

# MICKEY LI

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## SUMMARY

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- An Expert in Software for Complex UAV systems and Multi-Robot Cooperation and Control.
- 5+ Years of experience in developing experimental multi-robot systems with ROS, PX4 and Ardupilot
- Extensive experience with independent research, leading projects, publishing and industrial collaboration

## EDUCATION

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**PhD, Robotics and Autonomous Systems** Sept 2018 - Oct 2023

University of Bristol, Bristol Robotics Laboratory & Toshiba Bristol Research and Innovation Laboratory.

**Thesis:** Reliability-Aware Multi-UAV Coverage Path Planning (Submitted, est. Viva Oct 2023)

**MEng Mathematics and Computer Science** Oct 2014 - Jun 2018

Imperial College London. Graduated with First-Class Honours.

**Thesis:** Real Time Semantic Segmentation with SLAM for Gaze Intention Decoding from ego-centric video.

**Taunton School** Aug 2009 - Jun 2014

A-levels: *Further Maths A\**, *Maths A\**, *Physics A*, *Music A*, *EPQ A*

GCSEs: *8A\* incl. mathematics*, *2A incl. english*, *2B*

## MAJOR PROJECTS AND EXPERIENCE

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**Optimal Topologies for Drone Vertiports** March 2023 - February 2023

*Postdoctoral Research Associate*

*University of Bristol Flight Laboratory*

- In a team of 4, responsible for investigating optimal topologies for collision free approaches for deployable drone vertiports, and designing systems and user interfaces for safety-critical multi-drone operations in practice.
- Interaction and Collaboration with numerous industrial partners to achieve project goals.
- Demonstrated successful multi-drone flight outdoors in front of research council assessors.

**Reliability-Aware Multi-UAV Coverage Path Planning for 3D Environments** April 2019 - Oct 2023

*PhD Submitted, Supervised by Prof. Arthur Richards*

*Bristol Robotics Laboratory*

- Investigating how to optimally utilise failure prone agents to maximise the reliability of mission completion.
- I developed a novel probabilistic reliability metric which quantifies the reliability of a multi-UAV coverage plan in general 3D environments, given individual UAV failure models.
- Investigated numerous optimisation methods including Integer Linear Programming and Genetic Algorithms in order to find reliability-optimal path plans. 3D environments required methods which were scalable and computational efficiency. Methods were evaluated in simulation and reality on a number of aircraft inspection scenarios
- Designed, pre-registered and ran a thorough month long practical multi-drone experiment to test our hypothesis.
- Published and Presented the work at national and international conferences such as AAMAS and ICRA.

**Project Starling - Implementing Cloud Inspired Flight Infrastructure for Multi-Drone Development, Deployment and Testing**

Jan 2021 - June 2023

*Lead Project Manager and Developer*

*Bristol Robotics Laboratory, Flight Arena*

- Took the initiative for envisioning, designing and implementing a scalable and reusable open-source single and multi-drone development and deployment architecture to address the lack of consistent, efficient and reproducible aerial research.
- Using cloud technologies such as Docker and Kubernetes with traditional Robotics and drone tools such as ROS2, PX4 and Gazebo to allow for a simplified workflow to reduce the barrier to entry for students and researchers.
- Heavily used in my PhD, in 4 other research projects, for 2 years in MSc level teaching, as well as in 4 MSc dissertations.

**Real Time Semantic Segmentation with SLAM for Gaze Intention Decoding** April 2018 - Aug 2018

*MEng Dissertation, Supervised by Dr Aldo Faisal & Dr Stefan Leutenegger Imperial College London, Faisal Lab*

- Responsible for developing a real time system which could label and position items which a user was gazing at.
- Created and trained a novel real-time semantic segmentation network called YoloMask using Tensorflow
- Network was integrated into the SemanticFusion SLAM mapping system and integrated with Ego-Centric Glasses

## SKILLS, INTERESTS, AWARDS AND PUBLICATIONS

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### Research Interests

- Control and Design of Multi-agent systems, Co-ordination, Path Planning and SLAM for Multi-drone systems.
- Optimisation, Statistics, Generative Methods, Reinforcement Learning and Machine Learning techniques

### Programming and Systems Experience

- Python, C++, C, Cython, Javascript, GO, Rust, Haskell, R, Matlab
- Docker, Kubernetes, Apache Spark, Unreal Engine, Unity, Airsim, OpenGL, OpenCV, PCL
- ROS/ROS2, Gazebo PX4, Ardupilot, Arduino, Raspberry Pi, basic electronics, CAD and 3D Printing

### Publications

Scitech 2024, RSS EMIRCAT 2023, ICRA 2021, AAMAS 2021, UKRAS 2020

### Awards & Certifications

Bristol PLUS Award, UK Drone License A2 CoC & GVC (2021-2026)

### Languages

English (Native),

Mandarin and Cantonese (Intermediate Spoken, Basic Comprehension)

Extensive Presentation, Public Speaking, Project Management and Teamwork Experience

## EXTRACURRICULAR ACTIVITIES AND ADDITIONAL RELEVANT EXPERIENCE

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### Teaching and Supervision

Oct 2020 - Feb 2024

- Significant Supervision experience of total of nine robotics masters students on topics ranging from multi-vehicle path optimisation, vertiports, marsupial robotics control and implementing UAV applications. Requires good communication, teaching and interpersonal skills. Students were successful in submitting dissertations.
- Developed and taught the Starling simulation environment and programming fundamentals for the Aerial MSc Group project course. Required the writing and delivery of several lectures in addition to running group tutorials.
- Organised and delivered a two day workshop on an introduction to the Starling UAV system which aimed to bring students from software and drone basics of Python, PX4, ROS2, Docker and basic Kubernetes to flying real drones. Attended by 20 students and researchers within the department.
- Small group teaching of foundational mathematics, logic and programming to undergraduate and masters level engineering and computer science students. Requires good co-operation between TAs and the course leaders.

### “The Forest” Art Installation

June 2023

*Project Manager and Engineer*

*Bristol Festival of Nature 2023*

- Member of a team of 5 creating an audio-visual installation exploring human activity in the urban-nature divide.
- Responsible for securing internal funding ( $\approx$  £1000) from various programmes and projects.
- Participated in the design, and development of the software and hardware of the 2, 2 meter “sound pillars”.

### RoC-Ex: Robotics Cave Explorer Outreach Game

Apr 2021

*Lead Project Manager and Developer*

*UK-RAS Robotics Festival 2021*

- Developed an educational game accepted for the National UK-RAS 2021 Robotics Week, designed to teach school-aged children how a robot senses the world and its environment.
- Lead a team of 7 volunteer postgrad students through planning and development of the game.
- Lead the integration of the missions into the Godot game engine, and setup deployment and delivery of the game.
- Successfully released to the general public with currently over 1000 hits: <https://farscope-outreach.co.uk/>

References Available upon Request