I instinctively believe that everything happened in the world can be precisely interpreted by formulas and computable probability and vice versa. I guess this is the reason why I got provoked quickly when first introduced to the concept of Turing machines in ‘Introduction of the Theory of Computation’.

Problems can be turned into strings as Turing Machines and become computable. Including every detail in instructions, the state diagram I draw according to transition functions, however complex, always lead to the right answer. The elegance of computational theories with the rigorous logic and mathematical basis behind them fascinate me unrelentingly. Once as I turned variables into strings to determine whether my family will go to a specific restaurant for fun, a new query occurred to me: can I always write down these 7-tuples? In other words, can Turing machines solve every problem with hypothetically limitless steps?

With the feature that output is consistent for the same input, I began to consider probability. Knowledge in A-Level physics enables me to know that to get a random factor, the physical procedure needs to be included. Accordingly, variable on string independent from a physical factor can only generate pseudo-random number instead of a real random number, unless the start state is random.

On the other hand, there is a solution to the logical ground and grasp more of my attention. Assume a Turing machine to decide acceptance between two strings of input can be constructed, and a second machine to give the opposite result can be followed. In consequence, when Turing Machines themselves became the inputs, diagonalization method rules out the possibility of the existence of the second machine by showing the paradox at the intersection where the answer should be opposite to itself. In no way can we even decide whether a certain input would be accepted.

The subtle self-referential construction in the Halting Problem which is the second solution reminds me of when I was a child, intrigued by the concept of “brain in the vat”, liar paradox and the equivalence between “if p then q” and “not p or q”. I can still remember I nearly laughed out the first time I found native set theory proved to be contradictory by Russell’s paradox and intuitive “any definable collection is a set” cannot be true. Benefitting from continuously learning in mathematical logic as years passed by, I drew more comprehension in abstract concepts. The similarity in construction to prove Gödel’s first incompleteness theorem shows me the charm of self-reference once more. Notwithstanding this, while I am researching the background of incompleteness theorem, concepts of axiomatic reasoning and formal systems illuminate the beauty of other sides in mathematics for me different from scope learn in school.

Compare with paradoxes, self-referential recursion functions differently. Concept of dynamic programming attracts me in the first place. The bottom-up approach used to save the solution of optimal subproblems in a table so that each overlapping problem only need to be solved once. Top-down analysis is my favourite part, logical thinking applies to distinct situations and eventually solve the problems. Principles of algorithms give me a new perspective when dealing with different tasks. Therefore, I have a desire to delving further in algorithm and prepared with mathematical thinking.

I found myself interested in almost every subject, from natural science to humanities, it took my time to confirm what I crave for, but with the merit of exposed to other engrossing areas. It is always a pleasure to talk with who concentrate in different directions.

I aspire to contemplate the logic behind the world and science by rational inference and the application of knowledge. The underlying principle of the world guides my curiosity and passion seamlessly.