I always hold the view that computer science can help tackle many challenging problems more effectively, which is the main reason why I want to pursue this subject further. The Enigma machine used in the decoding during the Second World War and the theorem-proving software that was able to verify the Four-Color theory are both great examples of the ability of computing science. Therefore, I am inspired to learn more about this subject in my further study.

To dive deeper into the field of computer science and improve my computational thinking, I attended a summer camp where I learned how to use algorithms to solve Sudoku. I did not know how to solve the Sudoku with the proper program at first and thus I decided to look into this solution myself, as a human being. Concretely, how I solve this problem is to look through each row, column and 3\*3 sub-grid and try to see whether or not an appropriate number can be filled in that cell. If it can be filled in, that would be great. Else, I will move on to the next empty cell. This brute-force approach comes with obvious limitations in filling certain Sudoku, thus, a hint provided by my instructor helped me come up with an idea that used the search algorithms. After taking references from the theory of Depth-First Search Algorithm (DFS) and Breadth-First Search Algorithm (BFS) from the book called “Introduction to Algorithms”, I surprisingly found that we could consider the whole problem as a search tree. Thus, I took the initial Sudoku as our parent vertex and each time I assigned values from 1 to 9 to the empty cell in the Sudoku, and check if the filled number meets the rules of Sudoku. If correct, the initial vertex would branch into a new vertex, and the whole new Sudoku could be saved in the stack, after which, it moved to the next empty cell. Else, it would backtrack to the previous state and try the next number between 1 and 9. By doing this recursively, we could reach the vertex that all the numbers are filled in and follow the rules. On the other hand, the BFS was using the same method, but a different data structure was called a queue. Additionally, I was excited by the fact that although asymptotic complexities of both algorithms are the same as O(|V|+|E|), DFS is quicker than BFS in most cases. This is due to that DFS aims to go as far as possible whereas BFS discovers all vertices at a certain distance before moving to the further vertices and in a puzzle with so many possibilities, DFS is definitely a superior approach. Based on this experience, I managed to find that with the use of the computer program, I can come up with the solution to fragment the whole problem into pieces that can be solved effectively and logically. Besides, I am deeply keen on the differences between the way humans and computers solve the same problem and that is exactly why I want to take this research path and hopefully to seek out an answer with my further study.

Math is the core of CS and that's why I have done a lot of math in and outside the school to prepare for the upcoming study. I achieved a gold certificate in the UK Senior Mathematical Challenge 2018 and 2019 and the First Place Certificate for the Problem-Solving Round in the High School Team Maths Competition in 2018, facilitating me to form a systematic understanding of some mathematical concepts in computer science like the Asymptote and Big-O notations.

There is no doubt that computer intelligence will play a vital role in the future human society but what appeals to me the most is how different human brain and computer programs work in solving the same issue and how this bridge can be shortened. Computers are superior than humans in many aspects, however, the creativity and innovation by humans should not be underestimated and thus to make computer more intelligent than it is now in solving the life problems more effectively is my largest academic passion and career goal.