Since childhood, I have harboured a strong interest in numbers, as evidenced by how quickly I can memorise phone numbers and my habit of summing and decomposing them into prime numbers. As my comprehension of mathematics has matured, the allure of its logic and precision has always captivated me. I am 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 a simple fraction.

To cultivate and enhance my mathematical acumen, I have ardently participated in various mathematical competitions. I could distinctly recall a problem when preparing for the AMC, and it asked for the probability of getting an odd number before all even numbers appeared once. I was so engrossed in the problem that I forgot the dinner, but the sense of fulfilment that arose from solving a challenging problem was incomparable.

After acquiring a 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 organised by NASA. In the Asian regional finals, my team was 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 potential field. During the competition, we also employed mathematical modelling 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.

I have actively engaged in some introductory courses of data science for its burgeoning influence and collaborated with classmates on a case study about the identification and categorisation of coins using computer visualisation 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. As I marvelled at its power, my curiosity in the underlying mathematical principles was further piqued.

Mathematical principles like linear transformations and matrix factorisations underpin the efficacy of CNNs, which relies heavily on Matrix. I first studied matrix when I was preparing my ACT test but did not fully understand its significance in applied scenarios until I worked on the data project. This experience left me astonished by its power and motivated me to embark on the systematic exploration of linear algebra, which could then help me skilfully utilise more cutting-edge machine learning algorithms.

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 by pursuing 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 overarching goal is to perpetuate the joy that mathematics brings to my life.