Dr. Andrea L'Afflitto

Contact Information

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Work Experience in Academia

Associate Professor.
Department of Industrial and Systems Engineering, Virginia Tech. June, 2022 – Present
Affiliate Professor.
Department of Aerospace and Ocean Engineering, Virginia Tech. December, 2022 – Present
Affiliate Professor.
National Security Institute. August, 2022 – Present
Affiliate Professor.
Department of Mechanical Engineering, Virginia Tech. March, 2020 – Present

Research in robust output-feedback control, optimal control, robotics, and autonomy. *Applications*: Design of autopilots for aerial and ground robots.

Assistant Professor.
Department of Industrial and Systems Engineering, Virginia Tech. August, 2019 – May, 2022
Assistant Professor.
School of Aerospace and Mechanical Engineering, the University of Oklahoma. August, 2015 – July, 2019

Work Experience in the Industry

AFRL Summer Faculty Fellow.
Kirtland Air Force Base. Summer 2021

ONR Summer Faculty Fellow.
U.S. Department of the Navy. Summer 2020

Summer Faculty Fellow.
Army Research Lab, Aberdeen, MD. Summer 2017–2019

International Space Station – Systems and Operations Engineer.
German Aerospace Agency (DLR), Cologne, Germany. January, 2007 – May, 2008

Education

Ph.D. in Aerospace Engineering.
Georgia Institute of Technology, Atlanta, GA, USA. August 2011 – April 2015

Master of Science in Mathematics.
Virginia Polytechnic Institute and State University, Blacksburg, VA, USA. August 2009 – May 2010.

Master of Science in Aerospace Engineering and Astronautics.
Federico II University, Naples, Italy. September 2004 – September 2006.

Bachelor of Science in Aerospace Engineering.
Federico II University, Naples, Italy. September 2001 – September 2004.

Publications

Edited Books:

EB1. A. L'Afflitto, G. Inhalan, and H.-S. Shin (eds.). *Control of Autonomous Aerial Vehicles: Advances in Autopilot Design for Civilian UAVs*, Springer, London, UK – Accepted.

Books:

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

Selected Book Chapters [Out of 2]:

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.

Selected Journal Papers [Out of 22]:

J1. R. B. Anderson, J. A. Marshall, and A. L'Afflitto. *Novel Model Reference Adaptive Control Laws for Improved Transient Dynamics and Guaranteed Anti-Windup*, Journal of the Franklin Institute – Vol. 358, 12, Aug. 2021, pp. 6281-6308.

J2. R. B. Anderson, J. A. Marshall, A. L'Afflitto, and J. M. Dotterweich. *Model Reference Adaptive Control of Switched Dynamical Systems with Applications to Aerial Robotics*, International Journal of Intelligent & Robotic Systems – Vol. 100, 3, Nov. 2020, pp. 1265-1281.

J3. A. L'Afflitto. *Barrier Lyapunov Functions and Constrained Model Reference Adaptive Control.* IEEE Control Systems Letters – Vol. 2, 3, May 2018, pp. 441-446.

J4. 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.

J5. 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.

J6. 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.

Workshops:

W1. A. L'Afflitto, R. B. Anderson, and J. A. Marshall. *Robust adaptive control of multi-rotor UAVs*, American Control Conference, July 2019.

Selected Conference Papers [Out of 23]:

C1. J. A. Marshall, G. I. Carter, and A. L'Afflitto. *Model Reference Adaptive Control for Prescribed Performance and Longitudinal Control of a Tail-Sitter UAV*, in AIAA SciTech, January 2022 – Invited paper.

C2. A. L'Afflitto, *Robust Adaptive Control for Constrained Dynamical Systems Following Unreliable Reference Signals*, in proc. American Control Conference, July 2018.

C3. A. L'Afflitto, *Differential Games, Asymptotic Stabilization, and Robust Optimal Control of Nonlinear Systems*, in proc. Conference on Decision and Control, December 2016.

C4. A. L'Afflitto and W. M. Haddad, *Singular Linear-Quadratic Control for Semistabilization.* Conference on Decision and Control, Florence, Italy, December 2013.

C5. 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.

Selected Invited Talks [Out of 13]:

I1. From tactical mapping to sensor placement: Advances in the guidance and control of small autonomous unmanned aerial vehicles. GSERITA 2021, Lisbona, Portugal, September 2021.

I2. From Tactical Operations to Sensor Placement and Shipboard Landing. M&S Community of Interest Joint Army/Navy UAV Workshop, June 2021.

I3. 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.

I4. Robust Control, Optimal Control, and Differential Games. University of New Mexico, October 28, 2016.

I5. Optimal Control and Differential Games: From Spacecraft Attitude Control to Formation Flying. Italian Center for Aerospace Research (CIRA) – May 19, 2016.

I6. Feedback Optimal Control, Robust Control, and Differential Games: Theory, Numerical Solutions, and Applications. Oak Ridge National Laboratory (ORNL) – April 28, 2016.

Selected List of Graduated Advisees

Ph.D. Students:

- Dr. Julius A. Marshall. *Thesis title*: "Guidance and Control of Autonomous Unmanned Aerial Vehicles for Maritime Operations" – Fall 2022;
- Dr. Robert B. Anderson. *Thesis title*: "Routing and Control of Unmanned Aerial Vehicles for Performing Contact-Based Tasks" – Spring 2021;

M.S. Students:

- Mr. Shardul Amrite.
- Mr. Rishabh Chaure.
- Mr. Sean E. Eagen.
- Mr. Grant I. Carter.
- Mr. Robert B. Anderson.
- Mr. Timothy A. Blackford.
- Mr. John-Paul P. Burke.
- Mr. Coleton Domann.
- Mr. Joshua Karinshak.

Awards

Selected External Funding [Out of 15 – $3.3+M]:

- **A. L'Afflitto** and W. Sun. *Robust Adaptive Control and Vision-Based Navigation System Design for Multi-Rotor Aerial Vehicles*, Army Research Lab, January 2023 – 2026. Cumulative: **$624,832**; Personal share: **$329,180**.
- **A. L'Afflitto** and C. Sandu. *TA1: Physics-Based Robust, Adaptive, and Scalable Control Algorithms for Autonomous Ground Vehicles Operating at High-Speed in Adversarial Environments*, U.S. Army Ground Vehicle Systems Center, January 2021 – December 2023. Cumulative: **$397,672**; Personal share: **$198,836**.
- **A. L'Afflitto**. *Robust Adaptive Control Algorithms for Vertical Take-Off and Landing Autonomous Unmanned Aerial Vehicles*, U.S. Department of the Navy, January 2021 – April 2023. Cumulative: **$179,996**.
- **A. L'Afflitto** and D. K. Walters. *Robust Adaptive Controls for Shipboard Landing of Multi-Rotor Unmanned Aerial Vehicles*, Office of Naval Research, June 2019 – May 2021. Cumulative: **$401,484**; Personal share: **$221,016**.
- **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**. This proposal

was in collaboration with Rose State College, whose PIs submitted the proposal no. 1700647 and received a $305,150 award.

Editorial Activities:

- IEEE Transactions on Aerospace and Electronic Systems – Outstanding contributions as an Associate Editor, 2021.
- Elsevier Control Engineering Practice – Top 15 reviewer, 2020.
- IET Control Theory and Applications – Top 5% most outstanding reviewer out of over 1000, 2015.

Editorial Activities

Selected Journals:

- IEEE – Transactions on Aerospace and Electronic Systems, Associate editor, 2019 – Present.
- Elsevier – Control Engineering Practice, Associate editor, 2015 – 2019.

Selected Conferences:

- 2021 Southeast Control Conference – General Chair.
- IEEE Conference Editorial Board, 2019 – Present, Member.

Reviewer

Funding Agencies:

- National Science Foundation:
  - Dynamics, Control and Systems Diagnostics.
  - Cyberinfrastructure for Sustained Scientific Innovation.
  - IIS:Robust Intelligence.
  - Innovations in Integration of Robotics.
  - EPSCoR RII Track 2.
  - Advanced Technological Education.
  - Graduate Research Fellowships Program (GRFP)
- Office of Naval Research.
- Czeck Science Foundation.
- Mitacs.

Books:

- Springer.

Selected Journals:

- *Cambridge University Press* Robotica.
- *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.
- *IEEE* Conference on Decision and Control.
- *IFAC* International Conference on Automatic Control.