

# KHAI NGUYEN

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## EDUCATION

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**Carnegie Mellon University**, Pittsburgh, PA, US

May 2024

*Master of Science in Mechanical Engineering – Research Program*

- GPA: 4.0/4.0; Vingroup Scholar

**ETH Zürich**, Zürich, Switzerland

Summer 2023

*Robotics Summer School and Robotics Student Fellowship Programs*

**Hanoi University of Science and Technology**, Hanoi, Vietnam

Oct 2021

*Bachelor of Science in Control Engineering and Automation – Talent Program*

- GPA: 3.85/4.0 (top 1% university)

## PUBLICATIONS

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\* denotes alphabetical authorship

- A. Alavilli\*, K. Nguyen\*, S. Schoedel\*, B. Plancher, Z. Manchester, “TinyMPC: Model-Predictive Control on Resource-Constrained Microcontrollers,” **in review**, *International Conference on Robotics and Automation (ICRA)*, 2024. [[arxiv](#)][[website](#)][[video](#)]
- K. Nguyen, V. T. Dang, D. D. Pham, and P. N. Dao, “Hierarchical Formation Control Scheme with Reinforcement Learning for Multi-Vessel Systems,” *International Journal of Robust and Nonlinear Control*, 2023. [[html](#)]
- P. N. Dao, D. D. Pham, K. Nguyen, and T. C. Nguyen, “Adaptive Reinforcement Learning Motion/Force Control of Multiple Uncertain Manipulators,” *Intelligent Systems and Networks*, 2021. [[html](#)][[video](#)]
- K. Nguyen, A. Le, T. D. Nguyen, and K. T. Nguyen, “Output DC Voltage Stabilizer and Efficiency Improvement in Wireless Power Transfer Systems,” *Measurement, Control, and Automation*, 2021. [[html](#)]

## HONORS AND AWARDS

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- **ETH Zürich Robotics Student Fellowship, 2023:** Awarded to 8 world-wide students for summer research.
- **ETH Zürich Robotics Summer School, 2023:** Awarded to 50 world-wide students for summer school.
- **Vingroup Scholarship, 2022**, by Vingroup: Full-ride scholarship for graduate studies.
- **Honda Scholarship, 2021**, by Honda Foundation: Awarded to 100 outstanding students nation-wide.
- **Top 15 Finalists of The Honda Young Engineer and Scientist’s Award, 2021**, by Honda Foundation.
- **CCU Virtual Internship Program, 2021**, by National Chung Cheng University, Taiwan.
- **University Academic Scholarship, 2018, 2019, 2020, 2021**, by HUST: Awarded to top 1% GPA students.
- **Global Project-Based Learning Program, 2020**, by Shibaura Institute of Technology, Japan.
- **Acecook Happy Scholarship 2020**, by Acecook Vietnam: Awarded to outstanding students.
- **Top 2 Best Oral Presentation Award**, at the Student Forum 2020 – Renewable Energy.
- **Best Poster Award**, at the 37th Student Research Conference, 2020, by HUST.

## RESEARCH AND WORK EXPERIENCE

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**Robotic Exploration Lab**, CMU, Pittsburgh, PA, US

Sep 2022 – Present

*Graduate Research Assistant, advised by Prof. Zachary Manchester*

- Investigating local planning and control frameworks for autonomous driving using MPC to ensure safe and efficient trajectory, while handling control limits and obstacles.
- Co-leading [TinyMPC](#), a high-speed MPC solver based on ADMM with low memory footprints, outperforming existing solvers and demonstrating real-world efficacy on nano-quadrators; collaborated with [Prof. Brian Plancher](#).
- Developing a novel differentiable MPC framework embedding implicit neural networks, enabling joint inference and input optimization for solving complex robotic problems.
- Exploring a new navigation stack from a learned library of perceptive low-level skills for agile quadruped robots.

**Robotic Systems Lab, ETH Zürich, Zürich, Switzerland**

Jul 2023 – Aug 2023

Research Assistant, advised by [Dr. Jesus Tordesillas](#) and [Prof. Marco Hutter](#)

- Proposed a framework to enforce hard convex constraints on neural networks through differentiable optimization.
- Employed the proposed framework to learn control barrier function-based safety filters with various constraints (linear, quadratic, and second-order cone); aiming to realize safe learning-enabled control on robotic systems.

**Advanced Control and Robotics Group, HUST, Hanoi, Vietnam**

Mar 2019 – Aug 2022

Research Assistant, advised by [Prof. Phuong Nam Dao](#)

- Explored motion/force robust controller for multiple mobile manipulators to accomplish cooperative tasks.
- Integrated control theory to boost the adaptability and robustness of reinforcement learning algorithms by 66%.
- Developed hierarchical formation control for multi-agent systems; scaled up and simulated with Matlab/Simulink.

**Viettel Aerospace Institute (VTX), Hanoi, Vietnam**

Aug 2020 – May 2022

Autopilot Engineer and Intern

Designed, built, and operated a prototype autopilot system for high-speed aerial vehicles with multiple teams.

- Investigated guidance and control; tuned attitude controller to reduce settling time and overshoot by 30% and 35%.
- Implemented controllers in embedded systems including STM32 ARM (C/C++) and Altera/Xilinx FPGA (VHDL).
- Authored one peer-reviewed article in the Institute Journal on modern control design for pneumatic actuators.

**Advanced Power Electronic System Lab, HUST, Hanoi, Vietnam**

Nov 2019 – Feb 2021

Research Assistant, advised by [Prof. Trung Kien Nguyen](#)

- Led a team to develop wireless power transfer, static and dynamic wireless charging systems for electric vehicles.
- Tested prototype wireless charging systems (66-80% efficiency); compared it with simulation (90% efficiency).
- Proposed Extended Kalman Filter to dynamically estimate vehicle states and parameters; achieved 90% accuracy.

## TALKS

- **TinyMPC: Model-Predictive Control on Resource-Constrained Microcontrollers** Nov 2023  
*Robotic Exploration Lab, CMU, Pittsburgh, PA, US.* [[slides](#)]
- **Enforcing Non-Fixed Hard Convex Constraints on Neural Networks and Its Applications** Aug 2023  
*Robotic Systems Lab, ETH Zürich, Zürich, Switzerland.* [[slides](#)]
- **Areas with More Motivation to Develop in the Pandemic** Nov 2021  
*AOTULE Student Conference (virtual), KAIST, Korea.* [[event](#)] [[slides](#)]

## TEACHING

- **Assistant, CMU 24-774 Advanced Control Systems Integration**, with [Prof. Mark Bedillion](#), graduate level, F2023.
- **Instructor, GSTT Initiative**: Taught advanced STEM subjects to students for the talent program exams, 2018.

## EXTRACURRICULARS

- **Member, Carnegie Autonomous Racing**: Co-led the F1TENTH team finishing at 4/12 in the CPS2023 race, 2023.
- **Member, MIT-PITT-RW**: Verified GPU-based MPPI controller on optimal planning and obstacle avoidance, 2023.
- **Organizer, European Union**: Organized European music concerts to promote cultural exchanges, Vietnam, 2019.
- **Interpreter, Plan International**: Visited remote areas to raise awareness of child rights and safety, Vietnam, 2019.

## SKILLS

- **Domains**: Optimization, Planning and Control, State Estimation, Dynamics, System ID, Machine Learning.
- **Programming**: C/C++, Python, Julia, Matlab, LaTeX.
- **Software**: Git, Simulink, Eigen, ROS 1/2, PyTorch, JAX, Drake, OCS2, MuJoCo, IsaacGym, Gazebo, CARLA, CoppeliaSim, Trello.
- **Robots**: Crazyflie, F1TENTH AVs, SuperMegaBot UGVs, Unitree Go1, ANYmal (sim), INDY AVs (sim).