Week 1

Introduction to Computer Science

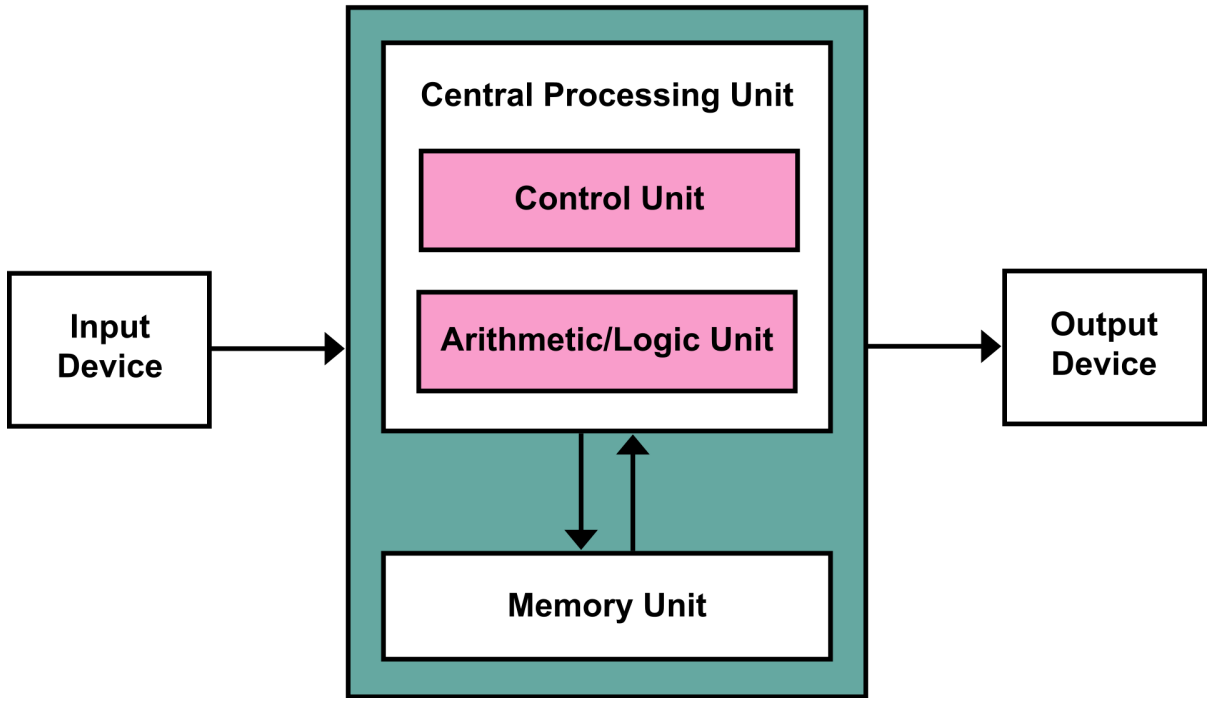
What is a computer?

A **computer** is a machine that can be programmed to carry out sequences of arithmetic or logical operations (computation) automatically. (Wikipedia)

What are the components of a computer?

- Central Processing Unit (CPU)
  - Arithmetic Logic Unit (ALU): Add, Subtract, Multiply, Divide, Compare
  - Control Unit (CU): Fetch, Decode, Execute
- Memory
  - Random Access Memory (RAM). Main memory of the computer. Where the program and data are stored to be executed by the CPU. Volatile.
  - Hard disk. Secondary memory of the computer. Where the program and data are stored to be executed by the CPU. Non-volatile.
- Input/Output
  - Input: Keyboard, Mouse, Touchscreen, Microphone, Camera, etc.
  - Output: Monitor, Printer, Speakers, etc.

Von Neumann Architecture



What language does a computer speak?

Computers speak in **Binary** which is a **base 2** number system. It uses only **0 and 1** to represent numbers which is easy to represent with electrical circuits, 0 is off and 1 is on.

Decimal: Base 10

Position	Weight
Ones	10^0
Tens	10^1
Hundreds	10^2
Thousands	10^3
Ten-thousands	10^4

235 = (2 _ 10^2) + (3 _ 10^1) + (5 * 10^0)

235 = 200 + 30 + 5

Binary: Base 2

Position	Weight
Ones	2^0
Twos	2^1
Fours	2^2
Eights	2^3
Sixteens	2^4

7 = (1 _ 2^2) + (1 _ 2^1) + (1 * 2^0)

7 = 4 + 2 + 1

What is Programming?

Programming (coding) is the process of creating a set of instructions that tell a computer how to perform a task.

There are multiple programming languages that can be used to create these instructions. Such as Java, Python, JavaScript, C++, C, Assembly, etc.

In this course we are going to use the **Java language**, a **high-level** programming language.

Different types of programming languages:

- **Low-level** programming languages are closer to machine language. They are harder to read and write than high-level languages. Examples are Assembly and C.
- **High-level** programming languages are closer to human language. They are easier to read and write than low-level languages. Examples are Java, Python, C++, JavaScript, etc.

Let's create our first Java program!

When programming you have to follow a set of rules called **syntax**. If you don't follow the syntax rules the program will not run.

Our first Java program will print "Hello World!" to the screen. The most famous program in the world!

```
System.out.println("Hello World!");
```

Java is case sensitive, so **System.out.println** is not the same as **system.out.println**.

Java programs need to be formatted in a specific way. For example, you can insert any number of spaces between two **tokens** (words, numbers, symbols) and the program will still run.

```
System.out.println(20+3);
System.out.println(20 + 3);
System.out.println(20 +3);
System.out.println(20+ 3);
```

Each one of these will print 23 to the screen.