

# WENRUI FAN

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## EDUCATION

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**University of Sheffield** Sheffield, United Kingdom | Sep. 2021 – Sep. 2022  
**Master degree with Distinction, major in Robotics** GPA: 75.83/100  
**Main Courses:** Machine Vision, Machine Learning, Deep Learning, Multisensor and Decision System, Mechatronic, Manipulator, Mobile Robotics.

**Beijing Institute of Technology** Beijing, China | Aug. 2017 – Jul. 2021  
**Bachelor degree, major in Aerospace Engineering** GPA: 87.33/100  
**Main Courses:** Deep Learning, Machine Learning, Machine Vision, Electrical and Electronic Technologies, Human-Computer Interaction Technology & Application, Theoretical Mechanics, Material Mechanics, Elastic Mechanics, Fluid Mechanics, Principle of Automatic Control, Modern Control Theory, Robotics: Aerial Robot, Computational Motion Planning, Mobility, Perception, Artificial Intelligence  
**Honor:** First Prize Scholarship (Fall of 2018 & 2019, top 3%), Excellent Student Cadre (Spring of 2019)  
**Technique:** MATLAB, C language, C++, Python, ROS

## ACADEMIC EXPERIENCE

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**Meta-Learning with Casual Representation Learning** China | 03/2023~now  
*Internship in HIT as a research assistant*  
**Supervisor: Prof. Bin Chen**

- Using causal representation learning to find more representative features and leveraging them to help few-shot learning and meta-learning.

**Large Visual-Language Pretraining Model with Domain Library in Expert Domains** China | 01/2023~now  
*Internship in HIT as a research assistant*  
**Supervisor: Prof. Bin Chen**

- Fetching data in expert domains to construct a framework to create domain libraries with professional attributes;
- Pre-training a large visual-language model in an expert domain;
- Using adversarial training in pretraining procedure to reduce the requirement of data;
- Deploying VLP model in downstream tasks like few-shot learning and zero-shot learning.

**Robot Interception with Vision-based Deep Reinforcement Learning | MSc Thesis** UK | 09/2022  
**Supervisor: Dr. Sean Anderson**

- Developed a scheme for robot interception problems with deep learning and reinforcement learning;
- Using YOLO as the object detection system to identify the target from environment;
- Using PPO algorithm as the path planner based on the target information;
- Training and testing SAC, TD3, Q-learning, and three variants of PPO on both discrete and continuous action spaces.

**Starfish Recognition in Great Barrier Reef | Kaggle Competition** UK | 02/2022

- Recognizing and tracking starfishes in videos recorded in the Great Barrier Reef;
- Using modified YOLO model as the starfish detector and detector.

**CNN-based Speech Recognition** UK | 04/2022  
**Advisor: Dr. Sean Anderson**

- Transforming the audio signals into the spectral graphs;
- Performing image classification to recognize the speech.

**Airport Customer Satisfaction Survey and Analysis Based on Statistic Machine Learning** UK | 11/2021  
**Advisor: John Oyekan**

- Performing data cleaning and data modelling based on the results of customer survey;

- Analyzing the big data using machine learning models and providing useful suggestions for improving the service.

### **Path Planning and Control of the Grabbing Segment of the Rotorcraft Aerial Manipulator**

China | 06/2021

*BSc Thesis, Score: 95/100, Supervisor: Prof. Haoping She*

- Trajectory planning for manipulator end effector;
- Designed rotor manipulator system online and offline stability control schemes;
- Compared the control performances between different schemes.

### **Path Planning for Mobile Robot in 3D Environment Based on Ant Colony Algorithm**

China | 09/2020

*2021 2nd International Conference on Artificial Intelligence and Information Systems (ICAIS 2021)*

*URL: <https://iopscience.iop.org/article/10.1088/1742-6596/1982/1/012095/meta>*

- Paper topic:** this paper introduced the ant colony algorithm to the path planning of mobile robots, and explored the optimal path solution. The definition of path planning was studied firstly. Then modelling method of path planning was discussed. Also, the current research status of three-dimensional path planning at home and abroad he existing problems of 3D path planning was analyzed.
- Major technique:** these basic theoretical knowledges have laid the foundation for the research work of this paper and we then modeled the three-dimensional terrain environment, and used MATLAB software for simulation experiments to implement the ant colony algorithm to plan the robot's three-dimensional terrain path, and finally performed fuzzy reinforcement learning method based on ant colony algorithm to find the optimal path for the mobile robot.

### **UAV Automatically Trajectory Planning Based on Deep Learning and Reinforcement Learning**

Beijing, China

*Second prize award for Science and Technology Innovation Fair of BIT Advisor: Prof. Xinfu Liu*

01/2019 –03/2020

- Used the results from convex optimization as samples.
- Designed and trained deep learning networks for UAV path planning.
- Used reinforcement learning to optimize the route and correct trajectory differences.

### **UAV Automatically Trajectory Planning and Following for Obstacle Avoidance**

Beijing, China

*Advisor: Prof. Xinfu Liu*

08/2019 –02/2020

- Designed and built the UAV on the base of Qualcomm Snapdragon Flight Development Kit
- Modified circuit on board to use external DGPS and laser sensor
- Used VICON systems to do motion capture and locate indoors
- Transformed the trajectory planning algorithm into C++ from MATLAB
- Completed the trajectory following part and did physical simulation on gazebo

### **China Undergraduate Mathematical Contest in Modeling**

Beijing, China

*Advisor: Prof. Chunguang Xiong*

09/2018

Objective: utilize Graph theory to do processing optimization of multi-manipulators on assembly line

- Analyzed the requirements of the whole systems and built a goal framework; took in charge of mathematical analysis and providing the mathematical models and algorithm; implemented the algorithm on MATLAB and provided results of simulation
- Concluded that on the base of graph theory and ant colony optimization, we found a locally optimal solution in a relatively large range because it was almost impossible to find the globally optimal solution for this kind of optimal problem