JOSEPH E. GAUDIO

https://josephgaudio.github.io

RESEARCH RELATED EXPERIENCE

The Boeing Company   Chicago, IL
Researcher   *March 2022 — Present*

Research and development in intelligent systems, autonomy, guidance, and control.

Aurora Flight Sciences, a Boeing Company   Cambridge, MA
Research Scientist - Intelligent Systems and Control   *June 2020 — March 2022*

Research and development in intelligent systems, autonomy, guidance, and control.

Massachusetts Institute of Technology — Active Adaptive Control Laboratory   Cambridge, MA
Research Assistant   *September 2016 — May 2020*

Research at the intersection of online learning, adaptive systems, control theory, and machine learning:

- Stability theory in learning, leveraging the intersections between machine learning and adaptive control.
- Parameter convergence in online learning problems using adaptive algorithms.
- Online learning and control in the presence of time-varying features, nonlinear algorithms.
- Control of adaptive systems in the presence of constraints.
- Guidance, Navigation, and Control (GNC) of aerial vehicles.

Collaboration with The Boeing Company and the Air Force Research Laboratory (AFRL).

The Boeing Company   Seattle, WA
Research Intern - Control & Autonomy   *June 2018 — August 2018*

The Boeing Company   St. Louis, MO
Guidance, Navigation and Control Intern   *June 2017 — August 2017*

The Boeing Company   St. Louis, MO
Guidance, Navigation and Control Intern   *May 2016 — August 2016*

The Boeing Company   St. Louis, MO
Guidance, Navigation and Control Intern   *May 2015 — August 2015*

University of Illinois at Urbana-Champaign — Control Systems Laboratories   Champaign, IL
Control Systems/Mechatronics Assistant   *August 2014 — May 2016*

University of Illinois at Urbana-Champaign — Ewoldt Research Group   Champaign, IL
Research Assistant   *January 2013 — January 2014*

EDUCATION

Massachusetts Institute of Technology   Cambridge, MA
PhD Mechanical Engineering, Minor Mathematics   *May 2020*
Thesis: Fast Learning and Adaptation in Control and Machine Learning
Advisor: Dr. Anuradha M. Annaswamy

University of Illinois at Urbana-Champaign   Champaign, IL
BS Mechanical Engineering, Minor Electrical Engineering   *May 2016*

University College London   London, United Kingdom
Study abroad in the Department of Electronic and Electrical Engineering   *January 2015 — May 2015*

PUBLICATIONS

Gaudio JE, Annaswamy AM, Lavretsky E, Bolender MA, "Parameter Estimation in Adaptive Control of Time-Varying Systems Under a Range of Excitation Conditions," *IEEE Transactions on Automatic Control*, 2022.

Annaswamy AM, Guha A, Cui Y, Tang S, **Gaudio JE**, "Integration of Adaptive Control and Reinforcement Learning Approaches for Real-Time Control and Learning," *arXiv:2105.06577*, 2022.

Cui Y, **Gaudio JE**, Annaswamy AM, "A New Algorithm for Discrete-Time Parameter Estimation," *arXiv:2103.16653*, 2021.

McDonald S, Cui Y, **Gaudio JE**, Annaswamy AM, "A High-order Tuner for Accelerated Learning and Control," *arXiv:2103.12868*, 2021.

Gaudio JE, Annaswamy AM, Moreu JM, Bolender MA, Gibson TE, "Accelerated Learning with Robustness to Adversarial Regressors," *Learning for Dynamics and Control (L4DC)*, 2021.

Sarker A, **Gaudio JE**, Annaswamy AM, "Parameter Estimation Bounds Based on the Theory of Spectral Lines," *arXiv:2006.12687*, 2020.

Gaudio JE, Annaswamy AM, Bolender MA, Lavretsky E, Gibson TE, "A Class of High Order Tuners for Adaptive Systems," *IEEE Control Systems Letters (L-CSS)*, 2020; Selected for presentation at the *59th IEEE Conference on Decision and Control (CDC)*, 2020.

Gaudio JE, Annaswamy AM, Lavretsky E, Bolender MA, "Fast Parameter Convergence in Adaptive Flight Control," *AIAA Guidance, Navigation, and Control Conference*, 2020.

Gaudio JE, Gibson TE, Annaswamy AM, Bolender MA, Lavretsky E, "Connections Between Adaptive Control and Optimization in Machine Learning," *58th IEEE Conference on Decision and Control (CDC)*, 2019; *International Conference on Machine Learning (ICML), Workshop on Adaptive & Multitask Learning*, 2019.

Gaudio JE, Gibson TE, Annaswamy AM, Bolender MA, "Provably Correct Learning Algorithms in the Presence of Time-Varying Features Using a Variational Perspective," *International Conference on Machine Learning (ICML), Workshop on Real-world Sequential Decision Making: Reinforcement Learning and Beyond*, 2019; *arXiv:1903.04666*, 2019.

Annaswamy AM, **Gaudio JE**, "Robust Adaptive Control," *Encyclopedia of Systems and Control*, Springer London, 2019.

Gaudio JE, Annaswamy AM, Bolender MA, Lavretsky E, "Adaptive Flight Control in the Presence of Limits on Magnitude and Rate," *arXiv:1907.11913*, 2019.

Gaudio JE, Annaswamy AM, Lavretsky E, "Adaptive Control of Hypersonic Vehicles in the Presence of Rate Limits," *AIAA Guidance, Navigation, and Control Conference*, 2018.

Blackwell BC, Deetjen ME, **Gaudio JE**, Ewoldt RH, "Quantitative Measures of Yield-Stress Fluid Drop Impacts on Coated Surfaces," *Atomization and Sprays*, 2017.

Blackwell BC, Deetjen ME, **Gaudio JE**, Ewoldt RH, "Sticking and Splashing in Yield-Stress Fluid Droplet Impacts on Coated Surfaces," *Physics of Fluids*, 2015.

Deetjen ME, Blackwell BC, **Gaudio JE**, Ewoldt RH, "Liquid-Solid Impacts of Yield-Stress Fluids," *APS Division of Fluid Dynamics 66th Annual Meeting*, Pittsburgh, 2013.

CONFERENCE WORKSHOPS ORGANIZED

Gibson TE, **Gaudio JE**, Annaswamy AM, "Intersections of Machine Learning and Parameter Estimation in Control," *57th IEEE Conference on Decision and Control (CDC)*, 2018.

CONFERENCE INVITED SESSIONS ORGANIZED

Gaudio JE, Dibaji SM, Gibson TE, Annaswamy AM, "Machine Learning in Control, Theory and Applications I&II," *58th IEEE Conference on Decision and Control (CDC)*, 2019.

CONFERENCE AND WORKSHOP PRESENTATIONS

"The Intersection Between Machine Learning & Guidance, Navigation, and Control," *IEEE Conference on Control Technology and Applications (CCTA), Workshop on Multi-Vehicle and Assured Autonomous Control for Aerospace Applications*, 2021.

"A Class of High Order Tuners for Adaptive Systems," *59th IEEE Conference on Decision and Control (CDC)*, 2020.

"Fast Learning and Adaptation in Control and Machine Learning," *Air Force Research Laboratory, Control Science Center Presentation*, 2020.

"Fast Parameter Convergence in Adaptive Flight Control," *Aerospace Control and Guidance Systems Committee (ACGSC) Meeting 125*, 2020.

"Connections Between Adaptive Control and Optimization in Machine Learning," *58th IEEE Conference on Decision and Control (CDC)*, 2019.

"Adaptive Control Theory in the Presence of Hard Limits on Magnitude and Rate with Aerospace Applications," *LIDS Student Conference*, 2018.

"Adaptive Control of Hypersonic Vehicles in the Presence of Rate Limits," *AIAA Guidance, Navigation, and Control Conference*, 2018 (Invited Presentation).

POSTER PRESENTATIONS

"Accelerated Learning with Robustness to Adversarial Regressors," *Learning for Dynamics and Control (L4DC)*, 2021.

"Provably Correct Learning Algorithms in the Presence of Time-Varying Features Using a Variational Perspective," *International Conference on Machine Learning (ICML), Workshop on Real-world Sequential Decision Making: Reinforcement Learning and Beyond*, 2019.

"Connections Between Optimization in Machine Learning and Adaptive Control," *International Conference on Machine Learning (ICML), Workshop on Adaptive & Multitask Learning*, 2019.

"Stable and Fast Learning with Momentum and Adaptive Rates," *Learning for Dynamics and Control (L4DC)*, 2019.

"Connections Between Adaptive Control and Machine Learning," *Learning for Dynamics and Control (L4DC)*, 2019.

"Accelerated Learning in the Presence of Time Varying Features," *LIDS Student Conference*, 2019.

"Accelerated Learning in the Presence of Time Varying Features," *MIFODS Workshop on Non-Convex Optimization and Deep Learning*, 2019.

"On Robustness and Acceleration for Linear Dynamical Systems," *Princeton Day of Optimization*, 2018.

TECHNICAL COMMITTEES

IEEE Control Systems Society: Technical Committee on Intelligent Control (TCIC).

IEEE Control Systems Society: Technical Committee on System Identification and Adaptive Control (TCSIAC).

TEACHING AND MENTORING EXPERIENCE

Teaching Assistant for MIT 2.153: Adaptive Control and Connections to Machine Learning - Held weekly office hours, taught one lecture, and graded problem sets.

Mentor for a SuperUROP project on learning methods for fault detection in aerial vehicles.

AWARDS AND HONORS

Sontheimer Travel Award in Mechanical Engineering, MIT

National Science Foundation Graduate Research Fellowship Program — Honorable Mention 2016, 2018

James Scholar, UIUC

University Honors/Bronze Tablet (Top 3 Percent of Graduating Class), UIUC

Undergraduate Research Opportunities Program — Research Award Recipient, UIUC

Seichi Konzo Memorial Award for Outstanding Student in Mechanical Engineering, UIUC

PAPER REVIEWING

IEEE Transactions on Automatic Control; IEEE Transactions on Control Systems Technology; IEEE Control Systems Letters; Annual Reviews in Control; AIAA Journal of Guidance, Control, and Dynamics; American Control Conference (ACC); Learning for Dynamics and Control (L4DC).

ADDITIONAL EXPERIENCE

GE Aviation   Evendale, OH
Development Engine Assembly Intern   *June 2014 — August 2014*

Provisur Technologies   Mokena, IL
R&D Mechanical Engineering Intern   *May 2013 — August 2013*

TECHNICAL SKILLS

Computer Languages	MATLAB/Simulink
Software & Tools	LaTeX