

# Mr. Hanlin CAI

D.O.B. Nov. 01, 2002 | Tel: (+86) 15905925789 | [hanlin.cai@ieee.org](mailto:hanlin.cai@ieee.org) | <https://caihanlin.com>  
Building 7, Golden Garden, Quanzhou City, Fujian Province, China (362700)

## OVERVIEW

As a highly motivated and collaborative student majoring in engineering, I have a strong interest in the industrial IoT system and network security. During undergraduate studies, I gain valuable experience in hardware design, attack detection, and machine learning. This entails completing a six-month industrial internship, publishing two peer-reviewed papers, and securing five awards at the national level in competitions.

## EDUCATION

**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%), Arithmetic 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)

**Main Courses:** Control System Design, Software Engineering, Operating System, Digital System, Real-time and Embedded System, Robotics and Automation, Algorithms and Data Structures, Machine Learning

- **Course Projects:** Industrial Internship Experience (97/100), Signals & Systems Integration Project (92/100)
- **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**)

## PUBLICATIONS

- [1] Hanlin Cai, Zheng Li, Jiaqi Hu, Wei Hong Lim, Sew Sun Tiang, Mastaneh Mokayef, Chin Hong Wong\*. “**Optimizing Traffic Sign Detection System Using Deep Residual Neural Networks Combined with Analytic Hierarchy Process Model**”. *The 28th International Conference on Artificial Life and Robotics, 2023. Recommended for expanding publication in the Journal of Advances in Artificial Life Robotics.*
- [2] 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.*
- [3] Hanlin Cai, Yuchen Fang, Meng Yuan, Zhezhuang Xu\*. “**BLEGuard: Hybrid Detection Mechanism for Spoofing Attacks in Bluetooth Low Energy Networks**”. *The 38th AAAI Conference on Artificial Intelligence (One of most important conferences for AI Research). Under review, 2024.*
- [4] 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**”. *Sensors Journal. Under review, 2024.*

## 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 analyze images of industrial instruments.

**Achievement:**

- Won the Best Technology Award in China national youth science innovation project competition (Top 1%).

**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 utilizing 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.
- Developed an attack detection algorithm based on temporal convolutional network, text-CNN and SVM.

**Achievement:**

- Secured a research grant of \$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 network systems by developing a detection framework that integrates reconstruction and classification learning approaches.

**Key Responsibilities:**

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

**Achievement:**

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

## AWARDS & HONOURS

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

## SKILLS & SPECIALTY

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**Language Skills:** English (Fluent, IELTS 7.0), Mandarin (Native), Hokkien (Native), Cantonese (Native)

**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*)

## VOLUNTEER WORKS

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**Department of Volunteer Work, Youth League Committee of Fuzhou University**

**Deputy President (Mentor: Dr. Yixuan Hu)**

**Sep. 2021 – Sep. 2022**

- **Outline:** Managed the planning, operation, and publicity of volunteer service work, and helped mentors to promote the improvement, digitization and intelligence of volunteer service management.
- **Key Responsibilities:** Organized 39 activities (19 volunteer activities for epidemic prevention and control, 12 for community service, and 8 for environmental protection) with over 890 participants in related activities.
- **Achievement:** Responsible for the publicity work of 17 volunteer activities, with a total of more than 240,000 page views, covering more than 40,000 people. Personal volunteer service time exceeded 240 hours.