

# Mizuho Aoki

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## RESEARCH INTEREST

My research is dedicated to optimizing the navigation performance of vehicles with high degrees of freedom. I specialize in the application and improvement of model predictive controller (MPC) and utilize both deterministic and stochastic algorithms to enhance driving behavior. In my latest work in the Ph.D. dissertation, I addressed a complex multi-objective control problem by dividing it into hierarchical subproblems, resulting in effective driving behavior in narrow spaces. I am also actively following advancements in diffusion-based planners and reinforcement learning, with a particular interest in their ability to tackle a wide range of challenges in motion planning, across various robotic platforms.

## SKILLS

- Python
- ROS / ROS 2
- C++/C
- Unity

## EXPERIENCE

### Research Fellow for Young Scientists (PD)

Japan Society for Promotion of Science (JSPS)

Oct 2025 - Mar 2026

### Research Intern

AI Lab, Cyber Agent, Inc., Tokyo

Feb 2024 - Mar 2025

- Investigated methods for navigation and localization leveraging Vision-Language Models (VLMs).

### Research Fellow for Young Scientists (DC2)

Japan Society for Promotion of Science (JSPS)

Apr 2024 - Sep 2025

### Research Assistant

Nagoya University

Apr 2022 - Mar 2023

- Joint research project with J-QuAD DYNAMICS, Inc.

### Part-time Software Engineer

MapIV, Inc., Nagoya

Apr 2021 - Sep 2022

- Developed software for autonomous driving utilizing ROS, C++, and Python.

## EDUCATION

### Ph.D. in Engineering

Nagoya University, Nagoya, Japan

*Thesis: Nonlinear Model Predictive Control for Autonomous Vehicles:*

*Enhancement via Simplified Physics-Aware Prediction and Decomposed Optimization*

Advisor: Prof. Tatsuya Suzuki

Sep 2025

### Master of Science (M.S.) in Engineering

Nagoya University, Nagoya, Japan

Sep 2022

#### Additional Information

- Early termination (Half a year shortened.)

### Bachelor of Science (B.S.) in Engineering

Nagoya University, Nagoya, Japan

**GPA 4.00/4.30**

Mar 2021

#### Awards & Honors

- Received the 2022 President's Award of Nagoya University

## LANGUAGES

### Japanese

Native

### English

Upper Intermediate (IELTS 6.5)

## AWARDS

- Received the IEEE ITS Society Nagoya Chapter Young Researcher Award 2023
- Our team Suzlab got 3rd prize and 4th place in the F1TENTH autonomous racing competitions at IV 2023 and ICRA 2023
- Received an Excellent Student Award from the Society of Instrument and Control Engineers (SICE)
- Received a Graduate School Research Award from the Society of Automotive Engineers of Japan (JSAE)
- Won 1st prize in Japan Automotive AI Challenge 2022 (simulation)
- Won 3rd prize in Japan Automotive AI Challenge 2022 (integration)
- Received the 2022 President's Award of Nagoya University
- Received an Excellent Student Award from the Robotics Society of Japan

## PUBLICATIONS

- **Mizuho Aoki** , Kohei Honda, Hiroyuki Okuda , and Tatsuya Suzuki, Switching Sampling Space of Model Predictive Path-Integral Controller to Balance Efficiency and Safety in 4WIDS Vehicle Navigation, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2024
- Kohei Honda, Naoki Akai, Kosuke Suzuki, **Mizuho Aoki** , Hirotaka Hosogaya , Hiroyuki Okuda , and Tatsuya Suzuki, Stein Variational Guided Model Predictive Path Integral Control: Proposal and Experiments with Fast Maneuvering Vehicles, IEEE International Conference on Robotics and Automation (ICRA), 2024
- Kentaro Sugiura, **Mizuho Aoki**, Hiroyuki Okuda, Tatsuya Suzuki, "Evaluation of Controllability of Interaction Between Pedestrian and Autonomous Mobile Robot in Shared Mobility Space", 20th International Conference on Informatics in Control, Automation And Robotics (ICINCO), Italy, 2023.

- Koki Hoshino, Kohei Honda , **Mizuho Aoki** , Hiroyuki Okuda, and Tatsuya Suzuki, "Actual-Vehicle Verification of Automatic Parking in Narrow Spaces Considering Precise Collision Avoidance Constraints for Rectangular Objects", SICE Annual Conference, Japan, 2023.
- **Mizuho Aoki**, Kohei Honda, Hiroyuki Okuda, Tatsuya Suzuki, Akira Ito, Daisuke Nagasaka, "Obstacle Avoidance Control Based on Nonlinear MPC for All Wheel Driven In-Wheel EV in Steering Failure", 2022 IEEE 25th International Conference on Intelligent Transportation Systems (ITSC), pp. 2863-2868, regular paper, Macau, China, Oct. 8-12, 2022.
- **Mizuho Aoki**, Kohei Honda, Hiroyuki Okuda, Tatsuya Suzuki, "Evaluation of Vehicle Prediction Models for Model Predictive Path-Tracking Control", Transaction of Society of Automotive Engineers of Japan, 2022, Vol.53 No.3, p. 687-692, 2022/05/25, Online ISSN 1883-0811, Print ISSN 0287-8321, <https://doi.org/10.11351/jsaeronbun.53.687>
- **Mizuho Aoki**, Kohei Honda, Hiroyuki Okuda, and Tatsuya Suzuki, "Comparative Study of Prediction Models for Model Predictive Path-Tracking Control in Wide Driving Speed Range", 2021 IEEE Intelligent Vehicles Symposium (IV), pp. 1261-1267, Japan, 2021.