Omkar Sudhir Patil

omkarpatil64328@gmail.com omkar-patil-024 omkarsudhirpatil.com patilomkarsudhir

Google Scholar

Education

University of Florida *Aug 2019 to May 2023*
PhD in Mechanical Engineering
- **Advisor:** Dr. Warren Dixon, **Dissertation:** Implicit and Deep Learning-Based Control Methods for Uncertain Nonlinear Systems

University of Florida *Aug 2019 to Aug 2022*
MS in Mechanical Engineering

Indian Institute of Technology Delhi *Jul 2014 to Aug 2018*
B.Tech in Production and Industrial Engineering

Experience

Assistant Professor *Aug 2026 to present*
Louisiana State University

Research Scientist *Oct 2025 to Aug 2026*
University of Florida

Postdoctoral Research Associate *May 2023 to Oct 2025*
University of Florida

Graduate Research Assistant *Aug 2019 to May 2023*
University of Florida

Project Associate *May 2018 to Apr 2019*
Indian Institute of Technology Delhi

Proposal Writing Experience

1. "Feedback-based Deep Learning for Uncertain Dynamical Systems," *US Air Force Research Laboratory* (Funded, $428,377), PI: Warren Dixon.
2. "Designing Integrated, Generic, and Interoperable Compositional Analyses of Modern Systems (DIGICAMS)," *US Air Force Office of Scientific Research Center of Excellence* (Funded, $5,750,000), PIs: James Fairbanks, Warren Dixon, Matthew Hale, Miroslav Pajic, David Spivak.
3. "Analysis-Derived Adaptation for Continuous Deep Learning in Autonomous Systems," *Vannevar Bush Faculty Fellowship, Department of Defense*, PI: Warren Dixon.
4. "Real-Time Deep Learning for Nonlinear Adaptive Control," *Energy, Power, Control, and Networks (EPCN) Program, National Science Foundation*, PIs: Yu Wang, Warren Dixon.

Mentorship

PhD Students: Emily Griffis, Wanjiku Makumi, Hannah Sweatland, Cristian Nino, Rebecca Hart, Saiedeh Akbari, Brandon Fallin, Wenyu Wu, Xuehui Shen
Undergraduate Students: Marla Eisman, Cameron Lott

Publications

Books

[1] **O. Patil**, E. Griffis, and W. E. Dixon, *Lyapunov-Based Deep Learning for Autonomy*. In development with Springer (anticipated completion May 2026).

Journal Papers

[2] **O. Patil**, R. Sun, S. Bhasin, and W. E. Dixon, "Adaptive control of time-varying parameter systems with asymptotic tracking," *IEEE Trans. Autom. Control*, vol. 67, no. 9, pp. 4809–4815, 2022.

[3] **O. Patil**, D. Le, M. Greene, and W. E. Dixon, "Lyapunov-derived control and adaptive update laws for inner and outer layer weights of a deep neural network," *IEEE Control Syst Lett.*, vol. 6, pp. 1855–1860, 2022.

[4] **O. Patil**, A. Isaly, B. Xian, and W. E. Dixon, "Exponential stability with RISE controllers," *IEEE Control Syst. Lett.*, vol. 6, pp. 1592–1597, 2022.

[5] **O. Patil**, R. Kamalapurkar, and W. Dixon, "A saturated RISE controller with exponential stability guarantees," *IEEE Trans. Autom. Control*, 2025.

[6] **O. Patil**, D. Le, E. Griffis, and W. Dixon, "Lyapunov-based deep residual neural network (ResNet) adaptive control," *IEEE Access*, 2025.

[7] **O. Patil**, B. C. Fallin, C. F. Nino, R. G. Hart, and W. E. Dixon, "Bounds on deep neural network partial derivatives with respect to parameters," *arXiv preprint arXiv:2503.21007*, 2025.

[8] A. Isaly, **O. Patil**, H. Sweatland, R. Sanfelice, and W. E. Dixon, "Adaptive safety with a RISE-based disturbance observer," *IEEE Trans. Autom. Control*, vol. 69, no. 7, pp. 4883–4890, 2024.

[9] E. Griffis, **O. Patil**, Z. Bell, and W. Dixon, "Lyapunov-based long short-term memory (Lb-LSTM) neural network-based control," *IEEE Control Syst. Lett.*, vol. 7, pp. 2976–2981, 2023.

[10] C. Nino, **O. Patil**, and W. Dixon, "Second-order heterogeneous multi-agent target tracking without relative velocities," *IEEE Control Systems Letters*, vol. 7, pp. 3663–3668, 2023.

[11] E. Griffis, **O. Patil**, R. Hart, and W. Dixon, "Lyapunov-based long short-term memory (Lb-LSTM) neural network-based adaptive observer," *IEEE Control Syst. Lett.*, vol. 8, pp. 97–102, 2024.

[12] R. Hart, E. Griffis, **O. Patil**, and W. Dixon, "Lyapunov-based physics-informed long short-term memory (LSTM) neural network-based adaptive control," *IEEE Control Syst. Lett.*, vol. 8, pp. 13–18, 2024.

[13] D. Le, **O. Patil**, C. Nino, and W. E. Dixon, "Accelerated gradient approach for deep neural network-based adaptive control of unknown nonlinear systems," *IEEE Trans. Neural Netw. Learn. Syst.*, 2025.

[14] C. F. Nino, **O. Patil**, C. D. Petersen, S. Phillips, and W. E. Dixon, "Collaborative spacecraft servicing under partial feedback using Lyapunov-based deep neural networks," *The Journal of the Astronautical Sciences*, 2025.

[15] C. Nino, **O. Patil**, J. Insinger, M. Eisman, and W. E. Dixon, "Online resnet-based adaptive control for nonlinear target tracking," *IEEE Control Syst. Lett.*, 2025.

[16] C. Nino, **O. Patil**, S. Edwards, and W. E. Dixon, "Distributed RISE-based control for exponential heterogeneous multi-agent target tracking of second-order nonlinear systems," *IEEE Control Syst. Lett.*, 2025.

[17] W. Makumi, **O. Patil**, and W. Dixon, "Lyapunov-based adaptive deep learning for approximate dynamic programming," *Automatica*, vol. 180, p. 112 462, 2025.

[18] E. Griffis, **O. Patil**, W. Makumi, and W. Dixon, "Adaptive output feedback control using lyapunov-based deep recurrent neural networks (Lb-DRNNs)," *IEEE Trans. Autom. Control*, 2025.

[19] R. Hart, **O. Patil**, Z. Bell, and W. Dixon, "Concurrent learning for system identification and control using lyapunov-based deep neural networks," *IEEE Control Syst. Lett.*, vol. 9, pp. 2957–2962, 2025.

Conference Papers

[20] **O. Patil**, D. M. Le, E. Griffis, and W. E. Dixon, "Deep residual neural network (ResNet)-based adaptive control: A Lyapunov-based approach," in *Proc. IEEE Conf. Decis. Control*, 2022.

[21] **O. Patil**, K. Stubbs, P. Amy, and W. E. Dixon, "Exponential stability with RISE controllers for uncertain nonlinear systems with unknown time-varying state delays," in *Proc. IEEE Conf. Decis. Control*, 2022.

[22] **O. Patil** and S. Bhasin, "Lyapunov based hierarchical trajectory control of an autonomous ground vehicle subjected to slip," in *IFAC World Congr.*, 2020.

[23] D. M. Le, **O. Patil**, C. Nino, and W. E. Dixon, "Accelerated gradient approach for neural network-based adaptive control of nonlinear systems," in *Proc. IEEE Conf. Decis. Control*, 2022.

[24] D. M. Le, **O. Patil**, P. Amy, and W. E. Dixon, "Integral concurrent learning-based accelerated gradient adaptive control of uncertain Euler-Lagrange systems," in *Proc. Am. Control Conf.*, Jun. 2022.

[25] A. Isaly, **O. Patil**, R. Sanfelice, and W. E. Dixon, "Adaptive safety with multiple barrier functions using integral concurrent learning," in *Proc. Am. Control Conf.*, 2021, pp. 3719–3724.

[26] R. Dasgupta, S. B. Roy, **O. Patil**, and S. Bhasin, "A singularity-free hierarchical nonlinear quad-rotorcraft control using saturation and barrier Lyapunov function," in *Proc. Am. Control Conf.*, 2019.

[27] E. Griffis, **O. Patil**, W. Makumi, and W. E. Dixon, "Deep recurrent neural network-based observer for uncertain nonlinear systems," in *IFAC World Congr.*, 2023.

[28] R. Hart, **O. Patil**, E. Griffis, and W. E. Dixon, "Lyapunov-based deep physics-informed neural network-based adaptive control," in *Proc. IEEE Conf. Decis. Control*, 2023.

[29] C. Nino, **O. Patil**, J. Philor, Z. Bell, and W. Dixon, "Deep adaptive indirect herding of multiple target agents with unknown interaction dynamics," in *Proc. IEEE Conf. Decis. Control*, 2023.

[30] C. F. Nino, **O. Patil**, S. C. Edwards, Z. I. Bell, and W. E. Dixon, "Distributed target tracking under partial feedback using Lyapunov-based deep neural networks," in *Proc. Am. Control Conf.*, 2025.

[31] C. F. Nino, **O. Patil**, C. D. Petersen, S. Phillips, and W. E. Dixon, "Collaborative spacecraft servicing under partial feedback using Lyapunov-based deep neural networks," in *Proc. AAS/AIAA Sp. Flight Mech. Meet.*, 2025.

[32] W. Wu, **O. Patil**, H. Sweatland, and W. Dixon, "Control contraction metric-based deep neural network adaptive control," in *Proc. IEEE Conf. Decis. Control*, 2025.

[33] S. Kolhe, **O. Patil**, J. Fu, and W. Dixon, "Integral concurrent learning control barrier functions for signal temporal logic tasks under unknown dynamics," in *Proc. IEEE Conf. Decis. Control*, 2025.

Under Review

[34] **O. Patil**, E. Griffis, W. Makumi, and W. E. Dixon, "Simultaneous online system identification and control using composite adaptive Lyapunov-based deep neural networks," *IEEE Trans. Autom. Control*, 2025, under review, Preprint: https://arxiv.org/abs/2311.13056.

[35] H. Sweatland, **O. Patil**, and W. Dixon, "Adaptive deep neural network-based control barrier functions," *IEEE Trans. Autom. Control*, under review, Preprint: https://arxiv.org/abs/2406.14430.

[36] S. Akbari, E. J. Griffis, **O. Patil**, and W. E. Dixon, "Lyapunov-based dropout deep neural network (Lb-DDNN) controller," *Automatica*, under review, Preprint: https://arxiv.org/abs/2310.19938.

[37] B. Fallin, C. Nino, **O. Patil**, and W. Dixon, "Lyapunov-based graph neural networks for adaptive control of multi-agent systems," *IEEE Trans. Autom. Control*, under review, Preprint: https://arxiv.org/abs/2503.15360.

[38] S. Akbari, C. Nino, **O. Patil**, and W. Dixon, "Lyapunov-based deep neural networks for adaptive control of stochastic nonlinear systems," *IEEE Trans. Autom. Control*, under review, Preprint: https://arxiv.org/abs/2412.21095.

[39] R. Hart, **O. Patil**, Z. Bell, and W. Dixon, "Lyapunov-based concurrent learning for dnn parameter identifiability without persistent excitation," *IEEE Trans. Autom. Control*, under review, Preprint: https://arxiv.org/abs/2505.10678.

[40] S. Akbari, **O. Patil**, and W. Dixon, "LyLA-therm: Lyapunov-based Langevin adaptive thermodynamic neural network controller," *IEEE Trans. Autom. Control*, under review, Preprint: https://arxiv.org/abs/2508.14989.

[41] Y. Wang, **O. Patil**, and W. Dixon, "Riemannian lyapunov optimizer: A unified framework for optimization," *Proceedings of the International Conference on Machine Learning (ICML)*, under review, Preprint: https://arxiv.org/abs/2601.22284.

Awards

- **Graduate Student Research Award**, 2023, for outstanding research as a graduate student in the Department of Mechanical and Aerospace Engineering, University of Florida
- **BOSS Award**, 2018, for the best hardcore experimental project in Mechanical Engineering discipline, IIT Delhi

Invited Talks

- "Lyapunov-based deep learning for safe and reliable autonomy," *Indian Institute of Technology Bombay*, Feb. 2026
- "Lyapunov-based deep learning for safe and reliable autonomy," *University at Buffalo*, Feb. 2026
- "Lyapunov-based deep learning for safe and reliable autonomy," *Indian Institute of Science (IISc) Bangalore*, Jan. 2026
- "Lyapunov-based deep learning for safe and reliable autonomy," *Louisiana State University*, Jan. 2026
- "Lyapunov-based deep learning for safe and reliable autonomy," *Research Scientist Seminar, University of Florida*, Sep. 2025
- "Lyapunov-based deep learning for safe and reliable autonomy," *Graduate Fluids Seminar, University of Florida*, Oct. 2025
- "Simultaneous System Identification and Control using Composite Adaptive LbDNNs," *AFOSR Program Review, Air Force Office of Scientific Research, Washington DC*, April 2025
- "Composite Adaptive Lyapunov-based Deep Neural Network Control," *AFOSR COE Program Review, Duke University*, Dec. 2023
- "Deep Residual Neural Network (ResNet)-based Adaptive Control: A Lyapunov-based Approach," *AFOSR COE Program Review, University of Florida*, April 2023
- "Lyapunov-derived control and adaptive update laws for inner and outer layer weights of a deep neural network," *Resilient and Autonomous Systems Lab (RASLab), Florida State University*, Dec. 2021
- "Lyapunov-derived control and adaptive update laws for inner and outer layer weights of a deep neural network," *Air Force Office of Scientific Research (AFOSR) Center of Excellence Program Review, Duke University*, Oct. 2021

Teaching Experience

- Teaching Assistant, Vibrations (EML4220), University of Florida, Spring 2020
- Developer of Interactive Research Demonstrations, including web-based tutorials on Lyapunov-based deep neural networks, control barrier functions, physics-informed neural networks, and SLAM algorithms (available at omkarsudhirpatil.com)

Technical Skills

Machine Learning & Deep Learning: PyTorch, TensorFlow, JAX, Hugging Face Transformers, LLM fine-tuning, Physics-Informed Neural Networks (PINNs), neural network training and optimization
High-Performance Computing: CUDA, GPU programming, distributed training, cluster computing (SLURM), parallel computing, multi-node training
Programming Languages: Python, MATLAB, C/C++, Julia, JavaScript
Scientific Computing: NumPy, SciPy, scikit-learn, control systems libraries, optimization frameworks
Web Development & Visualization: JavaScript, D3.js, Three.js, HTML/CSS, interactive educational tools, scientific visualization
Development Tools: Git, Docker, Jupyter, VS Code, LaTeX, continuous integration

Peer Review Service

Journals: Nature Communications, IEEE Transactions on Automatic Control, Automatica, IEEE Control Systems Letters, IEEE Transactions on Control Systems Technology, IEEE Transactions on Signal Processing, IEEE/ASME Transactions on Mechatronics, IEEE Transactions on Neural Networks and Learning Systems, International Journal of Adaptive Control and Signal Processing

Conferences: Advances on Neural Information Processing Systems (NeurIPS), International Conference on Learning and Representations (ICLR), International Conference on Machine Learning (ICML), AAAI Conference on Artificial Intelligence (AAAI), IEEE Conference on Decision and Control, American Control Conference, IFAC World Congress