

# Mr. Hanlin CAI

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## 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

Sep. 2020 – Jun. 2024

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

➤ Weighted Average Score: 82.43

**Main Courses:** Control System Design (93), Software Engineering (97), Operating System (92), Real-time and Embedded System (90), Digital System (90), Robotics & Automation (90), Algorithms and Data Structures (90)

- **Course Projects:** Industrial Internship Experience (97/100), Signals & Systems Integration Project (92/100)
- **Scholarships:** FEPEG Scholarship (**Highest Award at FZU, Top 0.5%**), XiamenAir Scholarship (**Top 1%**), Best Academic Performance Award at MU (Top 1%), 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

- **Description:** Tackled the complexities of instrument inspection within intricate industrial environments by devising an intelligent inspection system leveraging IoT devices, quadruped robots and cloud computing.
- **My Role:** 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:** Our system won the best technology award at national youth 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

- **Description:** 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.
- **My Role:** Established a BLE experimental platform, collected datasets using BLE Sniffer & nRF Connect; Developed attack detection algorithm based on temporal convolutional network, text-CNN and SVM models.
- **Achievement:** Secured a research grant of \$3000; Authored a research paper and submitted to AAAI 2024.

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

*Supervisor: Prof. Pietro Lio'*

June 2022 – Dec. 2022

- **Description:** Resolved the challenge of detecting Multiple-mix-attacks within IoT network systems by developing a detection framework that integrates reconstruction and classification learning approaches.
- **My Role:** Developed a multiple-mix-attacks detection algorithm based on LSTM and random forest models.
- **Achievement:** Research report ranked in top 5%; Won an outstanding oversea visiting scholarship (\$2400).

## PUBLICATIONS

- [1] Hanlin Cai, Zheng Li, Jiaqi Hu, Wei Hong Lim, Sew Sun Tiang, Mastaneh Mokayef, Chin Hong Wong\*. "Deep Residual Neural Network for Efficient Traffic Sign Detection". *The 28th International Conference on Artificial Life and Robotics (ICAROB), 2023. Recommended for expanding publication in the Journal of Advances in Artificial Life Robotics (JAALR), Vol. 4(2), pp. 80–88.*
- [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, 2023.
- [4] Hanlin Cai\*, Yufei Wu, Wenxuan Luo. “**Multi-objective Optimization Model Based on Analysis of Human-Land Relationship Coupling: A Case Study of the Masai Mara National Reserve**”. *The 5th International Conference on Modeling, Simulation, Optimization and Algorithm*. Under review, 2023.
- [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**”. *Sensors Journal (IF: 3.847, JCR Q2)*. Under review, 2023.

## RESEARCH FUNDINGS

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- Industrial Inspection System based on Intelligent IoT and Bionic Quadruped Robot (\$3000). *China National Undergraduate Innovation and Entrepreneurship Training Program (No. 202310386056)*. **Project Leader.**
- Community Monitoring System based on Inspection Vehicle and Smart IoT (\$1000). *China National Youth Science Innovation Project Competition Award (No. 230802A08)*. **Project Leader.**
- Industrial Security Inspection Web Platform (\$600). *China National Collegiate Internet of Things Technology and Application Competition Award (No. 2023B168)*. **Project Leader.**

## 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**

- **Description:** Took charge of the planning, operation, and publicity of volunteer service work, and helped mentors to promote the improvement, digitization and intelligence of volunteer service management.
- **My Role:** 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.

## SKILLS & SPECIALTY

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**Language Skills:** English (Fluent, IELTS 7.0 in Sep. 2023), Mandarin(Native), Hokkien (Native)

**Programming:** Python (Good), Bash (Good), MATLAB, Java, C++, HTML, JavaScript, CSS, Markdown

**Tools:** LaTeX, Git, Linux, ROS1, Cloud, Docker, Conda, Bluetooth, Raspberry Pi, ESP32, Arduino

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

## AWARDS & SERVICES

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Best Technology Award in China Youth Science Innovation Project Competition ( <b>Top 1%</b> )	Aug. 2023
Finalist Award in COMAP’s Mathematical Contest in Modeling ( <b>Top 1%</b> of all 20508 paper)	May 2023
First Prize (Championship, Top 5%) in Fujian Youth Science Innovation Project Competition	May 2023
Second Prize in National Collegiate Internet of Things Technology and Application Competition	Aug. 2023
First Prize (Top 5%) in China Undergraduate Mathematical Contest in Modeling (Provincial level)	Dec. 2022
Third Prize (Top 10%) in China National College Student Computer Design Competition	Aug. 2022
Maynooth University Best Student Course Project in Academic Year 2022 (Top 5%)	Oct. 2022
Top 10 Best Volunteers of FZU (Only 10 students are awarded in a year)	Apr. 2022
Outstanding Volunteer in the 44th Session of the World Heritage Committee	July 2021