

Dr. Andrea L'Afflitto

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Work Experience Assistant Professor.

Department of Aerospace and Mechanical Engineering, The University of Oklahoma, Norman, OK. August, 2015 – Present

Research in robust output-feedback control, optimal control, and differential games theory for aerospace engineering applications. *Application:* design of autopilots for UAS.

Teaching portfolio:

- Flight Controls (G/U)
- Nonlinear Dynamical Systems and Control (G/U)
- Advanced Dynamics & Control of Mechanical Systems (G/U)
- Optimization & Optimal Control (G/U)

Service: - Graduate studies committee member (2017 – Present).

Summer Faculty Fellow.

Army Research Lab, Aberdeen, MD. Summer 2017, 2018

Collaboration on the design, implementation, and testing of nonlinear robust controls for quadrotor aircraft.

International Space Station – Systems and Operations Engineer.

German Aerospace Agency (DLR), Cologne, Germany. January, 2007 – May, 2008

Payload and operations coordinator of EXPOSE-E: a payload installed outside the European module Columbus for the International Space Station.

Education

Ph.D. in Aerospace Engineering.

Georgia Institute of Technology, Atlanta, GA, USA. August 2011 – April 2015

Research in *optimal control, finite-time state-feedback optimal control, partial-state state-feedback optimal control, and semistabilization of nonlinear dynamical systems.*

Master of Science in Mathematics.

Virginia Polytechnic Institute and State University, Blacksburg, VA, USA. August 2009 – May 2010.

Research in calculus of variations and optimal control theory with applications to spacecraft and aircraft fuel-optimal path planning.

Master of Science in Aerospace Engineering and Astronautics.

Federico II University, Naples, Italy. September 2004 – September 2006.

Research in space systems design in conjunction with an internship at the Italian Space Agency (ASI). *Summa cum laude.*

Bachelor of Science in Aerospace Engineering.

Federico II University, Naples, Italy. September 2001 – September 2004.

Research in space systems design in conjunction with an internship at Co.Ri.S.T.A. (Alenia Spazio Group). *Summa cum laude.*

Publications

Books:

- B1. A. L’Afflitto. *A Mathematical Perspective on Flight Dynamics and Control*, Springer, London, UK – ISBN 978-3-319-47466-3.

Book Chapters:

- BC1. K. Mohammadi and A. L’Afflitto. *Robust Adaptive Output Tracking for Quadrotor Helicopters*, in “Adaptive Robust Control and its Applications” , Dr. Le Anh Tuan ed., InTech, pp. 77-100, ISBN: 978-953-51-5729-8.
- BC2. A. L’Afflitto, W. M. Haddad. *A Variational Approach to the Fuel Optimal Control Problem for UAV Formations*, in “Recent Advances in Aircraft Technology” , Dr. Ramesh Agarwal ed., InTech, pp. 221-248, ISBN: 979-953-307-635-4.

Selected Journal Papers [Out of 15]:

- J1. A. L’Afflitto and T. A. Blackford. *Constrained Dynamical Systems, Robust Model Reference Adaptive Control, and Unreliable Reference Signals*. International Journal of Control – In Press.
- J2. A. L’Afflitto. *Barrier Lyapunov Functions and Constrained Model Reference Adaptive Control*. IEEE Control Systems Letters – Vol. 2, 3, May 2018, pp. 441-446.
- J3. A. L’Afflitto, R. B. Anderson, and K. Mohammadi, *An Introduction to Nonlinear Robust Control for Unmanned Quadrotor Aircraft*. IEEE Control Systems Magazine – Vol. 38, 3, May 2018, pp. 102-121.
- J4. A. L’Afflitto, *Differential Games, Partial-State Stabilization, and Model Reference Adaptive Control*. Journal of the Franklin Institute, Vol. 354, 1, Jan. 2017, pp. 456-478.
- J5. W. M. Haddad and A. L’Afflitto, *Finite-Time Stabilization and Optimal Feedback Control*. IEEE Transactions on Automatic Control, Vol. 61, 4, April 2016, pp. 1069-1074.
- J6. A. L’Afflitto, W. M. Haddad, and E. Bakolas, *Partial-State Stabilization and Optimal Control*. International Journal of Robust and Nonlinear Control, Vol. 26, 5, Mar. 2016, pp. 1026-1050.

Selected Conference Papers [Out of 18]:

- C1. A. L’Afflitto, *Robust Adaptive Control for Constrained Dynamical Systems Following Unreliable Reference Signals*, in proc. American Control Conference, July 2018.
- C2. A. L’Afflitto, *Differential Games, Asymptotic Stabilization, and Robust Optimal Control of Nonlinear Systems*, in proc. Conference on Decision and Control, December 2016.
- C3. A. L’Afflitto and W. M. Haddad, *Singular Linear-Quadratic Control for Semistabilization*. Conference on Decision and Control, Florence, Italy, December 2013.
- C4. A. L’Afflitto and C. Sultan, *On the Fuel and Energy Consumption Optimization Problem in Aircraft Path Planning*. IEEE Conference on Decision and Control, Atlanta, GA, December 2010.
- C5. A. L’Afflitto and C. Sultan, *Calculus of Variations for Guaranteed Optimal Path Planning of Aircraft Formations*. IEEE International Conference on Robotics and Automation, Anchorage, AK, May 2010.

Invited Talks:

- I1. Model reference adaptive control and UAS autopilot design. University of Napoli, Italy, “Federico II”, May 21-22, 2018.
- I2. From theory to practice: A nonlinear robust control to assist quadrotor pilots in adverse conditions. Naval Future Force Science and Technology Expo, July 20, 2017.
- I3. Robust Control, Optimal Control, and Differential Games. University of New Mexico, October 28, 2016.

14. Optimal Control and Differential Games: From Spacecraft Attitude Control to Formation Flying. Kirtland Air Force Base, August 11, 2016.
15. Robust Control, Optimal Control, and Differential Games. Wright-Patterson Air Force Base, July 22, 2016.
16. Optimal Control and Differential Games: From Spacecraft Attitude Control to Formation Flying. Italian Center for Aerospace Research (CIRA) – May 19, 2016.
17. Feedback Optimal Control, Robust Control, and Differential Games: Theory, Numerical Solutions, and Applications. Oak Ridge National Laboratory (ORNL) – April 28, 2016.

Selected Awards Funding:

- **A. L’Afflitto. Young Faculty Award, DARPA-RA-17-01-YFA-FP-090, TA24 – A bio-inspired approach to fly undetected in cluttered environments, DARPA, July 2018 – June 2021. Cumulative: \$498,513.**
- **A. L’Afflitto. T3C1S4C – UAS Control System – Robotics CTA 2017-18 Biennial Program Plan, Army Research Lab through Robotics Collaborative Technology Alliance, January 2018 – December 2020. Cumulative: \$185,343.**
- **A. L’Afflitto and Z. Siddique. Collaborative Research: Unmanned Aerial Systems and Specialized Workforce Development to Support Oklahoman Agriculture and Industry, NSF ATE Program, July 2017 – July 2020. Cumulative: \$408,804; Personal share: \$224,842.**

Editorial Activities:

- IET Control Theory and Applications – Top 5% most outstanding reviewer out of over 1000 – 2016.

Editorial Activities

Journals:

- Elsevier – Control Engineering Practice, Associate editor, 2015 – Present.
- Springer – Journal of Intelligent & Robotic Systems, Guest editor, 2017.

Conferences:

- AIAA SciTech 2019, Associate editor.
- Networked and Autonomous Air and Space Systems Conference 2018, Editorial board member.
- American Control Conference 2017, Associate editor.

Reviewer

Books:

- Springer.

Selected Journals:

- *Elsevier Automatica.*
- *Elsevier Systems & Control Letters.*
- *IEEE Transactions on Automatic Control.*
- *IEEE Control Systems Magazine.*
- *Taylor & Francis International Journal of Control.*
- *Wiley International Journal of Robust and Nonlinear Control.*

Selected Conferences:

- *IEEE American Control Conference, 2010, 2011, 2013, 2016, 2018.*
- *IEEE Conference on Decision and Control, 2012–2015.*
- *IFAC International Conference on Automatic Control, 2011, 2014.*