

Personal Statement

Standing in the confluence of the Internet of Things (IoT) and machine learning, I believe that IoT research in our contemporary era has reached a pivotal juncture. My aspiration lies in building the next generation of industrial IoT systems, orchestrating a seamless integration of IoT technology and artificial intelligence (AI) into a cohesive framework, thereby enhancing their capacity to positively impact society. Retrospectively, my career ambition was sparked in 2015 while accessing the news about the Explosion Accident in Tianjin Binhai New Area caused by a lack of systematic safety management. Afterward, as my attention to industrial safety grows increasingly, I kept abreast of it during my undergraduate study and realized the essence of IoT technology in assuring industrial safety. With the enormous reading volume of 500 articles about machine learning and IoT, as well as the publication achievement of two peer-reviewed papers, my insight into industrial IoT systems was further strengthened. Realizing the significance of IoT research, therefore, I plan to continue my study on it and apply to the AAI Undergraduate Consortium (UC). I am confident that participation in the UC program will provide a valuable platform to further explore my research interests, engage with prospective mentors, and present my vision for IoT and AI research.

In the past several years, I have achieved excellent grades and scholarships, particularly ranking top 1 in the third academic year, which endows me with theoretical knowledge of system engineering, strategic management and practical skills in mathematic modelling and programming. For instance, this year, I acted as a leader to participate in the International Mathematical Contest in Modeling (**MCM 2023**), choosing the problem of “Reimagining Maasai Mara”. Within 96 consecutive hours, it needed us to establish a systematic evaluation model to evaluate the impact of different protection measures and policies on the Maasai Mara national reserve and propose a well-designed environmental protection strategy based on our multi-objective optimization model. In the process, I first worked with teammates to conduct a discretization analysis on land with the Rasterization Method, so that we could utilize the analytic hierarchy process to conduct quantitative computing and assess the value of environmental resources according to local conditions. Then, to output a suitable environmental protection strategy, we devoted ourselves to initially evaluating the rationality of specific policies based on the human-land relationship coupling model and further did the quantitative analysis of the strategy through a long-term forecasting algorithm implemented by Python. Eventually, the 25-page mathematical modelling report with great content and exquisite design ranked top 1% among all 20,508 papers and won the **Finalist Award**. It highlighted my mathematical ability in numerical analysis and system modelling. And it was during those hours of intense discussion and knowledge-sharing that I realised the value and strength of my team-working, leadership, exceptional powers of concentration, and communication abilities.

Encouraged always by my desire for self-improvement and expansion of knowledge, I gladly undertook further study outside of the lecture hall. As a goal-oriented person, I have been determined to pursue a postgraduate education since my sophomore year. Since then, I have joined initiatively the State Key Laboratory of Industrial Automation Control Technology and Information Processing in my college and acted as a research assistant in various research projects and competitions, which well demonstrated my great research potential and ability. Especially, worth mentioning is my leading role in the research project on the hybrid detection mechanism for spoofing attacks in Bluetooth Low Energy devices, one project that highly develops my insights into network se-

curity. In the process, to evaluate our detection mechanism, I took action to establish a physical BLE testbed by deploying 16 mainstream BLE devices like smart thermometers and door locks, as well as 4 attacker platforms. By virtue of benign advertising packets and spoofed advertising packets, the datasets used for detection algorithm testing were formed. Ultimately, we proposed the detection mechanism named *BLEGuard* that integrates BLE physical features judgment (like Advertising Interval and Received Signal Strength) and deep learning algorithms including temporal convolutional network (TCN), text-CNN, and Random Forest model. Such a hybrid mechanism with a state-of-the-art accuracy of over 98.7% could effectively resolve BLE spoofing attacks in complex networks and improve the performance of low-cost online detection and high-precision offline analysis. At present, the manuscript is undergoing final revisions and is expected to be submitted to the **IEEE Sensor Journal**, where I serve as the **First-author**. This research experience well paved the way for my future studies, and also helped me to develop my own perception of IoT system design and research methodology, which makes me qualified with hard skills and a researcher with an independent mind.

Following my guides into the vocational world, my internship experiences have taken me to industrial security and IoT systems in the real workplace while working as an embedded development intern at China Huading Intelligent Manufacturing Technology Co. LTD. Here, the deep involvement in a corporate project to develop “an Industrial Security Inspection System based on Intelligent IoT” provided me with the firsthand experience of the core role of intelligent IoT system in ensuring physical and information security at industrial sites. Such work enabled me to participate in real-world industrial sensor system deployment with the help of the Ali-Cloud IoT Platform, and developed motion algorithms for quadruped robots based on PID controllers and visual perception algorithms leveraging OpenCV. Thereafter, as the principal and representative in the 9th China National Innovation Project Competition, this project won the **Best Technology Award (Top 1%)**. The internship experience not only highlights my ability to put technical skills into practical application, but also furnishes me with the practical demand for intelligent IoT systems in industrial scenarios. Such an eye-opening experience further motivates me to probe into IoT. Though my current understanding of IoT industrial security systems reaches a certain level, I am dissatisfied with my ability to incorporate advanced AI technology into IoT systems. By participating in UC program, I can gain a richer technical perspective and thus expand my future research.

In conclusion, my participation in the UC program is instrumental in my pursuit of excellence in AI research, with a specific focus on the industrial IoT domain. This program provides a unique platform for me to enhance my knowledge and skills in AI. I eagerly anticipate engaging with esteemed mentors, collaborating with like-minded peers, and actively contributing to the academic community. As a first-generation college student of my family, the UC program’s alignment with my career aspirations is particularly meaningful, as I aim to become a university professor and continue nurturing the next generation of AI talents. Moreover, the opportunity to network with experts and individuals from diverse backgrounds is invaluable for broadening my global perspective and enhancing my intercultural communication skills. In essence, the UC program is the catalyst for my academic and research growth, and I eagerly anticipate the opportunity to learn, evolve, and make a lasting imprint in the field of AI and IoT.