

Statement of Purpose

I. Duke is Right for me

During the summer vacation in 2017, I traveled to the U.S. and visited Duke for the first time. I was drawn to the gorgeous architecture and beautiful scenery on campus. The thought of studying at Duke came to me after the visit. After conducting some research afterward, I found that the M.Eng. in ECE is a great fit for me, as I can make full use of my experiences to better understand the theories taught in this program. In return, Duke's prestige faculty and wide platform will provide me with the opportunities to study in-depth specialization about this subject, and the alumni network of Duke will also be a great asset to my development in the future. This is why I am motivated to pursue the M.Eng. in ECE at Duke University.

II. I am Right for Duke

In my undergraduate study, I accumulated a fair amount of knowledge and developed interdisciplinary skills through my experiences in many different areas. I believe my strong will, hands-on skills, and teamwork spirit shown from the following experiences make me a qualified candidate for the M.Eng. in ECE at Duke.

Learning & Competitions My knowledge of Machine Learning mainly derives from my undergraduate courses and academic competitions. In 2019 Mathematical Contest in Modeling, I led my teammates to complete a Data Mining project about Opioid Crisis. We analyzed the data from National Forensic Laboratory Information System, and found the growth pattern of drug reported quantity and demographic features to make a breakout prediction. Through this experience, I become familiar with the process and methods of Data Mining, *e.g.*, data preprocessing, correlation analysis, classification algorithms, *etc.*, which has prepared me well for the study of Prof. Rudin in Prediction Analysis. My interest in Machine Learning involves other fields, too. I started to learn about Computer Vision from *Artificial Neural Networks* course, where I practiced many neural networks. I also led a team in a Kaggle competition relevant to cactus identification and achieved a 99.97% accuracy in the test set. Afterward, I extended my study to dynamic objects captured through my research in University of Mining & Technology. I employed Back Propagation Neural Network and Partial Swarm Optimization to track targets and published a paper *Optimal Analysis of Target Dynamic Tracking Strategy Based on Computer Vision*. I think these experiences could be of great value to the work of Prof. Bartesaghi in Computer Vision.

Research & Publications Since my sophomore year, I have conducted research in Inplus Lab and focused on the contract and application layer of Blockchain technology. Referring to theories in *A Primer in Game Theory* and *Convex Optimization*, I proposed a two-layer Stackelberg Game data trading mechanism in Blockchain-based Internet of Vehicles (IoV) and verified my algorithms in some numerical experiments beforehand. After months of hard work, I completed a paper *Blockchain-Based Digital Goods Trading Mechanism in Internet of Vehicles: A Stackelberg Game Approach* with my colleagues and submitted it to 2019 International Conference on Service Oriented Computing (ICSOC). Initially, my work did not win the satisfaction of the ICSOC committee and they offered me suggestions for further improvement. Following their advice, I evaluated the robustness and efficiency of my algorithms by implementing several smart contracts on Rinkeby, a test net of Ethereum. With specific scenarios to support this protocol system, I confidently submitted this paper to the 2020 IEEE Cloud this time. During this process, I realized that there was a big gap between idea origination and perfect implementation. We need to take more factors into consideration to ensure the stability and efficiency of operation in the system, such as security and cost of execution and storage. As this work employs a consortium Blockchain to guarantee trading security and uses Game Theory methods to facilitate trading in IoV, I think it is aligned with Dr. Gorlatova's research of intelligent behaviors in IoT and Prof. Gong's studies in IoT Security and Privacy.

Internship In junior year, I was attracted to Computer Networks, which inspired me to explore other application scenarios, as I realized how powerful and scalable this technology could be. I seized the chance to intern at Microsoft to work on the *Predictable Remote Direct Memory Access (RDMA) for AI Training* project. We aimed at guaranteeing bandwidth for Data Manipulation Language training tasks in RDMA networks. In this project, I managed to implement the central logic controller and the adaptive data backup mechanism, *i.e.*, adaptively specifying the traffic classes of VM-pairs to guarantee the bandwidth of users. This work matches well with Prof. Hai Li and Hilton's focus on architectural design, and I am well-prepared to further explore this field.

III. My Future Goals

If admitted with honor, I prefer to work on Prediction Analysis, Computer Vision, Intelligent IoT, and Computer Architecture to make full use of my experiences. In the short term, upon obtaining my Master's degree, I expect to complete my program with excellent performance to consolidate my knowledge and become a reliable employer in a reputable company. In the long run, I would like to set up my own company and to promote promising products or services to better our lives. I firmly believe I can develop useful skills at Duke to achieve my dream.