

Lecture 01

Introduction

Mostafa Elhosseini

Professor at College of Computer Science and
Engineering

Taibah University

<https://youtube.com/drmelhosseini>

| What is a Computer?

- **Computer** can be any type of device that stores and processes data
- programmable electronic device designed to **accept data, perform** prescribed mathematical and logical operations at high speed, and **display** the results of these operations.
 - Mainframes, desktop and laptop computers, tablets, and smartphones are some of the different types of computers
- **Computers** can perform **calculations** and make logical **decisions** phenomenally faster than human beings can.
- Many of today's personal computers can perform **billions** of calculations in one second

| What is a Computer?

- Sunway TaihuLight **supercomputer** can perform in one second over 12 million calculations for every person on the planet
- Computers process data under the control of **sequences of instructions** called computer programs
- A computer consists of various devices referred to as **hardware**
 - Keyboard – Mouse – Harddisk – CPU – DVD - Memory
- Every year or two, the capacities of computers have approximately doubled inexpensively - Moore's Law, 1960s, Gordon Moore, co-founder of Intel

| What is Computer Hardware?

- Each type of computer has its own unique design, but internally they all share the same type of hardware
- **Input Units**
 - keyboards, touch screens and mouse devices
 - receiving voice commands, scanning images and bar codes, reading from secondary storage devices (such as hard drives, DVD drives, Blu-ray Disc™ drives and USB flash drives—also called “thumb drives” or “memory sticks”), receiving video from a webcam
 - Position data from GPS
 - Motion and orientation from an accelerometer
 - Kinect XBOX

| What is Computer Hardware?

■ Output Units

- Most information that's output from computers today is displayed on **screens** (including **touch screens**), printed on **paper**, played as **audio** or **video** on PCs and media players
- transmitted over the Internet or used to control other devices, such as robots and “intelligent” appliances
- Information is also commonly output **to secondary storage devices**, such as **solid-state drives** (SSDs), **hard drives**, DVD drives and **USB** flash drives. Popular recent forms of output are **smartphone** and **game-controller vibration**

| What is Computer Hardware?

■ Memory Unit

- temporarily stores information
- retains information that has been entered through the input unit
- The memory unit also retains processed information until it can be placed on output devices
- Information in the memory unit is volatile
- The **memory unit** is often called either **memory**, **primary memory** or RAM (Random Access Memory).
- Main memories on desktop and notebook computers contain as much as 128 GB of RAM, though 2 to 16 GB is most common.
- **GB** stands for **gigabytes**; a **gigabyte** is approximately **one billion bytes**. A **byte** is eight bits. A **bit** is either a 0 or a 1

| What is Computer Hardware?

- **Arithmetic and Logic Unit (ALU)**

- Performs calculations, such as addition, subtraction, multiplication and division.
- It also contains the decision mechanisms
- The ALU is implemented as part of the CPU

| What is Computer Hardware?

- **Central Processing Unit**

- coordinates and supervises the operation of the other sections
- Many of today's computers have multiple CPUs and, hence, can perform many operations simultaneously
- A multicore processor implements multiple processors on a single integrated-circuit chip

| References

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- Think Java: How to Think Like a Computer Scientist 1st Edition by Allen B. Downey, Chris Mayfield