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.*

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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.

I4. Optimal Control and Differential Games: From Spacecraft Attitude Control to Formation Flying. Kirtland Air Force Base, August 11, 2016.

I5. Robust Control, Optimal Control, and Differential Games. Wright-Patterson Air Force Base, July 22, 2016.

I6. Optimal Control and Differential Games: From Spacecraft Attitude Control to Formation Flying. Italian Center for Aerospace Research (CIRA) – May 19, 2016.

I7. 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.