# Yicheng Chen

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## EDUCATION

- **Beihang University** — Sept. 2021 - Jun. 2024 (expected)
  *M. Sc. in Control Science and Engineering, GPA: 89.2/100* — Advisor: *Prof. Xiwang Dong*

- **Technical University of Denmark** — Aug. 2019 - Sept. 2019
  *Visiting student at the summer school* — *Department of Applied Mathematics and Computer Science*

- **Beihang University** — Sept. 2017 - Jun. 2021
  *B. Eng. of Automation (**outstanding graduate award**), GPA: 88.5/100*

## RESEARCH INTERESTS

I am passionate about exploring optimization and machine learning, from the foundational principles and algorithmic design to their practical applications in robotics and autonomous systems.

## PUBLICATIONS

1. <u>Y. Chen</u>, J. Li, W. Qin, Y. Hua, X. Dong, and Q. Li, "Learning-Initialized Trajectory Planning in Unknown Environments", *arXiv:2309.10683*, 2023. [Submitted to ICRA'24] [video]

   [**Featured**] We introduce the Learning-Initialized Trajectory Planner (LIT-Planner), a novel approach that guides optimization using a neural network to provide initial values. Our method enjoys both time-efficiency and explainability.

2. <u>Y. Chen</u> and L. Wang, "Adaptively Dynamic RRT*-Connect: Path Planning for UAVs Against Dynamic Obstacles", *2022 7th International Conference on Automation, Control and Robotics Engineering (CACRE)*, Xi'an, China, pp. 1-7, 2022. [slides]

3. H. Chang*, <u>Y. Chen</u>*, B. Zhang, and D. Doermann, "Multi-UAV Mobile Edge Computing and Path Planning Platform Based on Reinforcement Learning". *IEEE Transactions on Emerging Topics in Computational Intelligence*, vol. 6, no. 3, pp. 489-498, 2022. (* equal contribution)

## MASTER'S THESIS

- **Cooperative Online Trajectory Planning for Autonomous Aerial Robotics Swarm** — Nov. 2022 - Present
  *Master's Thesis | Expected completion time: May 2024* — Advisor: *Prof. Xiwang Dong*

  - **Scope**: (1) Autonomy: Onboard perception, planning, and control. (2) Online: Real-time computing. (3) Cooperation: Multiple drones to perform cooperative tasks, such as search and rescue.
  - **Roadmap**: (1) By Sept. 2023, achieve reliable autonomous flight of a single drone in unknown environments. (2) By May 2024, achieve cooperative flight of a swarm of drones for some specific tasks.
  - **Progress**: Accomplished the first waypoint in Sept. 2023 with the paper "Learning-Initialized Trajectory Planning in Unknown Environments".

## PROJECTS

- **Aeriva: A Mini Autonomous Quadrotor Platform** — Mar. 2023 - Aug. 2023
  *Individual work*

  - **Accomplishments**: Designed and assembled a mini autonomous quadrotor platform 'Aeriva' from scratch. Configured up-to-date hardware and solved a series of engineering problems across the perception, planning, and control stack.
  - **Features**: (1) Agile and safe: Aeriva is built upon a 3.5-inch cinewhoop frame with Kakute H7 mini flight controller, with a thrust-to-weight ratio of 4.0, making it exceptionally agile, compact and safe. (2) High computing performance: Aeriva is equipped with NVIDIA Jetson Orin NX, facilitating it with strong onboard computing capabilities.
  - **Highlights**: This platform has supported my featured publication and the championship in the 2023 Huashan UAV challenge.

- **2023 Huashan UAV Challenge - Champion** — May 2023 - Jun. 2023
  *Team work | Leader of a six-person team* — *Ranked the first place in this national-level competition*

  - **Challenge**: This competition requires two autonomous drones to bypass a threat area in the field and reach a target point simultaneously. All positions are provided by UWB.
  - **Solutions**: Developed a cooperative trajectory planning and tracking algorithm for dual drones. Contributed to the system architecture of the drones, including the hardware and software. Provided a framework to achieve UWB positioning, communication between the drones and the ground station, trajectory planning, and tracking control based on ROS and PX4.

- ○ **Highlights**: Ranked first place in this competition. The achievements were presented in the 2023 Beihang Technology Exhibition.

- **SLAM Practice on Unmanned Ground Vehicles**  Oct. 2021 - Dec. 2021 & Mar. 2022 - May 2022
  *Individual work*
  - ○ **Accomplishments**: (1) implemented G-mapping on a TurtleBot. (2) Implemented Gmapping and RTAB-Map on an Ackerman mini vehicle. Besides, implemented a motion planning algorithm based on Dijkstra with TEB planner to navigate it through obstacles.

- **Modeling and Simulation for Quadcopter**  Mar. 2022 - Apr. 2022
  *Individual work*  *Course project: The Modeling and Simulation For Quadcopter*
  - ○ **Accomplishments**: Modeled and simulated quadcopters in MATLAB and Simulink. Implemented functions including position control, path following, and formation flight.

- **Application of Machine Learning in Medical Image Classification**  Mar. 2020 - May 2020
  *Team work | Leader of a three-person team*  *Course project: Pattern Recognition*
  - ○ **Aim**: Use machine learning approaches to help preliminary diagnosis of chest radiographs: classify radiographs into 3 classes – COVID, normal, and viral pneumonia with the highest possible accuracy.
  - ○ **Solution**: Used transfer learning to train several models including ResNet, DenseNet, InceptionResNet, etc. on a labeled training set. Used stacking to ensemble these models to build a stronger model.
  - ○ **Highlights**: Achieved accuracy of more than 0.98. Especially, the model achieved almost 100% precision in the COVID class. Released the solution on Kaggle. This project got full marks in the course.

- **2018 Beihang Robot Competition - 4th Place**  Oct. 2018 - Dec. 2018
  *Team work | Responsible for mechanical design and assembly*  *Ranked the 4th place in this college-level competition*
  - ○ **Challenge**: This competition requires participants to build a robot with the following functions: line tracking, obstacle avoidance, object grabbing, and Bluetooth remote control.
  - ○ **Solutions**: Built a multifunctional wheeled robot from scratch: Used Arduino as the computer. Incorporated infrared modules and ultrasonic modules for line tracking and obstacle avoidance in a reactive manner. Made a cylinder with a rubber band that can take objects in. Achieved remote control via the Bluetooth module and an Android Application.
  - ○ **Highlights**: Ranked the 4th place in the final. Got a lot of experience and more importantly, a great passion for robotics.

## SKILLS SUMMARY

- **English**: GRE (Verbal 152, Quantitive 170, AW 3.5), TOEFL iBT 105 (Reading 30, Listening 27, Speaking 22, Writing 26)

- **Programming**: Python, MATLAB, C/C++, LaTeX

- **Software**: ROS, Gazebo, AirSim, PX4, PyTorch, TensorFlow, OpenCV, Simulink, SolidWorks, AutoCAD

- **HardWare**: NVIDIA Jetson, Pixhawk, Motion Capture System, UWB

- **Hobbies**: Long-Distance Running, Hiking, Cycling, Table Tennis, Snowboarding

## HONORS AND AWARDS

- Excellent Graduate Student Award (ten persons per year) from Beijing Association of Automation  2022

- Best Presenter Award from CACRE 2022 committee  2022

- Outstanding Graduate Award from Beihang University  2021

- Merit Student Award from Beihang University  2017, 2018, 2019