

Statement of Purpose

My career aspiration is to excel as a specialized researcher, focusing on the intersection of **Security, Software Engineering**, and the **Application of LLMs**. In my doctoral research, I aim to conduct an extensive investigation into software stack vulnerabilities, particularly examining the multifaceted applications of LLMs within the domain of software security research. This includes investigating and identifying ways to utilize LLMs in detecting and mitigating software stack vulnerabilities. Additionally, I am keen on enhancing existing security tools, delving into different static and dynamic analysis methods to develop practical solutions that can benefit the wider community.

During my time at [BUET](#), I developed a keen interest in software development and security. Engaging in challenging academic projects like creating '[E-luxurious](#)'—a property rental platform like Airbnb—and designing a full-scale [DNS flood attack](#) with a corresponding defense mechanism heightened my skills. I also ventured into multiple outsourced projects to broaden my experience in software development practices. One notable project was [Traan-Chitro](#), a platform designed to coordinate relief activities during the COVID-19 pandemic. Later, I started participating in CTF competitions, where I learnt about various security tools. After graduation, I became a software engineer at [IQVIA](#), specializing in C# .NET backend development. Here, I work with various DBMS and software testing frameworks. I also focus on improving program analysis techniques to identify and resolve security vulnerabilities in developer-written code, ensuring compliance.

My journey into formal research began with my undergraduate thesis in computational criminology, where I developed a decision-aid system named '[Cri-Astrologer](#)'. Its purpose was to help in police investigations by predicting criminal demographics using crime evidence and victim data. Under [Dr. Islam's](#) guidance, I proposed a DeepFM-based DNN which surpassed existing ML and DL algorithms. At IQVIA, I have led R&D efforts to enhance query performance, reduce query counts, and explore cost-efficient solutions. Currently, I am actively engaged in an R&D project at IQVIA aimed at revolutionizing user interactions with data visualization. The aim of this project is to simplify complex dashboard configurations by integrating LLMs into the user interface. In this project, I have explored various LLMs, delving into prompt engineering and fine tuning these models.

I consider UC Riverside a suitable place to pursue my PhD, as there are several active researchers with whom I believe I will be able to contribute. Specifically, I am keen on collaborating with **Dr. Qian Zhang** due to her interest in using LLMs for SE and heterogeneous computing. I am also interested in **Dr. Zhiyun Qian's** work on file systems and android security. Additionally, I am also open and would be happy to work with others and explore the areas with similar focus.
