
Electrical & Computer Engineering
S E M I N A R
Louisiana State University

**Lyapunov-Based Deep Learning
for Safe and Reliable Autonomy**

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Abstract—Modern autonomous systems increasingly rely on deep learning for perception, prediction, and control, yet ensuring their safety and reliability remains a fundamental challenge. This talk presents a principled framework that integrates Lyapunov stability theory with deep neural networks to endow learning and control with energy-like structure and guarantees of convergence, robustness, and safety. By shaping the adaptation dynamics through a Lyapunov function, analogous to enforcing dissipation in physical systems, the network’s evolution obeys stability and passivity principles rather than arbitrary gradient updates. This energy-consistent view unifies deep learning and adaptive control, yielding reliable, structure-preserving autonomy that remains stable under uncertainty.

Bio—Dr. Omkar Sudhir Patil is a Research Scientist at the University of Florida specializing in advanced control, robotics, and AI-driven learning methods. His research bridges Lyapunov-based adaptive control, machine learning, and nonlinear dynamics to enable robust, real-time autonomy in uncertain systems. He has pioneered extensions of Lyapunov theory to deep neural networks, contributing new methods for stability, safety, and online learning in complex robotic environments.

When: Wednesday, 28 January 2026, 10:45 - 11:45
Where: Room 3316E Patrick F. Taylor Hall
Info: <https://www.lsu.edu/eng/ece/seminar>

