

# JIAHE XU

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## EDUCATION

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M.S, Robotics <i>Johns Hopkins University, Baltimore, MD</i>	GPA:3.8/4.0 Aug 2020 - May 2022
B.S, Computer Science <i>Jilin University, Changchun, China</i>	GPA:3.6/4.0 Sep 2016 - Jun 2020
Certificate, Machine Learning and AI <i>MIT, Cambridge, MA</i>	May 2019 - Aug 2019

## WORK EXPERIENCE

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Software Engineer - Carnegie Mellon University <i>Air Lab, CMU, Pittsburgh, PA</i>	Oct 2022 - now
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- Integrated lab's SLAM systems (MSO(multi-spectral), VIO, LIO) into Jetson platforms and improved the code's efficiency with tools such as VPI, tensorRT.
- Participated in multi-robot SLAM system development (backend).
- Designed a memory-based Analogical Learning Framework and tested it on mobile manipulators.
- Thermal camera and FOV camera calibration: improved Kalibr's corner detection method and mitigated the reprojection error from 2.5 pixels into 1 pixel.

Engineering Intern - Motion Planning and Control <i>Faraday Future, San Jose, CA</i>	May 2022 - Sep 2022
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- Built development tools, including configuration parser, signal monitor, and trajectory visualizer, which support high frames per second.
- Designed new heuristic functions and sample-based methods for the automatic parking task. New methods reached a 10% improvement in the company's evaluation metrics and have a faster overall speed.
- Delivered a lightweight Lidar-based place descriptor called Scan Context.

Research Assistant - UAV Pick-and-Place task <i>ASCO Lab, JHU, Baltimore, MD</i>	Jun 2021 - May 2022
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- Designed learning-based navigation algorithms to predict waypoints for local trajectory planning.
- Deployed machine learning techniques that combine the spatial and depth information for fruit localization.
- Reached 96.3% Staging success rate, 90% Detection success rate, and 70.3% Picking success rate.

## PROFESSIONAL SKILLS

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- Proficiency in C, C++, Python, Matlab.
- Experience with Pytorch, ROS, TensorRT, Ceres, Eigen, VPI, Docker, and Jetson platform.
- Knowledge in CUDA programming, multi-threading, SIMD, CI/CD, Pixhawk.

## AWARDS

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Medal winner in International Collegiate Programming Contest (ICPC), an international programming contest.

- The 2017 ACM-ICPC Asia Regional Contest Silver Medal.
- The 2016 ACM-ICPC Asia Regional Contest Bronze Medal.

## PROJECT EXPERIENCE

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### Intelligent Pressure Control Ventilator

- Implemented a mathematical lung model and Pressure Control Ventilator in Simulink.
- Designed an evaluation metric for the Reinforcement Learning agent's behavior.
- Applied DQN to train a professional controller for the intelligent ventilator machine.
- In the simulation environment, the prototype helped the lung reach a normal state within 3 mins (10 mins for medical professionals) and 30% less numeric cost compared to manual operations on our evaluation metric.

### Garage Pallet Detection

- Applied YoloV3 and Faster-RCNN for Pallet detection.
- Reached 85.3% success rate in the given dataset.
- Integrated traditional computer vision methods in data generation to accelerate the whole procedure.

### UAV trajectory planning in a haze

- Voxelized a known maze and applied shortest path algorithms to find an initial path.
- Took corner points (points that change direction) as initial settings for the CEM algorithm.
- Final trajectories only have up to 15% extra distance compared to theoretical optimal trajectories (unreachable due to obstacles).

### Autonomous car parking in a T-shape narrow alleyway

- Designed methods to generate obstacle-avoiding paths with quadratic cost.
- Took different planners: DDP, IQR, MPPI, and CEM for MPC and compared their efficiency.
- Manually added waypoints for DDP and iLQR methods to improve their performances. Both methods have about 5% cost improvement compared to sample-based methods with goal state reached).

### Human detection in indoor environments

- Used Turtlebot to navigate in a known environment and update the map with lidar in real time.
- Applied self-developed localization package for locating.
- Added an infrared camera to the robot for human detection and record the location of each person to count how many people are inside the room with 80% success rate.

### UR5 pick-and-place task

- Completed the forward kinematic and inverse kinematic of UR5 in ROS.
- Planned a trajectory for UR5's current position to the object's position with LQR.
- Applied PID control to make UR5 track the planned trajectory to reach the goal.