Luke Bhan

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RESEARCH

Machine Learning, Neural Operators, Learning-based Control

CURRENT EDUCATION

University of California San Diego, La Jolla, California — Sept 2022 - Present
Ph.D. Student, Department of Electrical and Computer Engineering
Advisors: Yuanyuan Shi, Miroslav Krstic

PREVIOUS EDUCATION

Vanderbilt University, Nashville, TN — Sept 2020 - May 2022
Masters of Science, Department of Computer Science
Advisor: Guatam Biswas
Thesis: Deep Reinforcement Learning for Adaptive Control in Robotics

Vanderbilt University, Nashville, TN — Sept 2018 - May 2020
Bachelors of Science, Department of Computer Science and Department of Physics and Astronomy
Advisors: Guatam Biswas and Kálmán Varga

HONORS AND AWARDS

Commitment to Diversity Award, University of California, San Diego, Department of Electrical and Computer Engineering (10k funding)

Underwood Memorial Award, Vanderbilt University, Department of Physics and Astronomy, (Outstanding graduating senior in physics)

Best Undergraduate Paper Award, Vanderbilt University, Department of Physics and Astronomy, (For the work [J1] below)

GRANTS AND FELLOWSHIPS

Computational Science Graduate Fellowship, Department of Energy, USA (4 year Ph.D. funding, 400k)

Ph.D. Fellowship, University of California, San Diego, Department of Electrical and Computer Engineering (66k funding)

JOURNAL PUBLICATIONS

[J8] Maxence Lamarque, Luke Bhan, Yuanyuan Shi, Miroslav Krstic. "Adaptive Neural-Operator Backstepping Control of a Benchmark Hyperbolic PDE." *To appear, Automatica.*

[J7] Maxence Lamarque, Luke Bhan, Rafael Vazquez, Miroslav Krstic. "Gain Scheduling with a Neural Operator for a Transport PDE with Nonlinear Recirculation." *To appear, IEEE Transactions on Automatic Control.*

[J6] Luke Bhan, Yuanyuan Shi, Miroslav Krstic. "Adaptive control of reaction–diffusion PDEs via neural operator-approximated gain kernels." *System & Control Letters*, Volume 195. 2024.

[J5] Miroslav Krstic, Luke Bhan, Yuanyuan Shi. "Neural operators of backstepping controller and observer gain functions for reaction–diffusion PDEs." *Automatica*, Volume 164. 2024.

[J4] Luke Bhan, Yuanyuan Shi, Miroslav Krstic. "Neural operators for bypassing gain and control computations in PDE backstepping." *IEEE Transactions on Automatic Control*, Volume 69. 2023.

[J3] Luke Bhan, Cody L Covington, Kálmán Varga. "Laser-Driven Petahertz Electron Ratchet Nanobubbles." *Nano Letters*, Volume 22. 2022.

[J2] Luke Bhan, Cody L Covington, Kálmán Varga. "Signatures of atomic structure in subfemtosecond laser-driven electron dynamics in nanogaps." *Physical Review B*, Volume 105. 2022.

[J1] Luke Bhan, Cody L Covington, Jason Rivas, Kálmán Varga. "Simulation of photo-electron spectrum and electron scattering by dual time propagation." *The Journal of Chemical Physics*, Volume 154. 2021.

CONFERENCE PUBLICATIONS

[C10] Luke Bhan*, Peijia Qin*, Miroslav Krstic, Yuanyuan Shi. "Neural Operators for Predictor Feedback Control of Nonlinear Delay Systems." In Proceedings of *Learning for Dynamics and Control* (L4DC), 2025.

[C9] Sharath Matada, Luke Bhan*, Yuanyuan Shi, Nikolay Atanasov. "Generalizable Motion Planning via Operator Learning." In Proceedings of *International Conference on Learning Representations* (ICLR), 2025.

[C8] Luke Bhan*, Yuexin Bian*, Miroslav Krstic, Yuanyuan Shi. "PDE Control Gym: A Benchmark for Data-Driven Boundary Control of Partial Differential Equations." In Proceedings of *Learning for Dynamics and Control* (L4DC), 2024.

[C7] Luke Bhan, Yuanyuan Shi, Iasson Karafyllis, Miroslav Krstic, James B Rawlings. "Moving-Horizon Estimators for Hyperbolic and Parabolic PDEs in 1-D." In Proceedings of *American Control Conference* (ACC), 2024.

[C6] Luke Bhan, Yuanyaun Shi, Miroslav Krstic. "Neural Operators for Hyperbolic PDE Backstepping Feedback Laws." In Proceedings of *IEEE Conference on Decision and Control* (CDC), 2023.

[C5] Luke Bhan, Yuanyaun Shi, Miroslav Krstic. "Neural Operators for Hyperbolic PDE Backstepping Kernels." In Proceedings of *IEEE Conference on Decision and Control* (CDC), 2023.

[C4] Luke Bhan, Yuanyaun Shi, Miroslav Krstic. "Operator learning for nonlinear adaptive control." In Proceedings of *Learning for Dynamics and Control* (L4DC), 2023.

[C3] Luke Bhan, Marcos Quinones-Grueiro, Gautam Biswas. "Concurrent policy blending and system identification for generalized assistive control." In Proceedings of *International Conference on Robotics and Automation* (ICRA), 2022.

[C2] Luke Bhan, Marcos Quinones-Grueiro, Gautam Biswas. "Fault tolerant control combining reinforcement learning and model-based control." In Proceedings of *International Conference on Control and Fault-Tolerant Systems* (SysTol), 2021.

[C1] Adam Stager, Luke Bhan, Andreas Malikopoulos, Liuhui Zhao. "A Scaled Smart City for Experimental Validation of Connected and Automated

Vehicles." In Proceedings of *IFAC Symposium on Control in Transportation Systems* (CTS), 2018.

INTERNSHIPS

Software Engineering Intern, *Mongo DB* — June 2021 - Aug 2021
Created the compression algorithm for MongoDB time-series database.

Machine Learning Intern, *T-Mobile* — June 2021 - Aug 2021
Created an internal analytics API for visualizing network loads to proactively identify and combat downtime.

TEACHING

Co-Instructor Physics Informed Machine Learning, University of California San Diego. — Spring 2025

- Taught 4 Lectures on Neural ODEs, Neural Operators, and Physics Informed Neural Networks (PINNs).
- Created and developed custom homework from scratch exploring augmented neural ODEs, FNOs, and PINNs.

Teaching Assistant *Numerical Analysis*, Vanderbilt University Mathematics Department — Fall 2021

Teaching Assistant *Introduction to Probability and Statistics* , Vanderbilt University Mathematics Department — Fall 2021

Teaching Assistant, *Intermediate Software Design* Vanderbilt University Computer Science Department — Fall 2020 - Fall 2021

INVITED TALKS

Seminar Presentations

Fed-NeMO Seminar, Yale University, (Hosted by Prof. Lu Lu)	Oct. 2024
Seminar, International Institute of Computer Science, UC Berkeley (Michael Mahoney's Group)	June 2024
Seminar, Hong Kong University of Science and Technology (Huan Yu's Group)	March 2024
Internal Control Seminar, University of California, San Diego (Hosted by Yang Zheng)	April. 2023

Conference Presentations

Paper presentation, American Control Conference (ACC)	July 2024
Paper presentation, IEEE Conference on Decision and Control (CDC)	Dec. 2024
Poster Presentation, Learning for Dynamics and Control (L4DC)	June 2023
Paper Presentation, International Conference on Robotics and Automation (ICRA)	June 2022
Paper Presentation, International Conference on Control and Fault-Tolerant Systems (SyStol)	Feb. 2022

ACADEMIC SERVICE

Journal Reviewer
Automatica (2023, 2024, 2025)
IEEE Transactions on Automatic Control (2023, 2024)
Systems & Control Letters (2024)
International Journal of Robust and Nonlinear Control (2024, 2025)
IEEE Control Systems Letters (2025)

Conference Reviewer
IEEE Conference on Decision and Control (CDC), (2023, 2024, 2025)
American Control Conference (ACC), (2024, 2025)
Learning for Dynamics and Control (L4DC), (2022, 2023)
Association for the Advancement of Artificial Intelligence Conference (AAAI),

(2023)
International Conference on Learning Representations (ICLR), (2023, 2025)