# 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% at FZU), 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 (Top 6% at MU)

**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:** FEPG 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)**
***Supervisors: 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.* ***Cited by 1 Paper.***

**[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 major modification, 2024.*

## RESEARCH FUNDINGS

- 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

**Volunteer Work Department, 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

**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, ROS, 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

**Best Technology Award in China Youth Science Innovation Project Competition (National level)** ***Aug. 2023***
**Finalist Award in COMAP's Mathematical Contest in Modeling (Top 1% of all 20508 paper)** ***May 2023***
First Prize (Championship, Top 2%) in Fujian Youth Science Innovation Project Competition *May 2023*
First Prize (Top 5%) in China Undergraduate Mathematical Contest in Modeling (Provincial level) *Dec. 2022*
Second Prize in National Collegiate Internet of Things Technology and Application Competition *Aug. 2023*
Third Prize (Top 10%) in China National College Student Computer Design Competition *Aug. 2022*
Maynooth University Best Student Course Project in Academic Year 2022 (Only one project in class) *Oct. 2022*
**Top 10 Best Volunteers of FZU (Only 10 students are selected in a year)** ***Apr. 2022***
**Outstanding Volunteer in the 44th Session of the World Heritage Committee** ***July 2021***