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

- *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**, …, 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

- 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

- 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

- 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