

# Statement of Purpose

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*Applicant for Electrical and Computer Engineering (DICE)*

I aspire to pursue a Ph.D. degree in the area of Wireless Communication and Networking. My long-term goal is to become a researcher in the laboratory of a high-tech company with an aspiration to completely reform the way we connect with the world. I believe I can reach this goal with the opportunity and resources provided at the ECE department of University of Texas, Austin.

As a research assistant in the past two years, I have established a solid mathematical background required to address academic challenges in wireless research. Until now, I have completed 3 research projects and co-authored 7 papers in top journals and conferences, including *IEEE Transactions on Multimedia*, *IEEE Access*, *IEEE GLOBECOM*, *IEEE ICC*, and *IEEE VTC*. My motivation for wireless research comes from reflections on my past experiences.

Fascinated by the TV series *Silicon Valley*, I had planned to become a software engineer when I was a freshman. To learn more about enterprise-level software development, I had joined 3 different companies during college. I first came to **Foxconn Advanced Communication Academy** for a one-year internship in my sophomore year. During that time, we had collaborated with *Intel* to develop a commercial platform for the management of 5G network infrastructures. Meanwhile, I also remotely collaborated with **BroadMission** on several software projects, including home supervision system with anomaly detection, customized CICD tracking tools, and a serverless Chatbot with user classification and customized responses. Later, I sought summer internship at **Cinnamon AI** to further pursue knowledge about deep learning and its real-world applications. From these industrial experiences, I had not only strengthened my programming skills but also boosted my ability to recognize and solve technical problems in software development.

A major life event has completely changed my career plan as an engineer. I had undergone lung surgery in my junior year. During my hospitalization, whenever my mobile phone ran out of battery, I had difficulty untangling the charging cords due to the drainage tube on my chest. Motivated by this event, I aspire to develop more convenient wireless technologies, making ubiquitous wireless connectivity become a reality. After reflecting on my work experiences, I realized it requires solving the problem fundamentally, instead of manipulating the well-known tools as I did before, to achieve my aspiration. Since then, I had made up my mind to pursue research in the area of wireless networks.

Despite my GPA was only 2.28 in the semester in which I was hospitalized, I receive an A in both courses “**Introduction to Wireless and Mobile Networking**” and “**Personal Communications Services**” in the following semester. Through these courses, I first learned the principles of radio propagation, channel modeling and multiple access in wireless networks. Then, I become familiar with the key techniques in modern communication systems such as diversity, MIMO, OFDM and beamforming. As I gained a better understanding of wireless research, I’m more convinced that it is my life's ambition and desired to make contributions to this field.

To delve deeper into wireless technologies, I joined Prof. Hung-Yu Wei's **Wireless Mobile Network Lab**. My first independent research focused on cache-enabled adaptive video streaming. Through studying the literature, I found the social impact of online users has huge potential to enhance the hit ratio of video caching, thus enhancing Quality of Experience (QoE). I also found that due to different playback request patterns and downlink capacity of mobile users, a video can be partially cached and be transcoded in real-time to improve resource utilization and adapt to the fast-changing channel condition. By integrating the above findings, I developed a social-aware QoE-driven video caching framework to improve existing video streaming schemes. Combining my proficiency in programming, I further conduct a series of experiments based on real-world data to validate my proposed framework.

My second study aimed to address the task offloading problem in the UAV-assisted vehicular network, which is NP-hard in general. I found that current algorithms often take a long time to obtain a decent solution and thus may fail to fulfill the latency requirements of emerging vehicular services regarding their high mobility. To address such challenge, by taking advantage of both Deep Neural Network (DNN) and Particle Swarm Optimization (PSO), I developed a hybrid learning framework that can jointly optimize UAV positions, computation offloading decision and spectrum allocation in Radio Access Network (RAN) with low-complexity while dynamically tuning the DNN in order to adapt to the time-varying wireless environment. From this series of research, I have acquired sufficient knowledge to pursue research in applications of deep learning to wireless networks.

As an undergraduate member in the collaborative project "**B5G smart cross-layer multi-access edge computing**", I have worked on a survey paper on the topic of service orchestration and resource management for edge computing. After analyzing over 350 related papers from various aspects, I have identified the limitations of existing techniques, outlined potential research directions and contributed 3 sections to the paper. Meanwhile, as Network Function Virtualization (NFV) and Software-Defined Network (SDN) become a promising paradigm for the 5G core network, I also collaborated with Prof. Chun-Ting Chou on the mathematical model design of virtual network embedding system and reliable QoS flow routing. These experiences have laid the rigor foundation for my research methodology and provided me with profound insights into research.

Highly attracted by the research of your esteemed research group, **WNCG**, I would like to apply for your prestigious program to pursue my Ph.D. study. Specifically, **Prof. Gustavo de Veciana**'s recent projects on wireless resource allocation and information sharing in wireless sensing systems perfectly match my research interest. In addition, **Prof. Robert Heath**'s expertise in mmWave communication and channel estimation for MIMO systems unveil the essence of wireless technologies that I'm pursuing. I also found **Prof. Sanjay Shakkottai**'s research on learning-based cellular network management and wireless scheduling appealing to me as they serve as promising solutions to deal with the increasingly complex wireless network deployment. I believe working with them would equip me with the latest knowledge required to achieve my aspiration of future wireless networks. I also believe that both my strong academic ability, firm industrious experiences together with my research passion, would make me a suitable candidate for admission.