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Digital Minds

What is a computer? For many, it is the definition of modern magic, a Pandora’s box of infinite knowledge via a satellite uplink with the ominously named Internet. Yet, computers serve for more than ordering off Amazon. They are a concept that drives modern society as an engine moves a car. Rocket ships, the stock market, and, recently, self-driving cars all rely on powerful computers to make the transition from blueprint to physical existence. Thus, with all the importance of computers in today’s society, it is time to strip this Wizard of Oz of his magical appearance and show the world how interesting computers are, and if you can believe it, reflect our own minds.

Computers are conceptual, a bundle of electronic signals that have evolved in complexity, that teach a way of logical thinking that is very applicable to many other forms of life, and that are a form of applied philosophy that emulates the logic of the human mind in a metal frame.

How does a computer run? Computers are built on binary numbers, which are either a 1 or 0. Morse code is a type of binary code as described in the book Code. “Morse code is said to be binary code because the components of the code consist of only two things- a dot and a dash.”

Both the binary numbers used by a computer and Morse code practice the exact same method to convey a word or idea. Either a sound is made, which a computer calls a 1, or a sound is not made which binary refers to as a 0. That’s it. Binary is simply 1’s and 0’s in a certain order. It is the order of these two numbers that can convey incredibly complex thoughts inside a computer. “But wait,” you might ask? If Morse code uses sound to convey an idea, what does a computer physically do during a 1 and 0?

During a 1, computers send an electronic signal, and on a 0 nothing happens. Computers rely on the same concept as Morse code, except computers use electricity as a medium instead of sound. There is an exception to this called quantum computers. A quantum computer does not use just 0’s and 1’s, rather, according to the article Quantum Computers, they “exploit the full complexity of a many-particle quantum wavefunction to solve a computational problem.” In other words, these computers can use partial electronic signals between 0 and 1, such as .5, to represent an idea. This concept is groundbreaking for certain types of computation performed by government computers. However, it is of little use in commercial computers, since normal consumers do not need to perform such complex calculations.

Code no longer is written by the user with binary numbers. Instead, new languages have been built off of binary. Consider a random sequence of 0’s and 1’s. Through code, this sequence has been given a meaning, just like when we use letters in English to create a word! Computer scientists were able to create a language of 1’s and 0’s, but that was not the end. More complex languages evolved. One computer scientist’s work became the basis for the next. New languages were written with old languages. Languages were combined. How is a computer language different from a spoken language? It is not. A language is a method of transmitting our thoughts. This can involve using body motion similar to sign language, it can be written like latin, or spoken such as in English. What about combining languages? Japanese is based on Chinese, and uses kanji, a Chinese alphabet where each symbol holds a meaning. Kanji is read by meaning, not sound. Thus, a Taiwanese, Chinese, or Japanese person can roughly read the same thing written in kanji, but pronounce it completely differently when speaking. But wait, Japanese has two more alphabets! Kana is the Japanese equivalent of English and operates the same with each symbol having its own sound. However, kana is only used for native Japanese words. Katakana, on the other hand, is the exact same as kana except most of the symbols look different and it is only used for foreign words. Thus, Japanese is made up of several languages, including many words of their own creation!

Programming is no different. C++, a programming language most Clemson computer scientists are taught, combines the features of BCPL and Simula, two completely different languages. React Node, a language for making apps for both iPhones and Androids, uses the programming languages Javascript, HTML 5, and Node.js. Thus, computer science is like a long tower, with each floor representing a programming language that relies on the ones below it.

Now we have a language, so what is the next step towards building the latest iPhone app, or GPS for a spaceship to Mars? Logical thinking, and lots of it. Coding could be viewed as a form of life, like in Langdon Winner’s Technology as a Form of Life. Coding follows logical reasoning with a mix of syntax similar to a foreign language, which are both common cultural conventions. While coding as a language has already been explained in the previous paragraph, coding also can be viewed as a form of applied philosophy and shares many of the same logical operators. Consider a conditional statement. It is hard to trace the origin of conditionals, but evidence shows they were used as far back as the Stoic School, a philosophy school in Greece that was greatly influenced by Socrates. Conditional statements are very similar to true and false. If something is true, do this, else, do this. This statement forms the basis of computer science. For example, what if you forgot your phone password? First you enter the wrong password, so an error screen appears. Then you type the correct password and suddenly your phone opens. So your phone is programmed to think: if right password, open phone, else, show error screen. But wait, in both computer science and philosophy you can make this example even more complex. What if we put a conditional statement inside a conditional statement? So when there is an if statement inside an if statement, this is called a nested if. Thus, still using the phone example, if (number is right ) then if(second number is right) then if (last number is right) open phone. Else show error screen. With this example there are three if statements inside one if statement!

So you may ask, why does this matter for regular people? Conditional statements are one of many forms of logical thinking used by computer scientists and philosophers. Yet, everyone thinks this way on a daily basis, they just do not realize it. When a regular Joe has to decide whether to sell his stock, he is weighing the pros and cons. If we view this situation with the eyes of a philosopher/computer scientist, he is evaluating if(he sells) then he makes a lot of money. Else if(he does not sell), then if(the company grows in value) then he makes even more money if(the company decreases in value) then he makes less money. People make these decisions every day and use logical thinking, however, the way we interpret and think about our surrounds can be trained, much like a boxer learns to read and dodge his opponent. Many people take a victim mindset regarding pushing the limits of their mind. According to Slack and Wise chapter 3, “if we think of our bodies as having limits, we see them as lacking something, as having limitations, as falling, short, as having problems that demand solutions.” Perhaps this glass half-full mindset can be attributed to how genetically predetermined intelligence feels. Fortunately, there are methods for improving the limits of the mind. According to the podcast Philosophize This! “Socrates questioned everyone, and brought new ideas into the world. The Socratic method is based on inductive reasoning with ideas explored through questioning.” Thus, through questioning and examining the details, Socrates was able to reach groundbreaking breakthroughs in the field of philosophy. Logic is not reserved for the ancient Greeks. Improving one’s reasoning abilities goes beyond just memorization. If weights strengthen the limbs, then questioning advances the mind.

Before Socrates was sentenced to death on grounds of corrupting the youth with his words, Plato quoted him saying “the unexamined life is not worth living.” Perhaps Socrates had a point, and learning to think about our surroundings logically is far more important than people realize. So next time you see a computer, remember, perhaps as a master you could learn much from your slave computer.

Why is so much logical thinking shared by both philosophy and computer science? If philosophy is the pursuit of understanding our own minds, then computer science is the creation of a simple mind modeled after our own. Computers are designed by humans to perform specific tasks. Their thinking is simple and straightforward. As a computer scientist, one must both create and guide their program’s thoughts. When a program is written for a chess game, the code for the board and pieces must be made, and then the thinking regarding winning conditions and piece movement must be instated. Thus, coding is a tower ascending into the unknown from binary numbers to C++, requires logical thinking derived from philosophy, and requires a form of thinking with applications for a broad range of situations.

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