Caio Kalil Lauand

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Education

University of Florida — Gainesville, FL
Ph.D. in Electrical and Computer Engineering (GPA: 3.89/4.00) — *Expected August 2025*
Advisor: Sean Meyn

University of Florida — Gainesville, FL
M.S. in Electrical and Computer Engineering (GPA: 3.88/4.00) — *May 2023*

University of North Florida — Jacksonville, FL
B.S.E.E. in Electrical Engineering (Summa Cum Laude – GPA: 3.96/4.00) — *April 2019*

Relevant Research Experience

Graduate Research Intern — May 2024 – August 2024
NREL - National Renewable Energy Laboratory — *Golden, CO*

- Developed theoretical foundations for a new class of online data-driven stochastic gradient descent algorithms, justifying their application to optimization of networked systems with non-compliant agents. The theory was applied to real-time optimization of power distribution grids.

Visiting Ph.D. Student — June 2023 – July 2023
INRIA - French Institute for Research in Computer Science and Automation — *Paris, France*

- Worked in conjunction with INRIA scientists to further develop theory for stochastic recursive algorithms.
- Proposed a new class stochastic approximation (SA) algorithms with universal stability properties and optimal convergence rates, while also reducing algorithmic complexity over standard theory.

Graduate Research Assistant — August 2020 – Present
Laboratory for Cognition & Control in Complex Systems, University of Florida — *Gainesville, FL*

- Worked on theoretical aspects of machine learning and optimization algorithms. In particular, studied the method of stochastic approximation (SA) and its deterministic analog (quasi-stochastic approximation or QSA). The theory developed was then applied to: gradient-free optimization, extremum-seeking control and reinforcement learning.
- Proposed QSA algorithm acceleration techniques to achieve convergence quartically faster than standard SA theory suggests.
- Obtained a representation for bias and variance in SA with Markovian disturbance and fixed/slowly diminishing learning rates.
- Developed stability theory for QSA algorithms with fixed learning rates. Proposed a filtering technique to reduce both variance and bias quadratically.
- Established global stability for a special case of extremum seeking control (ESC) algorithms.

Relevant Work Experience

Associate Robotics Engineer — October 2019 – April 2020
Teknical, LLC — *Jacksonville, FL*

- Integrated a multidisciplinary team to implement, optimize, and validate vision-guided robotic systems.
- Led a robot evaluation project to assess the implementation of robotic solutions.
- Prepared and taught workshops to instruct operators on troubleshooting and maintenance techniques for robots.

Solutions Engineering Summer Intern — May 2017 – August 2017
Comgás — *São Paulo, Brazil*

- Conducted a software research project to assess the implementation of off-the-shelf asset performance management solutions. Presented the findings of this research to the company's executive board.

Featured Publications

[1] **Caio Kalil Lauand** and Sean Meyn. Markovian foundations for quasi-stochastic approximation. *SIAM Journal on Control and Optimization*, 63(1):402–430, 2025.

[2] **Caio Kalil Lauand** and Sean Meyn. Markovian foundations for quasi-stochastic approximation in two timescales. In *IEEE Conference on Decision and Control*, 2024.

[3] **Caio Kalil Lauand** and Sean Meyn. Revisiting step-size assumptions in stochastic approximation. *arXiv 2405.17834*, 2024.

[4] **Caio Kalil Lauand** and Sean Meyn. The curse of memory in stochastic approximation. In *IEEE Conference on Decision and Control*, 2023.

[5] **Caio Kalil Lauand** and Sean Meyn. Quasi-stochastic approximation: Design principles with applications to extremum seeking control. *IEEE Control Systems Magazine*, 43(5):111–136, 2023.

[6] **Caio Kalil Lauand**, Ana Bušić, and Sean Meyn. Inverse-free Zap stochastic approximation. In *Allerton Conference on Communication, Control, and Computing*, Sep 2023.

[7] **Caio Kalil Lauand** and Sean Meyn. Bias in stochastic approximation cannot be eliminated with averaging. In *Allerton Conference on Communication, Control, and Computing*, Sep 2022.

[8] **Caio Kalil Lauand** and Sean Meyn. Approaching quartic convergence rates for quasi-stochastic approximation with application to gradient-free optimization. *Proc. Conference on Neural Information Processing Systems (NeurIPS)*, 2022 – **Ranked #7 among all publication venues across all disciplines on Google Scholar**.

[9] Brian Kopp, Jonathan Harris, and **Caio Kalil Lauand**. Utilizing existing commercial geostationary earth orbit fixed satellite services for low earth orbit satellite communication relays with earth. *New Space*, 7(1):19–30, 2019.

[10] Samuel Jones, Mario Collapelle, **Caio Kalil Lauand**, and Brian Kopp. Design of a beyond-line-of-sight microwave propagation study across the gulf of mexico. In *SoutheastCon 2018*, pages 1–5. IEEE, 2018.

Presentations

Markovian Foundations for Quasi-Stochastic Approximation in Two Timescales - Talk given at 2024 IEEE Control and Decision Conference (CDC), Milan, Italy.

Quasi-Stochastic Approximation: Design Principles with Applications to Extremum-Seeking Control - Talk given at the Advances on Model-Free Equilibrium-Seeking Control workshop during the 2023 American Control Conference, San Diego, CA.

The Curse of Memory in Stochastic Approximation - Talk given at 2023 IEEE Control and Decision Conference (CDC), Singapore, the online RL Theory Seminar series and the 2025 CWI Control and Reinforcement Learning Workshop, Amsterdam, Netherlands.

Clever Exploration for Machine Learning - Poster presented at the University of Florida's Statistics 2023 Winter Workshop and the 6^{th} Workshop on Cognition & Control, Gainesville, FL, 2023.

Approaching Quartic Convergence Rates for Quasi-Stochastic Approximation with Application to Gradient-Free Optimization - Poster presented at Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS) conference, New Orleans, LA, 2022.

Teaching Experience

Teaching Assistant:

- ◇ EEL 6935 Stochastic Methods for Engineering II, University of Florida

Supplemental Instructor:

- ◇ EEL3472 Electromagnetic Fields and Applications, University of North Florida
- ◇ COP2220 Computer Science I, University of North Florida

Tutor:

- ◇ Physics and Mathematics, University of North Florida

Reviewing Service

Reviewer: 2021 IEEE Conference on Decision and Control (CDC); 2023 American Control Conference (ACC); 2023 IEEE Conference on Decision and Control (CDC); 2024 IEEE Control Systems Letters (L-CSS); 2024 IEEE Transactions on Automatic Control (TAC); 2024 Conference on Neural Information Processing Systems (NeurIPS); 2025 International Conference on Learning Representations (ICLR); 2025 International Conference on Artificial Intelligence and Statistics (AISTATS); 2025 International Conference on Machine Learning (ICML).

Awards

Recipient: University of Florida's Electrical and Computer Engineering Graduate Excellence Award in Research, 2024

Recipient: NeurIPS Scholar Award, 2022

Recipient: University of North Florida's Electrical Engineering Award for Academic Excellence, 2019

Skills

Native Languages: Portuguese, English

Languages with Limited Professional Proficiency: Spanish

Programming Languages/Software: Python, C, R, Matlab, LaTeX, Git, Microsoft Office

Data Processing Libraries: Pandas, NumPy, SciPy, Matplotlib, Seaborn, Scikit Learn

Additional Skills: Time-Series Prediction, Image Classification, Data-Driven Optimization, System Identification, Analytical Problem Solving, Debugging, Public Speaking, Leadership, Teamwork, Lean Six-Sigma Yellow Belt Certification, Reinforcement Learning, Convex and Non-Convex Optimization, Hidden Markov Models