# 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 three peer-reviewed papers, and securing five awards at the international level in competitions.

## EDUCATION

**University of Cambridge, United Kingdom** ***Sep. 2024 – Oct. 2025***

*Master of Philosophy in Engineering, supervised by IEEE Fellow Özgür B. Akan*

- Research Project: Intelligent Communication Systems for Internet of Everything

**National University of Ireland, Maynooth (MU)** ***Sep. 2022 – Jun. 2024***

*Bachelor of Science in Robotics and Intelligent Devices*

- First Class Honours, Award Mark: 88.1% (Ranking: 1/52)

**Fuzhou University (FZU, China-Ireland Cooperative Program)** ***Sep. 2020 – Jun. 2022***

*Bachelor of Engineering in Automation (Taught in English)*

- GPA: 3.82/4.00, Average Score: 88.72

- **Scholarships:** Innovation Scholarship (Highest Award at FZU, $2500), XiamenAir Scholarship ($1000), First Prize Scholarship of FZU ($1000, Four Times), Best Academic Performance Award of MU (Top 2%), Best Bachelor Thesis Award of MU & FZU (Top 1/300), Outstanding Graduate of FZU (Top 5%)

## RESEARCH EXPERIENCE

**Embedded Development Intern, HUADING Intelligent Manufacturing Technology Co., Ltd., 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.

**Remote Research Assistant, State Key Laboratory of Industrial Automation Control Technology, China**

***Supervisors: Prof. Zhezhuang Xu and Dr. Yuan Meng*** ***Oct. 2022 – Jue. 2024***

**Outline:**

- Addressed the security vulnerabilities and susceptibility to attacks in Bluetooth Low Energy Networks utilising a hybrid attack detection mechanism based on cyber-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 was accepted into the **AAAI 2024**.

**Exchange Student, Cambridge Centre for the Integration of Science, Technology and Culture, UK**
***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

**[1]** Hanlin Cai, Yuchen Fang, Jiacheng Huang, Hongling Liao, Meng Yuan, Zhezhuang Xu. **"BLEGuard: Hybrid Detection Mechanism for Safeguarding Bluetooth Low Energy Networks Against Spoofing Attacks".** *The 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, Undergraduate Consortium, Aug. 2024.*

**[2]** Hanlin Cai, Zhezhuang Xu. **"Securing Billion Bluetooth Devices leveraging Learning-based Technique".** *The 38th Annual AAAI Conference on Artificial Intelligence, Undergraduate Consortium, Feb. 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, Oct. 2023.*

**[4]** Hanlin Cai, Jiacheng Huang, Yuchen Fang, Chen Dan, Honglin Liao, Chin Hong Wong, Zhezhuang Xu. **"Detecting Multiple-mix-attack in IoT Networks through Reconstruction and Classification Machine Learning Techniques".** *IEEE Sensors Journal. Under Review, 2024.*

## AWARDS & HONOURS

**KDD 2024 Undergraduate Scholars** ($1000, only 12 students are selected around the world) *Jue. 2024*
**AAAI 2024 Undergraduate Scholars** ($5000, only 15 students are selected around the world) *Dec. 2023*
Finalist of China International Internet+ Innovation and Entrepreneurship Competition (Top 3%) *Oct. 2023*
Best Technology Award in China National Youth Science Innovation Project Competition (Top 1%) *Aug. 2023*
Finalist Award in International Mathematical Contest in Modeling (Top 1% of all 20508 paper) *May 2023*
First Prize in China Contemporary Undergraduate Mathematical Contest in Modelling (Top 5%) *Dec. 2022*
Outstanding volunteer in the 44th Session of the World Heritage Committee *July 2021*

## SKILLS

**Language Skills:** English (Fluent, IELTS 7.5), Mandarin (Native), Hokkien (Native)
**Programming**: Python, MATLAB, Java, C++, HTML, CSS, JavaScript, Bash, LaTeX
**Specialty:** Swimming (Reached Chinese national second-level swimming athlete standard; Championship of 100-meter freestyle swimming competition of Fuzhou University in *June 2022*)