – May 2018): Provided mentorship to 2 college students from migrant families
- BESST Peer Mentor (Aug 2016 – May 2017): Provided mentorship to a first-year engineering student

**Grad Courses:** Artificial Intelligence, Computer Vision, Deep Learning, Machine Learning, Mechatronics

**Skills/Tools:** C++, CSS, GitHub, HTML, Joblib, Linux, MATLAB, OpenCV, Python, PyTorch, ROS, TensorFlow