

Nathan Lawrence

April 3, 2025

201 Gilman Hall
University of California
Berkeley, CA 94720

☎ +1 (778) 512-3141
✉ nplawrence@berkeley.edu
💻 nplawrence.com

Education

- 2023 **Ph.D. in Mathematics**, *The University of British Columbia*
Thesis: *Deep reinforcement learning agents for industrial control system design*
Advisors: Philip Loewen, Bhushan Gopaluni
- 2018 **M.S. in Mathematics**, *Portland State University*
- 2016 **B.A. in Mathematics**, *Portland State University Honors College*
summa cum laude

Employment

- 2024-present **Postdoctoral Scholar**, *Chemical & Biomolecular Engineering*, UC Berkeley
- 2023-2024 **Postdoctoral Research Fellow**, *Mathematics*, UBC

Publications

Click title for arXiv preprint. See Google Scholar for a complete list. [Google Scholar]

Preprints

- 2 MPCritic: A Plug-and-Play MPC Architecture for Reinforcement Learning
Nathan P. Lawrence, Thomas Banker, and Ali Mesbah
Preprint (under review) 2025
- 1 A View on Learning Robust Goal-Conditioned Value Functions: Interplay between RL and MPC
Nathan P. Lawrence, Philip D. Loewen, Michael G. Forbes,
R. Bhushan Gopaluni, and Ali Mesbah
Preprint (under review) 2025

Selected Publications

- 6 Local-Global Learning of Interpretable Control Policies: The Interface between MPC and Reinforcement Learning
Thomas Banker, **Nathan P. Lawrence**, and Ali Mesbah
American Control Conference 2025
- 5 Stabilizing reinforcement learning control: A modular framework for optimizing over all stable behavior
Nathan Lawrence, Philip Loewen, Shuyuan Wang, Michael Forbes, and Bhushan Gopaluni
Automatica 2024

- 4 Deep reinforcement learning with shallow controllers: An experimental application to PID tuning
Nathan Lawrence, Michael Forbes, Philip Loewen, Daniel McClement, Johan Backström, and Bhushan Gopaluni
 Control Engineering Practice 2022
- 3 Meta-reinforcement learning for the tuning of PI controllers: An offline approach
 Daniel McClement, **Nathan Lawrence**, Johan Backström, Philip Loewen, Michael Forbes, and Bhushan Gopaluni
 Journal of Process Control 2022
- 2 Almost surely stable deep dynamics
Nathan Lawrence, Philip Loewen, Michael Forbes, Johan Backström, and Bhushan Gopaluni
 NeurIPS 2020 (Spotlight)
- 1 Toward self-driving processes: A deep reinforcement learning approach to control
 Steven Spielberg, Aditya Tulsyan, **Nathan Lawrence**, Philip Loewen, and Bhushan Gopaluni
 AIChE Journal 2019

Patents

- 3 Application of simple random search approach for reinforcement learning to controller tuning parameters
Nathan Lawrence, Philip Loewen, Bhushan Gopaluni, and Gregory Stewart
 US Patent 11,307,562 2022
- 2 Method and system for directly tuning PID parameters using a simplified actor-critic approach to reinforcement learning
Nathan Lawrence, Philip Loewen, Bhushan Gopaluni, and Gregory Stewart
 US Patent 11,500,337 2022
- 1 Process controller with meta-reinforcement learning
 Daniel McClement, **Nathan Lawrence**, Philip Loewen, Bhushan Gopaluni, Michael Forbes, and Johan Backström
 US Patent App. 17/653,175 2022

Theses

- 2 Deep reinforcement learning agents for industrial control system design
Nathan Lawrence
 The University of British Columbia 2023
- 1 Convex and nonconvex optimization techniques for the constrained Fermat-Torricelli problem
Nathan Lawrence
 Portland State University 2016

Honors & Awards

- 2022 **Graduate Research Award – Applied mathematics**
 Doctoral; UBC mathematics departmental award
- 2022 **FIPSE Graduate Student Participation Award**
 1 of 5 graduate students invited to attend Future Innovations in Process Systems Engineering in Crete, Greece

- 2020–2023 **Alexander Graham Bell Canada Graduate Scholarship**
 Doctoral; National scholarship awarded by NSERC; Ranked **5th of 107** in Mathematical Sciences [Interview]
- 2020–2023 **Four Year Doctoral Fellowship**
 Doctoral; UBC scholarship
- 2017 **F.S. Cater Prize**
 Master's; Departmental scholarship at PSU

Talks

Invited

- 2024 “A reinforcement learning perspective on industrial model predictive control”
 Upper Bound, Edmonton
- 2023 “Deep reinforcement learning agents for industrial control”
 Math department colloquium, UBC
- 2021 “How to make a professional website”
 Workshop fascilitator, Institute of Applied Mathematics, UBC

Organizer

- 2025 “Learning Interpretable Control Policies: Unifying Reinforcement Learning, Differentiable Programming and Bayesian Optimization”
 Tutorial session, ACC, Denver, CO (forthcoming)
- 2022 “Making reinforcement learning a practical technology for industrial control”
 Workshop organizer, AdCONIP, Vancouver, BC

Conference (recent)

- 2025 “Local-global interface of reinforcement learning and model predictive control”
 NorCal Control Workshop, UC Davis
- 2024 “Stability-by-design for industrial reinforcement learning”
 TrustML Workshop, UBC
- 2023 “A modular framework for stabilizing deep reinforcement learning control”
 SIAM PNW biennial meeting, Western Washington University, Bellingham, WA
- 2023 “A modular framework for stabilizing deep reinforcement learning control”
 IFAC World Congress, Yokohama, Japan

Teaching

Instructor of Record

Intermediate algebra	Winter 2018
Introductory College Mathematics II	Fall 2016, Winter 2017
Calculus II	Summer 2017, Spring 2018
Calculus III	Spring 2017, Fall 2017

Mentor

UBC:	
Daniel McClement	M.Sc. 2020-2022
Kenechukwu Ene	B.Sc. 2022

Leo Wei, James Penfold, Aniket Chakraborty, Farbod Chamanian B.Sc. 2020

Related Experience

2018-2019 Teaching Assistant, Department of Mathematics, UBC
2018-2019 Mathematics tutor, The Math Learning Centre, UBC
2014-2016 Mathematics tutor, The Learning Center, PSU

Research Experience

2018-2023 **Graduate Research Assistant**, UBC, with Philip Loewen, Bhushan Gopaluni
Deep reinforcement learning, industrial process control
R&D with Honeywell Process Solutions
2018 **Research Assistant**, PSU, with Gerardo Lafferriere
Urban traffic simulation, networked control systems
2017-2018 **Research Assistant**, PSU, with Dacian Daescu
Low-dimensional characterization of human faces from gappy data
2015-2016 **Research Assistant**, PSU, with Mau Nam Nguyen
Convex analysis and optimization

Professional Activities

Reviewing: Automatica, Computers & Chemical Engineering, Scientific Reports, Control Engineering Practice, IEEE, IFAC
Member: Society for Industrial and Applied Mathematics (SIAM)
2020-2021 Organizer: DAIS research lab
2017-2018 Vice-president: SIAM, PSU Chapter

Skills

Programming: Python, Julia
Frameworks: PyTorch, TensorFlow, Stable-Baselines3, Spinning Up, Pandas, SciPy, Flux.jl, ReinforcementLearning.jl
Tools: Matlab, git, LaTeX

References

Ali Mesbah	☎ — ✉ mesbah@berkeley.edu
Philip Loewen	☎ — ✉ loew@math.ubc.ca
Bhushan Gopaluni	☎ — ✉ bhushan.gopaluni@ubc.ca
Michael Forbes	☎ — ✉ Michael.Forbes@Honeywell.com