

Carlos Gonzalez

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in carlosigonzalez

Education

- 2021–Present **Ph.D. Aerospace Engineering**
University of Texas, Austin, TX, USA Expected 2026
Advisor: Dr. Luis Sentis
- 2015–2016 **M.S. Electrical and Computer Engineering, *with distinction***
University of New Mexico, Albuquerque, NM, USA Cumulative GPA: 3.94 / 4.00
Advisor: Dr. Meeko Oishi
Emphasis: Systems and Control
- 2010–2014 **B.S. Mechanical Engineering, *cum laude***
University of New Mexico, Albuquerque, NM, USA Cumulative GPA: 3.72 / 4.00
Advisor: Dr. Ron Lumia

Work Experience

- 2021–Present **Graduate Research Assistant, *University of Texas at Austin, Austin, TX***
(Aug.) **Projects:** Mechatronics of omniwheel robot, and research in locomotion of humanoid robots
- Designed and prototyped mechanical structure of mobile robot to withstand human weight and developed low-level code to communicate with motors via EtherCAT (C++)
 - Redesigned parts of humanoid robot to improve durability and performance
 - Prototyped code for Model Predictive Control algorithms for legged manipulation (Python)
- 2020–2021 **Research Associate, *Institute for Human & Machine Cognition, Pensacola, FL***
(Sep.)–(July) **Projects:** Legged robot controls engineer for exoskeleton Quix and humanoid robot Atlas
- Design and implement (in Java) push recovery and balance strategies on Atlas
 - Improve force sensing and control capabilities of exoskeleton Quix
 - Wrote software integration code (comms) to control motors via CAN for exoskeleton Eva
- 2018–2020 **Research Fellow, *Istituto Italiano di Tecnologia, Genoa, Italy***
(July) **Project:** Implementation of a balance controller on the (torque-controlled) quadruped robot HyQ
- Simulated a novel balance control strategy to make HyQ balance on two point feet on Gazebo
 - Implemented unit tests for the designed balance controller (all in C++)
 - Implemented the controller on the real HyQ and made the robot balance on a support line
 - Incorporated a motion controller to the balance controller to achieve line walking in simulation
 - Submitted and presented the main simulations and experimental results in IROS [C2]
- 2016–2018 **Research Assistant, *New York University, Brooklyn, NY, USA***
Project: Sensitivity analysis of balance-stability of legged systems
- Designed a computational approach to establish the balance-stability of legged robots by combining numerical optimization and motion planning algorithms, publications [C4] and [J1]
 - Derived quasi-analytical solutions to quantify the changes in balance-stability of legged systems as design constraints (e.g., torque limits) change, published work in [C3]
- 2015–2016 **Research Assistant, *University of New Mexico, Albuquerque, NM, USA***
Project: Hybrid system identification for prognosis of Parkinson's Disease
- Implemented and compared several state-of-the-art methods in hybrid system identification
 - Derived an alternate identification approach using optimization methods for hybrid systems, showing more accurate and precise detection of submovements in Parkinson's disease patients
 - Published and presented work in IFAC conference [C5]

2014 **Research Student**, *University of New Mexico*, Albuquerque, NM, USA

Project: Control of a smart microelectromechanical material to be used as a microgripper

- Designed and presented research proposal plan to academic advisor
- Designed and implemented a gain-scheduled PID controller using iterative feedback tuning
- Performed several experiments to validate the proposed approach, published work on [J2]

Software Skills

Proficient Git, MATLAB, Simulink
Intermediate C++, ROS, Python, Java, Linux, L^AT_EX, OnShape, SolidWorks, Pro/ENGINEER
Basic LabView, Cortex

Publications

Journal Papers

- [J1] Carlotta Mummolo, William Z. Peng, **Carlos Gonzalez**, and Joo H. Kim, "Contact-Dependent Balance Stability of Biped Robots," *Journal of Mechanisms and Robotics*, vol. 10, no. 2, p. 021009, 2018. [link]
- [J2] **Carlos Gonzalez** and Ron Lumia, "An IPMC microgripper with integrated actuator and sensing for constant finger-tip displacement," *Smart Materials and Structures*, vol. 24, no. 5, p. 55011, 2015. [link]

Conference Papers

- [C1] Junhyeok Ahn, Seung Hyeon Bang, **Carlos Gonzalez**, Yuanchen Yuan, Luis Sentis, "Data-Driven Safety Verification for Legged Robots," in *IEEE-RAS International Conference on Humanoid Robots*, 2022. [to appear]
- [C2] **Carlos Gonzalez**, Victor Barasuol, Marco Frigerio, Roy Featherstone, Darwin G. Caldwell, and Claudio Semini, "Line walking and balancing for legged robots with point feet," in *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2020. [preprint]
- [C3] **Carlos Gonzalez**, Carlotta Mummolo, and Joo H. Kim, "Sensitivity of balancing in legged systems under torque constraint variations," in *Proceedings of the ASME International Design Engineering Technical Conference*, 2018, pp. 1–9. [link]
- [C4] Carlotta Mummolo, William Z. Peng, **Carlos Gonzalez**, and Joo H. Kim, "Contact-Dependent Balance Stability of Walking Robots," in *ASME 2017 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, 2017, pp. 1–7. [link]
- [C5] **Carlos Gonzalez**, Daniel Svenkeson, Diana J. Kim, Martin J. McKeown, and Meeko Oishi, "Detection of manual tracking submovements in Parkinson's disease through hybrid optimization," *IFAC-PapersOnLine*, vol. 48, no. 27, pp. 291–297, 2015. [link]

Extracurricular Activities

June 2017 – **Volunteer**, *Hospital for Special Surgery*, New York City, NY, USA

Dec. 2017 ◦ Processed experimental data using Cortex for a study on energy expenditure in human walking

June 2013 – **Volunteer**, *Multi-Agent, Robotic, Hybrid, and Embedded Systems Lab*, UNM, USA

March 2014 ◦ Designed and built mechanical parts for quadrotors used for research

◦ Worked with a 7 DoF robotic arm using MATLAB and its Robotic Toolbox by Peter Corke