Nam Tran Nguyen

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Summary

I am a Ph.D. researcher working across control theory, machine learning, and robotics, focused on uncertainty-aware modeling and control for physical systems. Experienced designing, validating, and publishing methods for autonomous vechicles, aerial robots, and manipulators.

Education

University of Central Florida	Ph.D. in Electrical Engineering, GPA: 4.0/4.0	*2025 – Now*
Northern Arizona University	M.S. in Electrical Engineering, GPA: 4.0/4.0	*2024 – 2025*
Hanoi Univ. of Science & Technology	B.S. in Automation & Control Eng., GPA: 3.66/4.0	*2019 – 2023*

Experience

Graduate Research Assistant - *University of Central Florida* Florida, USA

Uncertainty-Aware Physics-Informed Machine Learning for Robotic Control *05/2026 – Now*

- Targeting unreliable predictions of **hybrid physics-informed ML** models for robots in uncertain environments, where the learned part is better in-distribution and the physics part is better **out-of-distribution**.
- Developed an add-on **uncertainty quantification** module for a pre-trained hybrid model that estimates its epistemic uncertainty and uses it to set how much physics and learning each contribute to the prediction.
- Outperformed four baselines in **model predictive control** of a racing car, quadrotor, and Franka manipulator, cutting quadrotor position error **21%** (no disturbance) and **13%** (high noise) versus the hybrid baseline.

Online System Modeling and Adaptive Control for Autonomous Racing *10/2025 – 05/2026*

- Addressed real-time **trajectory tracking** under unknown, time-varying road-surface conditions, where fixed-model controllers lose accuracy and the **sim-to-real** gap degrades driving performance.
- Proposed an **online system modeling** method for tire-road interaction that jointly estimates vehicle states and tire parameters in real time, adapting the model to changing road surfaces.
- Designed a **differentiable MPC** on a physics-informed vehicle model that optimizes the controller's cost weights, plus a learned approximation of its solutions for weight tuning.
- Validated in a full-size race-car simulator with nonlinear and linearized solvers under hard real-time constraints, reaching **15% faster** lap times than standard MPC.

Data-Efficient System Identification for Dynamical Systems *05/2025 – 10/2025*

- Investigated **optimal experiment design** for identifying dynamical systems under operational constraints, selecting the most informative samples through online **uncertainty quantification** to cut data needs.
- Benchmarked **14** active-learning strategies across neural and probabilistic models on a high-fidelity building simulator, reducing RMSE by up to **54%** versus passive random sampling.

Graduate Research Assistant - *Northern Arizona University* Arizona, USA

Learning-Based System Modeling for Dynamical Systems *01/2024 – 05/2025*

- Compared physics-informed, physics-agnostic, and grey-box surrogate models on real-world time series from building systems, analyzing multi-step prediction error and the failure modes of each approach.
- Introduced a **physics-constrained** network for multi-step prediction with **25% higher** accuracy than standard ML; monotonicity and boundedness constraints on another model gave **50% higher** accuracy than vanilla ML.

Embedded Learning-Based Control on Microcontroller Hardware *01/2024 – 05/2025*

- Integrated a physics-informed surrogate into a learning-based **MPC** controller for a **MIMO** system.
- Deployed the controller on **Arduino** hardware, **wiring sensors and actuators** into a closed loop and holding steady-state error below **2%** under disturbances.

Real-Time Vision on NVIDIA Edge Hardware *01/2024 – 05/2024*

- Implemented real-time face-recognition pipelines with deep-learning object detectors and deployed them on **NVIDIA Jetson** edge hardware, reaching real-time inference from an **RGB-D** camera.

Undergraduate Research Assistant - *Hanoi University of Science and Technology* Hanoi, Vietnam

Traction Control for Autonomous Electric Vehicles *07/2022 – 10/2023*

- Engineered **fuzzy-based** traction-control algorithms for EV acceleration to curb excessive wheel slip and improve drivetrain efficiency and safety.
- Verified closed-loop controllers in a **hardware-in-the-loop** environment using **dSPACE** and TI microcontrollers, cutting wheel slip ratio by **23%** during acceleration.

Technical Skills

- **Estimation & Modeling**: MHE, EKF/UKF, Particle Filters, System Identification, Physics-Informed ML
- **Control & Learning**: Model Predictive Control, Reinforcement Learning, Uncertainty Quantification
- **Programming**: Python (PyTorch, JAX, CasADi, NumPy, SciPy), C/C++, MATLAB/Simulink, ROS2
- **Tools & Simulation**: MuJoCo, F1TENTH-Gym, IPOPT/OSQP, Linux, Git, Docker, HPC
- **Hardware**: NVIDIA Jetson, Raspberry Pi, Arduino Uno, dSPACE R&D Board, TI Microcontrollers

Publications

- **Nam T. Nguyen**, Binh Nguyen, Ahmad Amine, et al., "AD-MPCC: Adaptive Differentiable Model Predictive Contouring Control for Autonomous Racing Car," 2026. (Accepted to IROS 2026) Link: arxiv.org/abs/2607.00141
- **Nam T. Nguyen**, J. C. Tique, and Truong X. Nghiem, "Physics-Constrained Taylor Neural Networks for Learning and Control of Dynamical Systems," *2025 American Control Conference*, Denver, Colorado, USA.
- Binh Nguyen, **Nam T. Nguyen**, and Truong X. Nghiem, "Structure- and Stability-Preserving Learning of Port-Hamiltonian Systems," 2026. (Accepted to CDC 2026) Link: arxiv.org/abs/2604.13297
- **Nam T. Nguyen**, Truong X. Nghiem, Minh N. Vu, "EPIC-PIML: Epistemic-Constructed Physics-Informed Machine Learning." (Submitted to ICLR 2027)
- **Nam T. Nguyen**, Binh Nguyen, and Truong X. Nghiem, "Physics-Informed Data-Driven Modeling of HVAC Systems: A Systematic Analysis," *IEEE Access*, 2026.
- **Nam T. Nguyen** and Truong X. Nghiem, "Active Learning for Optimal Experimental Design in Machine Learning-Based Building Energy System Identification," 2026. (Submitted to Energy and Buildings)
- **Nam T. Nguyen**, Minh C. Ta, Thanh Vo-Duy, and Valentin Ivanov, "Enhanced Fuzzy-MFC-based Traction Control System for Electric Vehicles," *IEEE Vehicular Power and Propulsion Conference 2023*, Milan, Italy.

Awards

- Member of Tau Beta Pi Engineering Honor Society, Florida Delta Chapter (UCF), 2026
- UCF College of Graduate Studies Presentation Fellowship 2026
- Travel Award, American Control Conference (ACC), 2025
- Support for Graduate Students (SGS) Summer Research Award, Northern Arizona University, 2024
- LG Display Scholarship for Outstanding Students, 2022
- Excellent Study Scholarship (Top 1% of students), Hanoi University of Science and Technology, 2020, 2021, 2023
- Best Presentation Award, Student Forums on Sustainable Energy (2021) and Frontiers in Sustainability (2023)

Leadership

- Founder and host of the Research Talk series for Vietnamese engineering researchers around the world with 6,600 subscribers and 30,000 watch time hours: @NamNguyen.ee2.
- Leader of Vietnamese international student community at the University of Central Florida, USA.