Marco Ciarcià, Ph.D.

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WORK EXPERIENCE

Colorado State University, Fort Collins, CO, USA — Aug 2023 - present
Associate Teaching Professor

Teaching responsibility:

- MECH 207 Mechatronics I (course developer, 2025 - present)
- MECH 307 Mechatronics II (2023 - present)
- MECH 325 Machine Design (2023 – 2025)
- MECH 180A1 Introduction to Aerospace Engineering (course developer, 2024)

Research areas:

- Robotics
- Nonlinear and Optimal Control
- eVTOL Vehicles
- Small Satellites
- Aircraft CFD

AeroFly llc, Brookings, SD, USA — May 2021 - present
Co-founder and Chief Technology Officer

- Design, development, and testing of eVTOL rotorcraft
- The company was awarded two NASA-SBIR Phase I Contracts and one NASA-SBIR Phase II contract

South Dakota State University, Brookings, SD, USA — Aug 2016 – May 2023
Assistant Professor

Research areas:

- Robotics, Mechatronics, Nonlinear Control, Optimal Control
- eVTOL Vehicles, Small Satellites

Teaching responsibility:

- ME 451 Automatic Controls (2016-2023)
- ME 492/592 Sp.Tp. Mechatronics (2020-2022)
- ME 441/541 Robotic Systems (2018-2023)
- ME 492/592 Sp.Tp. Nonlinear Programming (2017-2019)

Nanocomsat, Zurich, Switzerland — Jan 2015 - July 2016
Chief Research Engineer

- Space flight mechanics specialist
- Guidance, navigation, and control software designer

Naval Postgraduate School, Monterey, CA, USA — July 2010 – Oct 2014
NRC Research Associate

- Developed algorithms for real-time trajectory optimization
- Designed and experimentally validated suboptimal guidance strategies at the Spacecraft Robotics Laboratory

Rice University, Houston, TX, USA Nov 2009 - July 2010
Visiting Researcher

- Investigated aircraft trajectory optimization techniques.
- Developed strategy for automated collision avoidance trajectory generation for an aircraft in landing phase.

Università degli Studi di Palermo, Palermo, Italy Mar 2009 - July 2009
Lecturer

Aircraft Design (graduate level)

Università degli Studi di Palermo, Palermo, Italy Sept 2007 - Feb 2010
Postdoctoral Fellow

- Investigated theoretical optimization of collision avoidance trajectories for ground effect aircraft.
- Validated aircraft collision avoidance maneuvers through high fidelity model simulations.

EDUCATION

Rice University, Houston, TX, USA Jan 2008
PhD in Mechanical Engineering
Thesis: *Optimal Starting Conditions for the Rendezvous Maneuver: Analytical and Computational Approach*. Research Advisor: Dr. Angelo Miele

Università degli Studi di Palermo, Palermo, Italy Nov 2001
BS+MS in Aerospace Engineering **(Magna cum laude)**
Thesis: *Robust Control of Autonomous Aircraft for Surveillance*

AWARDS

US National Research Council Post-Doctoral Research Fellowship Award
Award term: July 2010 - October 2014

FUNDED GRANTS

1. (PI) Design, Development, and Testing of an Advanced Multirotor for Human Transportation, NASA/SD Space Grant Consortium, Project Innovation Grant, 2021-2023, $65,903.
2. (PI) Development of an Autonomous Personal Aerial Transportation Vehicle for Aviation Transformation, NASA, USRC Grant, 2019-2021, $79,995.
3. (PI) Support for CubeSat Student Team, SD Space Grant Consortium, 2018-2023, $3,500/year.
4. (PI) Acquisition of a Motion Capture System for Indoor Robotics Application, SDSU Scholarly Excellence Seed Grant, 2017, $20,604 .
5. (Co-I) Drone-Based Measurements for Bridge Field Testing Phase II, Department of Transportation, Alaska UTC Center, 2024-2025, $120,000.
6. (Co-I) Drone-Based Measurements for Bridge Field Testing Phase I, Department of Transportation, Alaska UTC Center, 2021-2022, $76,830.
7. (Co-I) Development of an Experimental Testbed for Sprayer Nozzle Testing, Raven Industries, 2019-2020, $104,000.

8. (Co-I) Development of a Miniaturized Compression Device for Ex-vivo Mammalian Bone Tissue Testing, SDBOR, Research and Development Grant, 2017-2018, $4,000.

ADVISORSHIP

Graduate research assistants:

1. Hari Hara Vara Prasad Tummala (co-advised), M.S., 2024-present, thesis: *Optimizing Winglet Designs: A CFD Approach*.
2. Giovanni Lavezzi, Ph.D., graduated in 2022:
   - thesis: *Design, Development, and Testing of Near-Optimal Satellite Attitude Control Strategies*
   - Subsequently, research associate at MIT
3. Spencer Harwood, M.S., graduated in 2019, thesis: *Development of a Neural Network-Based Object Detection for Multirotor Target Tracking*.
4. Kidus Guye, M.S., graduated in 2018, thesis: *Development of an Indoor Multirotor Testbed for Experimentation on Autonomous Guidance Strategies.*
5. Xian Du, M.S. (co-advised), graduated in 2019, thesis: *Analysis of Unconventional Space Radiation Shielding Materials.*
6. Aleandro Saez, M.S. (co-advised), graduated in 2021, thesis: *Aerodynamic Optimization of a 2D Airfoil for Rotary-Wing Mars Rotorcraft.*
7. Quazi Irfan, M.S. (co-advised), graduated in 2021, thesis: *Velocity Drift Correction Using Ordinary Least Squares for Displacement Measurement with an MPU 6050 Sensor*.

Advised 18 undergraduate capstone projects. Selected projects:

- Development of a Rotorcraft for Human Transportation
- Development of an Ultralight Robotic Manipulator for Multirotors
- A Compressed - Air - Supersonic Micro Thruster Testbed
- Development of an Inspection Drone for Heat Exchangers

Student Teams

- Advisor of the CSU AIAA DBF Competition Team, 2023-present
  - 1st place mechanical engineering team at CSU's E-Days, 2025
  - 1st place mechanical engineering team at CSU's E-Days, 2024
- Advisor of the CSU AIAA USLI Competition Team, 2024-present
  - 3rd place mech engineering team at CSU's E-Days , 2025
  - 7th place nationwide competition, 2025
- Advisor of the CSU Ram Robotics Club, 2024-present
- Advisor of the SDSTATE FSAE Formula Competition Team, 2020-2023
- Founder and advisor of the SDSTATE CubeSat Student Team, 2017-2021

SERVICE/ EDITORSHIP

Committees

- Member of the AIAA Guidance, Navigation, and Control Technical Committee, 2021 – present
- CSU Mechanical Engineering Department:
  - Chair of Faculty Search Committee, 2024
  - Chair of the ME Code Committee, 2024 – present

- Chair of the Mechanics Committee, 2024 – present
- Chair of the Mechatronics Reorganization Working Group, 2023 – present
- Member of the Computing and Design Working Group, 2023 – present
- Member of the Department CCAF Promotion Committee 2023 – present

Conferences

- Chair of the *Attitude Dynamics and Control II Session* at the 29th AAS/AIAA Space Flight Mechanics Meeting, 2019
- Chair of the *Aerospace Robotics I Session* at the 2018 AIAA/SciTech Conference
- Chair of the *Intelligent and Multiagent Control Systems Session* at the 2019 IEEE International Conference on Electro/Information Technology

Editor

- Guest editor of *Micromachines* for the special issue on *Space Robotics*
- Associate Editor-in-Chief of *Applied Sciences* for the special issue on *Space Robotics*

Reviewer

Journals:

- Journal of Guidance, Navigation, and Controls
- Acta Astronautica
- Aerospace
- Journal of Aerospace Engineering
- Journal of the Astronautical Sciences
- Advances in Space Research
- Transaction on Aerospace and Electronic Systems
- CEAS Aeronautical Journal
- Mathematical Problems in Engineering
- Control Engineering Practice

Conferences:

- AIAA/SciTech Conference
- AIAA/AAS Astrodynamics Specialist Conference
- IEEE Robotics and Automation Society Conference
- IEEE International Conference on Electro/Information Technology

PUBLICATIONS

Book Chapter

Miele, A., Ciarcià, M., ***Best Initial Conditions for the Rendezvous Maneuver***. In: Variational Analysis and Aerospace Engineering, edited by Buttazzo, G., Frediani, A., Springer Optimization and Its Applications, Springer, New York (NY), Vol. 33, 2009, pp. 267-289.

Journal Publications

1. Lavezzi, G., Won, K., Ciarcià, M., Tazarv, M., ***A DIC-UAV based displacement measurement technique for bridge field testing***, Engineering Structures, Vol. 308, 2024.
2. Lavezzi, G., Guye, K., Cichella, V., Ciarcià, M., ***Comparative analysis of Nonlinear Programming Solvers: Performance Evaluation, Benchmarking, and Multi-UAV Optimal Path Planning***, Drones, Vol. 7, No. 8, 2023, pp. 487.
3. Saez, A., Manzo, M., Ciarcià, M., ***Numerical Analysis of Cambered Plate Configurations under Low Reynolds Numbers and at a Low-Density Condition***, Fluids, Vol. 8, 2023, pp. 194.
4. Lavezzi, G., Guye, K., Ciarcià, M., ***Nonlinear Programming Solvers for Unconstrained and Constrained Optimization Problems: a Benchmark Analysis***, arXiv preprint arXiv:2204.05297.
5. Lavezzi, G., Ciarcià, M., ***A Direct Method-Based Suboptimal Attitude Guidance for Accurate Ground-Target Tracking Maneuvers***, Advances in Space Research, Vol. 13, No. 2, 2022, pp. 3983 – 4000.
6. Lavezzi, G., Stang, N. J., Ciarcià, M., ***START: A Satellite Three Axis Rotation Testbed***, Micromachines, Vol. 13, No. 2, 2022.
7. Lavezzi, G., Ciarcià, M., ***A Hybrid Open/Closed-Loop Attitude Control Method for Imaging Satellites***, Journal of Aerospace Engineering, Vol 34, No. 5, 2021.
8. Ciarcià, M., Cristi, R., Romano, M., ***Emulating Scaled Clohessy-Wiltshire Dynamics on an Air-Bearing Spacecraft Simulation Testbed***, Journal of Guidance, Control, and Dynamics, Vol. 40, No. 10, 2017, pp. 2496 – 2510.
9. Ventura, J., Ciarcià, M., Romano, M., Walter, U., ***Fast and Near-Optimal Guidance for Docking to Uncontrolled Spacecraft***, Journal of Guidance, Control, and Dynamics, Vol. 40, No. 12, 2017, pp. 3138 – 3154.
10. Wilde, M., Ciarcià, M., Grompone, A., Romano, M., ***Experimental Characterization of an Inverse Dynamics Guidance and Control Strategy of a Spacecraft Docking with a Rotating Target***, Journal of Guidance, Control, and Dynamics, Vol. 39, No. 6, 2016, pp. 1173 – 1187.
11. Ciarcià, M., Grompone, A., Romano, M., ***A Near-Optimal Guidance for Cooperative Docking Maneuvers***, Acta Astronautica, Vol. 102, 2014, pp. 367 – 377.
12. McCamish, S. B., Ciarcià, M., Romano, M., ***Simulations and Visualization of Multiple Spacecraft Dynamics and Control with MATLAB-Simulink and Satellite Tool Kit***, Journal of Aerospace Information Systems, Vol. 10, No. 7, 2013, pp. 348 – 358.
13. Miele, A., Wang, T., Mathwig, A. J., Ciarcià, M., ***Collision Avoidance for an Aircraft in Abort Landing: Trajectory Optimization and Guidance***, Journal of Optimization Theory and Applications, Vol. 146, No. 2, 2010, pp. 233 – 254.
14. Miele, A., Ciarcià, M., Weeks, M.W., ***Rendezvous Guidance Trajectories via Multiple-Subarc Sequential Gradient Restoration Algorithm***, Journal of Aerospace Engineering, Vol. 22, No. 2, 2009, pp. 160 – 172.

15. Miele, A., Ciarcià, M., ***Optimal Starting Conditions for the Rendezvous Maneuver, Part 2: Mathematical Programming Approach***, Journal of Optimization Theory and Applications, Vol. 137, No. 3, 2008, pp. 625 – 639.
16. Miele, A., Ciarcià, M., ***Optimal Starting Conditions for the Rendezvous Maneuver, Part 1: Optimal Control Approach***, Journal of Optimization Theory and Applications, Vol. 137, No. 3, 2008, pp. 593 – 624.
17. Miele, A., Ciarcià, M., Weeks, M.W., ***Guidance Trajectories for Spacecraft Rendezvous***, Journal of Optimization Theory and Applications, Vol. 132, No. 3, 2007, pp. 377 – 400.
18. Miele, A., Weeks, M.W., Ciarcià, M., ***Optimal Trajectories for Spacecraft Rendezvous***, Journal of Optimization Theory and Applications, Vol. 132, No. 3, 2007, pp. 353 – 376.
19. Miele A., Ciarcià M., Mathwig, J., ***Reflections on the Hohmann Transfer***, Journal of Optimization Theory and Applications, Vol. 123, No. 2, 2004, pp. 233 – 253.

Conference Proceedings

1. Deegan, T, Acharya, P., Ciarcià, M., Nguyen, K.D., ***Toward a Holistic Framework for Human-Robot Coordination***, 2022 IEEE 3rd International Conference on Human-Machine Systems (ICHMS), 11/17-19/2022.
2. Irfan, Q., Ciarcià, M., Hatfield, G., ***Inertia Measurement Unit-Based Displacement Estimation via Velocity Drift Compensation Using Ordinary Least Squares Method***, 2022 IEEE International Conference on Electro/Information Technology, Mankato, MN, 5/19-21/2022.
3. Lavezzi, G., Ciarcià, M., ***Development of a Low-Cost Satellite Three-Axis Attitude Simulator Testbed***, AIAA SciTech Conference, San Diego, CA, 1/3-7/2022.
4. Saez, A., Manzo, M., Ciarcià, M., ***A Literature Review in Design Methodologies for Unmanned Aerial Vehicles for Mars Missions***, International Mechanical Engineering Congress & Exposition, Virtual, 11/1-5/2021.
5. Blocker, C., Gross, J., Steers, E., Hanshaw, A., Sydow, N., Letcher, T., Ciarcià, M., ***Albatross: an Autonomous, Electric, Multirotor for Personal Transportation***, Canadian Committee for the Theory of Machines and Mechanisms Symposium on Mechanisms, Machines, and Mechatronics, Virtual, 5/3-4/2021.
6. Lavezzi, G., Ciarcià, M., ***A Near-Optimal Attitude Control for an Earth Imaging Satellite***, 31st AAS/AIAA Space Flight Mechanics Meeting, Virtual, 2/1-3/2021.
7. Runge, N., Twedt, R., Olson, W., Berg, S., Smithee, I., Letcher, T., Ciarcià, M., ***Design, Development, and testing of an Autonomous Multirotor for Personal Transportation***, USCToMM Symposium on Mechanical Systems and Robotics, Rapid City, SD, 5/14-16/2020.
8. Lavezzi, G., Grøtte, M. E., Ciarcià, M., ***Attitude Control Strategies for an Imaging CubeSat***, 2019 IEEE International Conference on Electro/Information Technology, Brookings, SD, 5/20-22/2019.

9. Raslan, A., Michna, G., Ciarcià, M., ***Thermal Simulation of a CubeSat***, 2019 IEEE International Conference on Electro/Information Technology, Brookings, SD, 5/20-22/2019.

10. Shata, E., Acharya, P., Ciarcià, M., Nguyen, K, ***Optimization of a Chemical Reaction Using the Modified Quasilinearization Algorithm***, 2019 IEEE International Conference on Electro/Information Technology, Brookings, SD, 5/20-22/2019.
11. Harwood, S., Ciarcià, M., ***Analysis of Analog to Digital Conversion Techniques for Satellite Orbital Maneuvering Using Cold Gas Thrusters***, 29th AAS/AIAA Space Flight Mechanics Meeting, Ka'anapali, HI, 1/13-17/2019.
12. Roy, T., Ni, Z., Ciarcià, M., ***A Convex Optimization Approach for Distributed Energy Trading of Interconnected Microgrids***, 50th North American Power Symposium (NAPS), Fargo, SD, 9/9-11/2018.
13. Ciarcià, M., Grompone, A., Romano, M., ***A Suboptimal Guidance for Cooperative Docking Maneuvers***, 7th International Workshop on Spacecraft Constellation and Formation Flying, Lisbon, Portugal, 3/13-15/2013. ID: IWSCFF-2013-06-03.
14. Ciarcià, M., Romano, M., ***Suboptimal Guidance for Spacecraft Proximity Maneuvers with Path Constraints Capability***, AIAA Guidance Navigation and Control Conference, Minneapolis, MN, 8/13-16/2012, DOI: 10.2514/6.2012-4920.
15. Ciarcià, M., Romano, M., ***Spacecraft Proximity Maneuver Guidance Based on Inverse Dynamic and Sequential Gradient-Restoration Algorithm***, AAS/AIAA Astrodynamics Specialist Conference, Girdwood, AK, 7/31/2011-8/4/2011, Vol. 142, pp. 3679 – 3698, ISBN: 9780877035770.
16. Grillo, C., Ciarcià, M., Pizzolo, A., Gatto, C., Vitrano, F., ***Collision Avoidance Problem for an Ekranoplan***, 9th Congress of the Italian Society of Applied and Industrial Mathematics, Rome, Italy, 9/15-19/2008, DOI: 10.1685/CSC09271.
17. Miele, A., Ciarcià, M., ***Best Initial Conditions for the Rendezvous Maneuver***, Conference on Variational Analysis and Aerospace Engineering, Erice, Italy, 9/2007. ISBN: 978-0-387-95857-6.