

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 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

Finalist of China International Internet+ Innovation and Entrepreneurship Competition (Top 3%)	<i>Oct. 2023</i>
Best Technology Award in China Youth Science Innovation Project Competition (Top 1%)	<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 (Top 1% 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

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

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.