

# Shaohang Han

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## EDUCATION BACKGROUND

### Delft University of Technology

MSc. Robotics, Average: 8.5/10

Sep 2021 – Aug 2023

### Beihang University (Top 15 in China)

BSc. Mechanical Engineering, (Minor in Economics), Average: 90.5/100

Sep 2017 - Jun 2021

## Publications

[1] Luyao Zhang\*, **Shaohang Han\***, Sergio Grammatico, "An Efficient Game-Theoretic Planner for Automated Lane Merging with Multi-Modal Behavior Understanding", *IEEE International Conference on Intelligent Transportation Systems (ITSC)*, 2023, (\* indicates equal contribution)

[2] Desong Du\*, **Shaohang Han\***, Naiming Qi, Haitham Bou Ammar, Jun Wang, Wei Pan, "Reinforcement Learning for Safe Robot Control using Control Lyapunov Barrier Functions", *IEEE International Conference on Robotics and Automation (ICRA)*, 2023, (\* indicates equal contribution)

## RESEARCH EXPERIENCE

### Planning for Autonomous Vehicles in the Lane Merging Scenario (Master Thesis)

Oct 2022 - Aug 2023

Supervisor: Prof. Martijn Wisse

- Developed an efficient game-theoretic planner for interaction-aware behavior planning.
- Utilized MPC to generate contingency motion planning, considering the multi-modal behavior of the non-ego vehicle.
- Validated the complete planning stack in the CARLA simulator.

### Reinforcement Learning for Controllers with Safety Guarantee

Mar 2022 - Oct 2022

Supervisor: Prof. Wei Pan

- Proposed an actor-critic algorithm to learn a control Lyapunov barrier function and an optimal controller.
- Implemented the algorithm using the PyTorch framework and the PyBullet simulator.
- Validated the algorithm on a Husky mobile robot and a small-size Crazyflie quadrotor.

## PROJECT EXPERIENCE

### Planning & Control for MAVs

Oct 2021 - Feb 2022

- Implemented the PRM\* algorithm for graph construction, utilizing A\* for efficient path searching.
- Developed a mini-snap trajectory generation method with corridor constraints.
- Employed the Kinodynamics-RRT\* algorithm, incorporating polynomials as the steering function.

### Safe MPC Tracker for MAVs

Feb 2022 - Apr 2022

- Developed a Nonlinear MPC tracker utilizing the Acados toolbox, enabling obstacle avoidance by adding constraints.
- Designed a Linear MPC tracker using CVXPY, constructing terminal constraints and terminal cost for the Lyapunov stability guarantee.

### Peak Shaving by Dynamic Programming (DP)

Apr 2022 - Jun 2022

- Constructed a Markov Decision Process (MDP) for the system and approximated the transition model by sampling.
- Utilized Dynamic Programming (DP) recursion to determine an optimized policy, resulting in a significant reduction of 44% in peak power consumption.

## INTERNSHIP EXPERIENCE

### Baidu Apollo (World's Leading Fully Autonomous Driving Company)

July 2023 - Aug 2023

- Developed decision-making algorithms for autonomous lane merging.

### Institute of Software Chinese Academy of Sciences

Feb 2023 - Mar 2023

Supervisor: Prof. Lijun Zhang

- Developed and integrated the Hybrid A\* algorithm as a plugin into the ROS Navigation Stack, enhancing its path-planning capabilities.
- Tuned an Ackermann steering robot for on-board tests.

### Procter & Gamble Company (P&G)

Jul 2020 - Aug 2020

- Conducted mechanical design for shavers.

**HONORS & AWARDS**

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Winner of ERF2022 Hackon	2022
Outstanding Graduate of Beihang University	2021
Merit Student of Beihang University	2018

**SOCIAL COMMITMENT**

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President of Science & Technology Association	Jul 2018 - Jun 2021
Volunteer of the Second Belt and Road Forum for International Cooperation	Apr 2019 - Aug 2019
Volunteer Teacher	Jun 2018 - Jul 2018

**SKILLS**

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**Programming:** C/C++, Python, MATLAB  
**Optimization Toolbox:** CasADi, Acados, CVX, OSQP  
**Machine learning:** PyTorch, TensorFlow, scikit-learn  
**Simulator:** CARLA, Gazebo, PyBullet, Gym  
**Other software:** ROS, LaTeX, SOLIDWORKS  
**Language:** English (C1, IELTS 7.5), Chinese (native speaker)