KHAI NGUYEN

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EDUCATION

Carnegie Mellon University   **Pittsburgh, PA**
Master of Science in Mechanical Engineering - Research Program (Vingroup Scholar)   *May 2024*
- Current Courses: Engineering Optimization, Advanced Control Systems Integration, Advanced Robot Dynamics

Hanoi University of Science and Technology   **Hanoi, Vietnam**
Bachelor of Science in Control Engineering and Automation (GPA: 3.85/4.0)   *Oct 2021*

SKILLS

Programming:	Python, C/C++, MATLAB, Julia, LaTeX
Software & Tools:	VSCode, Linux, Git, Simulink, CoppeliaSim, CARLA, Trello
Knowledge:	Motion Planning and Control, State Estimation, System ID, Machine Learning, Lean Six Sigma

WORK EXPERIENCE

Viettel Aerospace Institute   **Hanoi, Vietnam**
Autopilot Engineer and Intern   *Aug 2020 - May 2022*
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 article on modern control design for pneumatic actuators using System ID Toolbox and PID Autotuner; achieved 98% modeling accuracy and improved 50% control performance.

RESEARCH EXPERIENCE

Robotic Exploration Lab   **Pittsburgh, PA**
Research Assistant (Advisor: Prof. Zachary Manchester)   *Sep 2022 - Present*
- Developing trajectory optimization and MPC frameworks based on 5D bicycle models of autonomous vehicles.
- Collaborating to build a 3D visualization model and improve an existing simulator in Julia language.

Advanced Control and Robotics Group   **Hanoi, Vietnam**
Research Assistant   *Mar 2019 - Aug 2022*
- Explored motion/force robust controller for multiple mobile manipulators to accomplish co-operative tasks.
- Integrated control theory to boost stability and robustness of reinforcement learning algorithms by 66%.
- Devised hierarchical formation control for multi-agent systems; scaled up and simulated with MATLAB/Simulink.

Advanced Power Electronic System Lab   **Hanoi, Vietnam**
Research Assistant   *Nov 2019 - Feb 2021*
- Led a team to develop wireless power transfer, static and dynamic wireless charging system for electric vehicles.
- Tested prototype wireless charging systems (66-80% efficiency); compared it with simulation (90% efficiency).
- Established Extended Kalman Filter to dynamically estimate vehicle states and parameters; reduced noises by 50%.

PROJECTS

Self-Driving Cars Project | *Python, CARLA*
- Applied longitudinal and lateral (Stanley, Pure Pursuit) tracking controller for vehicles; gained 99% accuracy.
- Formulated Error-State EKF for sensor fusion localization (IMU, GPS and LIDAR); examined sensor miscalibration and dead-reckoning effects; all reached 99% confidence.
- Implemented behavior planning (state machine), path generation (conformal lattice), collision avoidance, and optimal path selection; task scenarios 100% completed.

Modern Robotics Project | *MATLAB/Simulink, Python, CoppeliaSim*
- Solved inverse kinematics and forward dynamics of UR4/5 industrial robot; created a simulator and Matlab GUI.
- Generated trajectories using trapezoidal velocity profiles and designed PD controllers to attain 95% tracking accuracy.
- Performed motion planning using grid-based (A*, D* Lite) and randomized sample-based (RRT, PRM) searches.

Machine Learning Project | *Python, TensorFlow, Scikit-learn, Gym*
- Introduced new features into regularized logistic regression to predict QA passing probability; gained 82% accuracy.
- Applied K-means algorithm for image compression (6 times) and built content-based filtering recommender systems.
- Implemented Deep Q-Learning with Target Network, Experience Replay and soft update to train a safe lunar lander.