

I have continually been learning and researching technological topics in Autonomous Intelligent Machines (EE) and Systems (CS), corresponding to my undergraduate studies in EECS at the University of Liverpool. This statement will demonstrate my past commitment to sustained and intense study, my reasons wishing for research the area of Computer Science PhD in Harvard, and how the interdisciplinary approach will boost my future career ambitions.

My past research mainly lay on robotics, representing the Autonomous Intelligence Machines, and Blockchain, representing the Autonomous Intelligent System. The most direct implication of Autonomous Intelligent Machines lays on my research experience in robotics systems.

Modern robotics are capable of intelligence in solving real-world problems more efficiently compared with human. Bearing this in mind, I started my trails in LEGO EV3 MINDSTORMS, for applying the photoelectric sensor for line following, and ultrasonic sensor for obstacle avoidance. By applying the RobotC for programming purposes, I have done the self-learning about the PID controller and pruned parameters day and day for the best performance in the provided navigational track. Based on the modular design, team cooperation, and programming iteration, we achieved a 90/100 award.

Additionally, in researching mainstream robotic controller, I have made researches on the Arduino robotic car design for robotic soccer competition, with a specifically designed robot claw, with the integration of the electronic control, C programming, and mechanical assembly experiences. It is the interactive actions controlled by my hand with reflections on his clay that makes me so jubilant, dreaming that I have made my own robotic pet under my dynamic commands. Furthermore, I want to build more hands-on experiences in understanding how professional robotics are organized with each other, and I attended the Robomaster competition hosted by DJI as the product manager for designing the full life cycle of the Infantry Robot, by applying the 3D designing using SolidWorks, hardware assembling by tool cabinet, Mecanum Wheel testing, and PTZ motor PID tuning for stabilization, and applying MS Projects for team consensus, and cooperation.

For understanding the robots in a three-dimension environment, I have led the team for designing the drone's control system by integrating the Alexa drone skill, video transmission goggles, solenoid coil on the Pixhawk control board, with Autopilots as the console. Overcoming challenges from drone stabilization, control, Covid-19, and remote cooperation, we finally designed smart drone which can fly under vocal command, sending back visual images, GPS and remote control, wireless charging, and low battery directly fly back to portal functionality. For gaining more industrial training, I went to the Institute of Software Chinese Academy of Science, Beijing for building, training, validating and deploying Cartographer Mapping algorithm on the latest Linux Operation Distribution OpenEuler in Simultaneous Localization and Mapping, a popular topic in Computer Vision, and also practising programming in Python for the obstacle avoidance algorithm deployment with improvement on TurtleBot of ROS Kinetic. This experience shows how the professional robotic engineer is solving a really specific task rather a whole system compared with the DIY robotic lover. They work as a team with weekly group meetings in setting and checking the corresponding tasks and push forward to testing teams. The self-motivated robotic designs are laying the professional skills such as programming, and

ROS operation for the professional or doctoral training in future.

Even in my spare time, I have also made modelling, robotics and IoT related research. For example, I have attended four competitions, in polishing my skill sets in Differential Equations, Neural Networks, Optimization, Generative Algorithms, Max-Flow Min-Cut Network, Graph Theory, Simulated Annealing, Regression, and Classification Algorithms. I have also developed the spider robots, and Raspberry based IoT device in understanding the geometric property, and natural language processing. Furthermore, based on my observation on daily life, I have applied for inventory patents in making a better life, for example, an electronic arm training device, where a human can pull against the electronic machine for flexible home training experiences, currently under the substantial evaluation of the Intellectual Property Office. In relating to the current booming of deep learning (DL), I recently applied the NVIDIA Jetson Nano for applying the Accelerated SSD-mobilenet for mask recognition and alerting the people for wearing masks in facing the Covid-19 pandemic, and led a team of 5 for the 3<sup>rd</sup> Sky Hackathon Competition by NVIDIA.

Apart from Autonomous Intelligent Machines, I also focus on the new cooperation ecosystem where human intelligence is fully utilized for the best performance and a more harmonic and cooperative environment. Currently, the cooperation lack of trust for gaining a higher productive efficiency, and Blockchain, as a newly invented the trust machine powered by Cryptography, Network Programming, and Game Theory, may possibly be the Value Internet due to the popularity of Crypto-Currencies in bringing new ecosystem for collaboration.

Supervised by Dr. Qiuyu Chen, and Xiao Wang, I led the team of 10 for an interdisciplinary team from CS, EE, Business, Art, and Industrial Engineering in designing, and implementing the comprehensive students' evaluation system within the university, collecting comprehensive data for students' evaluation system, consisting of the students' competition result, coursework remark, and research outcome, which are currently scattered in every corner of the institute. Thus, students' evaluation data may be generated and passed through the network full of university-operated nodes, in helping to build an honourable student record using this trustable ledger powered from Blockchain. Finally, the paper "Blockchain Improves Credibility of Educational Background" has been accepted for publication on the 2021 4th International Conference on Information and Computer Technologies (ICICT), Hawaii, United States.

Apart from university experience, we sought industrial cooperation in Export Trading Insurance, where the accurate and authentic location information is influenced by uncertainty overseas as a global problem. Our team designed the Blockchain-Based Export Credit Insurance System by organizing the trading nodes on one network, where the GPS signal of the cargo is continually updated to the network, for transparent tracing, in reducing uncertainty, noted on the Blockchain. With the help of the untamed Blockchain and smart contract, the result of the consensus algorithm may trigger the corresponding mechanisms for implementation and evaluation purposes, and awarded the top 10 across the country.

In facing the challenges from Covid-19 and corresponding trust crisis for the Red Cross Foundation in donation usage, we are considering how the system may be improved with this trust machine: Blockchain. Although there are products on the markets already, all products and literature are limited by

only updating transaction feedback records on the Blockchain, instead of the full transparent transaction life cycle on the chain, which is to the desire of the public. Thus, our new product design incorporates the Equal Rights and Responsibilities Rule, in informing each receipt of this transaction in uploading the corresponding reference URL for demonstrating the usage of this donation, based on Blockchain's Unspent Transaction Output characteristics, and our research: A Transparent and Trustable Approach for Donation Fund Tracing using Blockchain Technology was elected the best presenter at the 2020 6th International Conference on Industrial and Business Engineering, applied for three inventory patents in Blockchain-related donation tracing, with a Method and Apparatus for Confirming Commodity Transaction Information, as the most innovative one in guaranteeing every donation can be tracked and protected.

Regardless of the robotics, or Blockchain-based system, the key idea is to build automatus systems using an interdisciplinary approach for creating the distinguished outcome. Robotics are applying the automation using the mechanical approach for improving the productivity by liberating the human beings from redundant work, and Blockchain system is building the next generation of cooperation, forming the closely related productive relationship.

My lifelong dream is to start up a company with cutting edge technology in serving the world, and I have devoted all my energy in achieving this dream, ranging from Artificial Intelligence to Automatic Robotics and Blockchain Systems. Doctoral training in Computer Science in Harvard is a substantial step for my dream since professional doctoral training disciplinaries provides a rational and logical way of understanding the world using the evidence-based empirical method with critical thinking in facing modern business environment. My current startup project (Final-Year-Project as well) is to design DL-based knowledge recommendation systems for systematic and professional learning, to be received Angel Fund Investment, with a market value of 0.5 million dollars. My personal research interest's area lays on the focusing on the potential business implications for the automatus system in transferring research outcome to business applying entrepreneurship, and I have learned the Artificial Intelligence Principles, and Techniques, and Algorithms in Stanford Summer Session with leading grades. Furthermore, I firmly believe my studies at the automatus system will continue my interdisciplinary learning approach for learning even more cutting-edge technologies with not only the electronic engineering but also computer science disciplinaries, with professional doctoral training with high academic integrity in researching and publishing innovative research and business scope in Artificial Intelligence, Robotic, and Blockchain System.

I am more than honoured to apply for the Computer Science PhD program from the bottom of my heart, and I am really looking forward to seeing you in October 2021!

(Word Count: 1490)