Since childhood, I have had a strong interest in numbers, as evidenced by how quickly I can memorize phone numbers and my habit of summing and decomposing them into prime numbers. I was amazed by how a messy polynomial can be transformed into a product of several polynomials, or how the sum of an infinite geometric series can be expressed as such a simple fraction. As my mathematical knowledge has grown, its logic and beauty have always captivated me.

To cultivate and enhance my mathematical understanding, I have actively participated in various mathematical competitions. I remember once when preparing for the AMC, one particularly memorable problem asked for the probability of getting an odd number before all even numbers appeared once. I was consumed by the problem and ended up skipping dinner, but the feeling of satisfaction after finally arriving at the correct answer before going to bed was incomparable.

In recent years, with the development of computing power, big data has been applied in various fields. During my spare time, I completed an introductory course in data science and collaborated with classmates on a case study about the identification and categorization of coins using computer visualization techniques. Our paper, "Brazilian Coin Counter Research Report", discussed a coin identification and validation model based on the AlexNet convolutional model. Through this experience, I gained a comprehensive understanding of data science, from data collection and classification to building convolutional neural network (CNN) models and conducting data analysis with Python programming. While marveling at its power, I also became more interested in the underlying mathematical principles.

CNNs heavily rely on matrix operations, such as convolutional filters, which extract features from complex datasets. Mathematical principles like linear transformations and matrix factorizations underpin the efficacy of CNNs. I first studied linear algebra during my ACT course but did not fully understand its significance in applied scenarios until I worked on the data project. This experience left me amazed by its power and motivated me to learn more about linear algebra systematically in my future university study.

After acquiring a solid foundation in mathematics, I eagerly sought opportunities to apply theoretical knowledge to real-world research, so I was privileged to participate in the Space City Competition, a global event organized by NASA. In the Asian regional finals, we were tasked with using the Lagrange method to calculate the position of the perigee. The principle behind it is based on the condition of force equilibrium for a mass in a gravitational field potential field. During the competition, our team employed mathematical modeling and equation-solving techniques to determine the location of the Lagrange points. Concepts such as potential functions and integration methods in mathematics proved pivotal in practical applications.

During my leisure time, I indulge in reading books about mathematics and its applications. Among them, "The Beauty of Mathematics" is one that I frequently browse through. What impressed me the most in the book was the example of using Hidden Markov Models for speech recognition. Speech recognition encounters so many languages and contexts, and I have always been curious about how computers achieve semantic understanding. By learning from a large amount of speech data through such an intuitive and concise probability model, computers can gradually engage in conversations with humans. It is truly fascinating.

Influenced by my father who is a fixed income trader, I often have the opportunity to use mathematical and statistical methods to analyze financial data and identify patterns. For example, the open interest of government bond futures exhibits obvious seasonal characteristics, with rapid declines occurring in each delivery month. I utilized filtering methods to remove the seasonality and obtained new data set which was better for price prediction. Additionally, by analyzing the spreads between bonds, I found that if the spread reaches one standard deviation away from the mean, the mean reversion might occur, causing the spread to move back. These statistical insights play a crucial role in financial trading.

In the future, I aspire to follow in my father’s footsteps and study mathematics at a university in the United Kingdom. After graduating from the University of Oxford, he applied his knowledge to the financial industry, while I am more interested in the field of data science and other related domains. Ultimately, my goal is to continue enjoying the pleasure that mathematics brings to my life.