

# Mr. Hanlin CAI

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## OVERVIEW

As a highly motivated and collaborative student majoring in engineering, I have a strong interest in the industrial automation and artificial intelligence. During undergraduate studies, I have gained valuable experience in sensor design, system modelling, and machine learning. This entails completing a six-month industrial internship, publishing four peer-reviewed papers, and securing five awards at the national level in competitions.

## EDUCATION

### University of Cambridge, United Kingdom

Sep. 2024 – Oct. 2025

Incoming MPhil in Engineering, supervised by IEEE Fellow Özgür B. Akan

- Research project: Intelligent Communication Systems for Internet of Everything

### Fuzhou University (FZU) (China-Ireland Cooperative Program)

Sep. 2020 – Jun. 2024

Bachelor of Engineering in Automation (Taught in English)

- Current GPA: 3.81/4.00 (Top 8%), Average Score: 88.38

### National University of Ireland, Maynooth (MU)

Sep. 2020 – Jun. 2024

Bachelor of Science in Robotics and Intelligent Devices (Combined Degrees)

- Expect to achieve First Class Honours (Third-year score: 88.7 | Ranking: 1/52)
- **Scholarships:** FEPG Scholarship (Highest Award at FZU, **Top 0.5%**), XiamenAir Scholarship (Top 1%), Best Academic Performance Award at MU (Top 2%), First Prize Scholarship at FZU (Top 2%, Three Times)

## RESEARCH EXPERIENCE

### Embedded Development Intern, Huading Intelligent Manufacturing Technology Co. LTD., Fujian, China

Mentors: SN.ENGR Yuxiong Xia and Dr. Dan Chen

Jan. 2023 – June 2023

#### Outline:

- Successfully tackled the complexities of instrument inspection with intricate industrial environments by devising an intelligent inspection system leveraging IoT devices, quadruped robots and cloud computing.

#### Key Responsibilities:

- Implemented real-time data collection of sensor modules using ESP32; Integrated machine control with visual algorithms to empower quadruped robots to extract and analyse images of industrial instruments.

#### Achievement:

- Won the **Best Technology Award** in the 2023 China National Youth Science Innovation Project Competition.

### Research Assistant, Laboratory of Industrial Automation Control Technology and Information Processing

Supervisors: Prof. Zhezhuang Xu and Dr. Yuan Meng

Oct. 2022 – Present

#### Outline:

- Addressed the security vulnerabilities and susceptibility to attacks in Bluetooth Low Energy Networks utilising a hybrid attack detection mechanism based on physical features and machine learning.

#### Key Responsibilities:

- Established a BLE experimental platform, collected datasets using BLE Sniffer, nRF Connect and Wireshark.
- Developed an attack detection algorithm based on temporal convolutional network, text-CNN and SVM.

#### Achievement:

- Secured a research grant over \$3000; Authored a research paper and submitted to **AAAI 2024** conference.

### Visiting Student, Cambridge Centre for the Integration of Science, Technology and Culture (CCISTC)

Supervisor: Prof. Pietro Liò

June 2022 – Dec. 2022

### Outline:

- Resolved the challenge of detecting multiple-mix-attacks within IoT networks by developing a detection framework that integrates reconstruction and classification learning approaches.

### Key Responsibilities:

- Developed a multiple-mix-attacks detection algorithm based on LSTM model and random forest algorithm.

### Achievement:

- Research report achieved a ranking within top 5%; Won an outstanding oversea visiting scholarship (\$2400).

## PUBLICATIONS

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- [1] Hanlin Cai, Yuchen Fang, Jiacheng Huang, Meng Yuan, Zhezhuang Xu. **“Hybrid Detection Mechanism for Spoofing Attacks in Bluetooth Low Energy Networks”**. *The 22nd ACM International Conference on Mobile Systems, Applications, and Services (MobiSys)*, 2024.
- [2] Hanlin Cai, Zhezhuang Xu. **“Securing Billion Bluetooth Devices leveraging Learning-based Technique”**. *The 38th Annual AAI Conference on Artificial Intelligence. Undergraduate Consortium*, 2024.
- [3] Hanlin Cai, Zheng Li, Jiaqi Hu, Wei Hong Lim, Sew Sun Tiang, Mastaneh Mokayef, Chin Hong Wong. **“Optimising Traffic Sign Detection System Using Deep Residual Neural Networks Combined with Analytic Hierarchy Process Model”**. *The 28th International Conference on Artificial Life and Robotics. Recommended for expanding publication in the Journal of Advances in Artificial Life Robotics*, 2023.
- [4] Hanlin Cai, Jiaqi Hu, Zheng Li, Wei Hong Lim, Mastaneh Mokayef, Chin Hong Wong. **“An IoT Garbage Monitoring System for Effective Garbage Management”**. *The 4th International Conference on Computer Engineering, Network, and Intelligent Multimedia (IEEE CENIM)*, 2022.
- [5] Hanlin Cai, Jiacheng Huang, Yuchen Fang, Shuying Liu, Wenzhuo Fan, Chen Dan, Zhezhuang Xu. **“Detecting Multiple-mix-attack in IoT Networks through Reconstruction and Classification Machine Learning Techniques”**. *IEEE Sensors Journal. Under Review*, 2024.

## AWARDS & HONOURS

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AAAI 2024 Undergraduate Scholars (Only 12 students are selected around the world)	Dec. 2023
Finalist of China International Internet+ Innovation and Entrepreneurship Competition ( <b>Top 3%</b> )	Oct. 2023
Best Technology Award in China National Youth Science Innovation Project Competition ( <b>Top 1%</b> )	Aug. 2023
Second Prize in National Collegiate Internet of Things Technology and Application Competition	Aug. 2023
Finalist Award in International Mathematical Contest in Modeling ( <b>Top 1%</b> of all 20508 paper)	May 2023
First Prize in China Contemporary Undergraduate Mathematical Contest in Modeling (Top 5%)	Dec. 2022
Third Prize in Chinese National College Student Computer Design Competition	Aug. 2022
Outstanding volunteer in the 44th Session of the World Heritage Committee	July 2021

## SKILLS

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**Language Skills:** English (Fluent), Mandarin (Native), Hokkien (Native), Japanese (Elementary)

**Programming:** Python, MATLAB, Java, C++, HTML, CSS, JavaScript, Bash, Markdown, LaTeX

**Specialty: Swimming** (Reached Chinese national second-level swimming athlete standard; **Championship** of 100-meter freestyle swimming competition of Fuzhou University in *June 2022*)