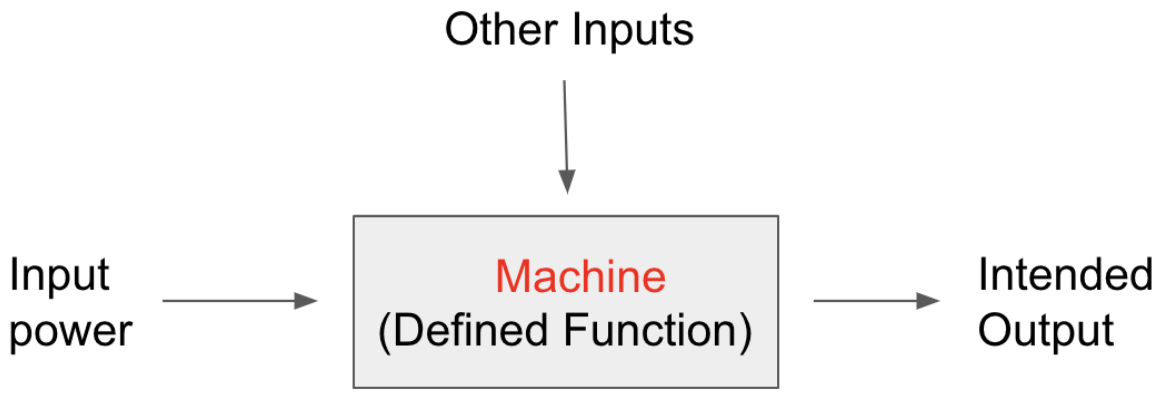
Chapter 1: Introduction to computer science

What is a machine?

A machine is something that uses power to perform an intended action. Input power can be of various forms like chemical, mechanical, thermal, electrical, etc.



Along with power, there can be other inputs as well like raw material, data, etc. These inputs can be given in one-time in some machines and can be in continuous form in others.

The word “intended” is important here because it helps to differentiate humans and machines. As of now, machines cannot think unlike humans.
Machines make decisions defined by it’s maker or they are trained by their makers to make decisions based on information known as artificial intelligent systems.

Examples: Even a bullock cart powered by animals is a machine and a robot “Curiosity” in Mars sent by NASA is a machine.

App based exercise:
Identify from images whether it’s a machine or not. If yes, write the input power and intended function.

What is a Computer?

A computer is a machine that takes electricity as input power and can be programmed to execute a sequence of logical or arithmetic operations automatically.

Electricity can be a continuous supply or from a battery with stored energy. Arithmetic operations are mathematical operations like addition, subtraction, etc. and logical operations are like “Yes or

No”. The word automatically is important because once programmed, a computer does not require any assistance to execute the series of operations.

How does a Human work?

To understand how a computer works it’s important to understand how we humans work. So what do we humans have? We have:

1. Body parts
2. Consciousness

Body parts

Our body is made up of a large number of parts and each one has a specific function to do. They get chemical energy through the food we eat.

Examples: Stomach to digest the food
Eyes to see
Lungs to breathe, etc.

If you observe clearly, we can divide these into 3 broader categories:

1. Input parts
2. Output parts
3. Internal parts

Input body parts

As the name suggests, input body parts are those which help to intake energy sources or data in various forms from the outside world for your body.

Examples of energy input parts:
- Mouth is used to intake food.
- Skin is used to intake sunlight.
- Nose is used to intake air.

Examples of data input parts:
- Eyes collect image data from the outside world.
- Tongue has sensors to collect taste data from food.
- Skin collects temperature, pressure to detect touch.
- Ears collect the data of the sound wave.

Output body parts

Differently, output body parts are those which help us to perform the intended functions. Examples:

- Legs to walk
- Hands to do a lot of things
- Mouth, Vocal chords to speak and communicate

Internal body parts

All other parts which are neither input nor output are called internal body parts. Examples:

- Stomach is used to convert the food into usable energy form.
- Lungs are used to convert air into oxygen (usable energy form).
- Heart is used to circulate the blood (consumable form of energy) to all the other body parts.

The most important internal body part is the brain. It's where all the processing of the raw data is happening to generate instructions to perform an intended function.

For example,
When you are crossing a street, you see a signal, your eyes capture the image, send it to the brain, it processes that the signal is red and commands your legs to put the break.

Now, the question is, how does the brain work? The brain breaks the problem of identifying the signal into smaller forms and assigns it to its sub-parts and the sub-parts do the same. This process goes on upto the level of a cell where each cell has to give a YES/NO for some minimalistic problem. This then combines with the other cell's decision and it builds up the hierarchy to the level of identifying the signal.

Now, how does a cell decide YES/NO for the minimalistic problem? The answer is that the cell has learned to decide for this when you are growing from childhood to adult over time.

But still, something is missing here !! Can you guess ??

Consciousness

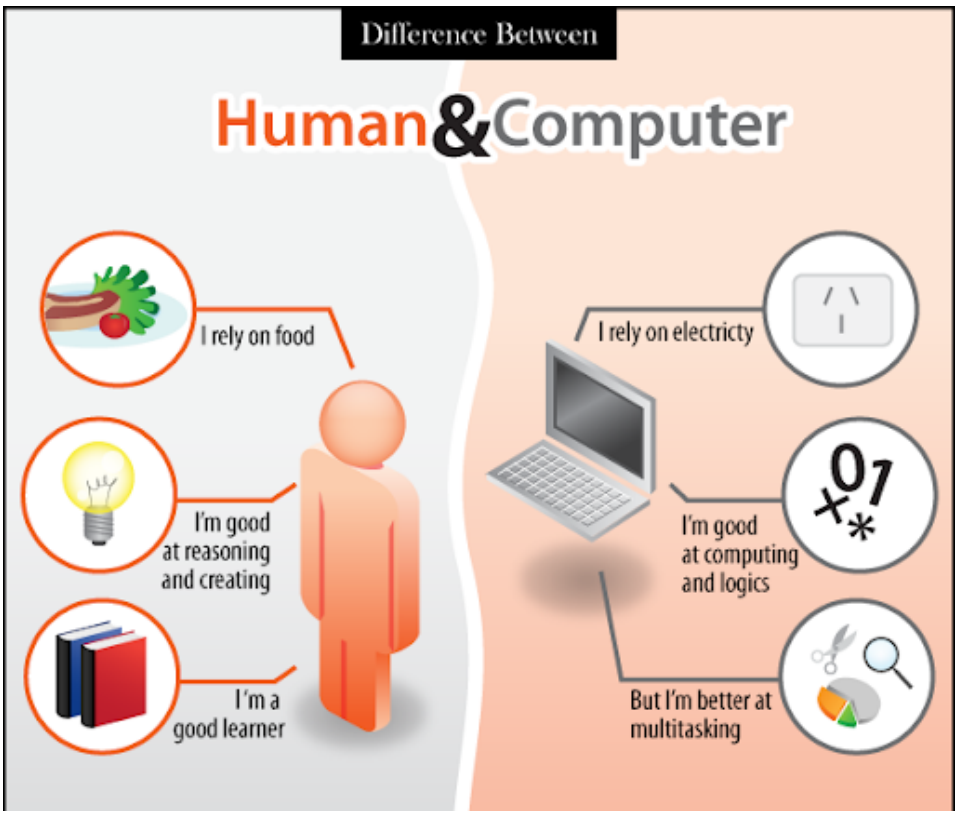
Everything you can **think** of can be seen as a learning process with time as you have grown but there is one thing that a cell or the brain cannot learn.
That is the ability to think. Yes, the time you were thinking to find the answer of this question, this ability to think is perhaps can't be learnt or trained. Something is driving that and we call it consciousness.

This is a hypothetical concept without any physical existence. Consciousness is what makes every person different otherwise if everyone is learning the same thing, everyone would have been the same. The opinions or perceptions every person makes comes through his/her conscious.

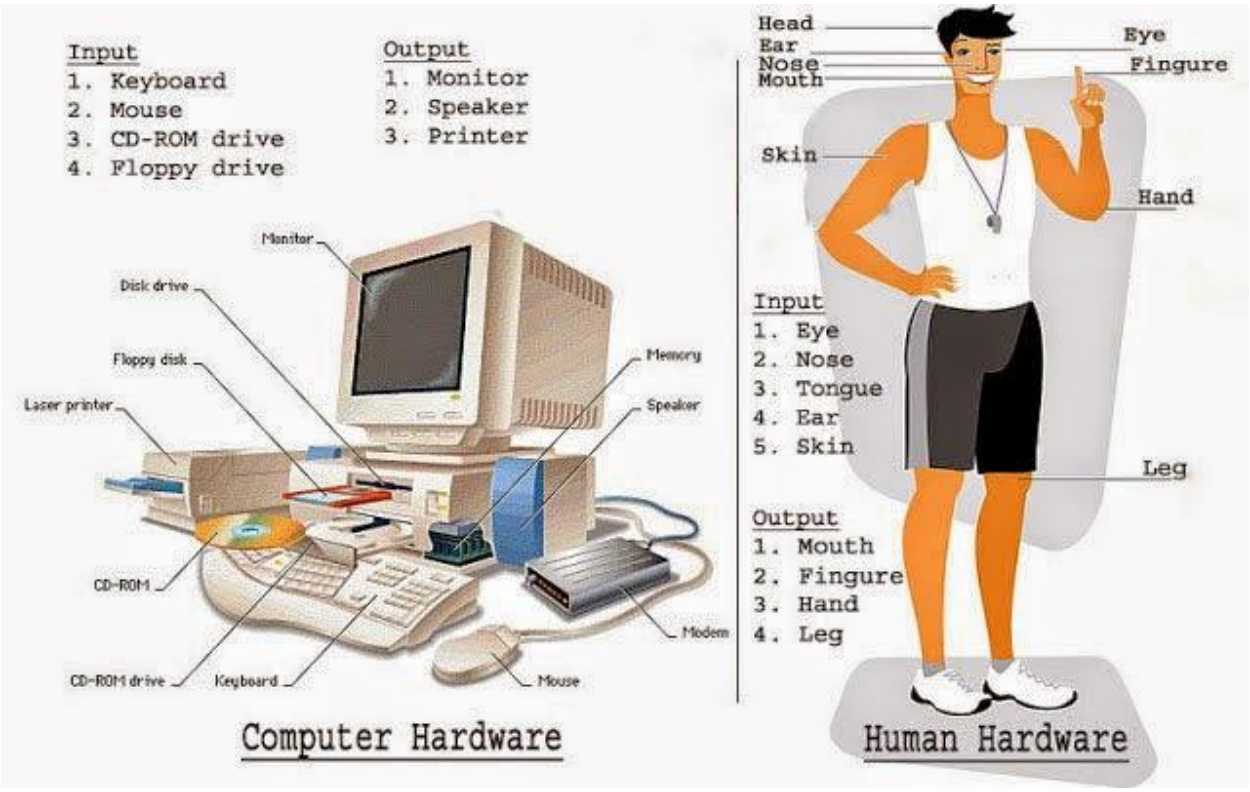
The feelings you feel for every other person and the physical emotions you have comes from consciousness.

All of the body parts along with the consciousness defines a Human and this is how a human works in day to day life.

How does a Computer work?



Everything in a computer is similar to the human brain except consciousness. Computer takes its power from electric energy and just like the body parts, it has following parts:



Input parts:

Some of the input parts with their ~~images and~~ functions are as follows:

- Keyboard
- Mouse
- Camera
- Microphone
- Scanner, etc.

https://www.tutorialspoint.com/computer_fundamentals/computer_input_devices.htm

Output parts:

Major output parts with their ~~images and~~ functions are as follows:

- Display
- Printer

https://www.tutorialspoint.com/computer_fundamentals/computer_output_devices.htm

Internal parts:

The two main parts of the computer are:

- Memory

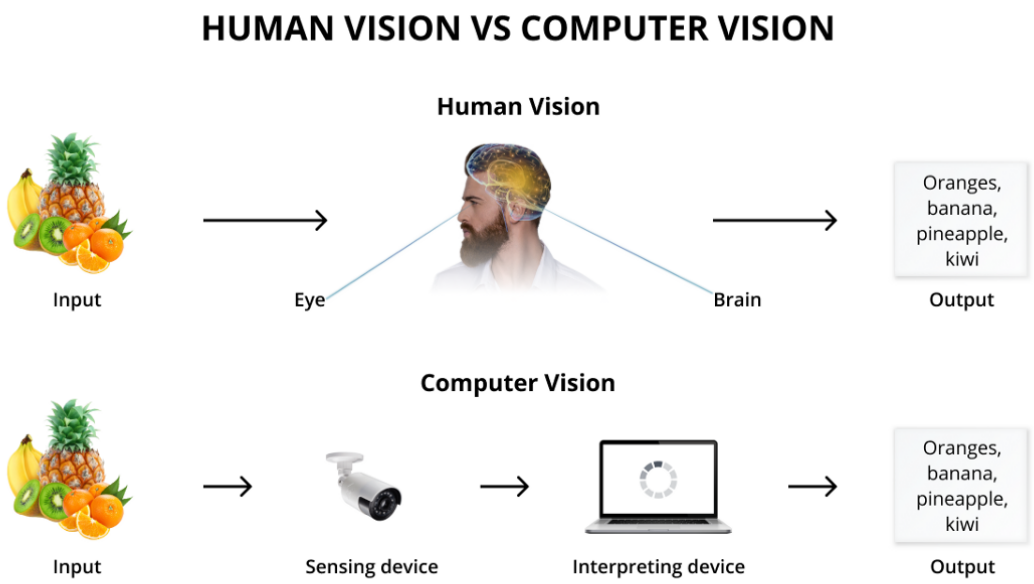
Our brain has an inbuilt mechanism of storing the things that we are learning day by day and even to filter out the non important things but in computers we have to store the data in memory made up of silicon.

- CPU

Central processing unit is the brain of the computer where the processing happens.

Just like the cell of the brain, the computer on the minimalistic lever works on the principles of electrical signal. The logic is simple if current is flowing it's a YES else NO. Hence, the computer is a digital machine, it understands only 1 and 0.

Now, you are the consciousness of the computer. Yes, you the human and your ability to think gives the computer power to think. Till now, artificial intelligence has not reached the level where computers can think and if that happens, you can't imagine what could happen to this world.



So, whatever parts we have discussed till now are called hardwares. The other category is called softwares through which we interact with the hardwares and tell or teach computers what to do or how to do.

A software is a sequence of programs written by a human and fed to the CPU to execute the intended functions. So, you can not touch, see, feel the software, it's just there like the consciousness.

Going ahead, we will only be talking about softwares and that is what computer science is all about.

Since the computer lacks consciousness, it can't take any decisions on its own and we have to give him tasks. We give tasks to the computer in the form of programs and that's why we need

programming languages. In the next module we will study in detail about the different kinds of programming languages.