Applications of Information and Communication Technology(ICT)

Lecture 1

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Lecture Outline

➢ Introduction

➢ Characteristics of Computer

➢ History and Generations of Computer

➢ Computer System and its Components

Information Technology ?

➢ Information Technology (IT) refers to the use, development, and management of technology and systems for the storage, retrieval, transmission, and manipulation of data. It encompasses a broad range of technologies, including computers, software, networks, databases, and electronic systems. The primary goal of Information Technology is to facilitate the efficient and effective processing of information in various forms.

➢ Information Technology plays a crucial role in modern society and is fundamental to the operations of businesses, government agencies, educational institutions, and individuals. It has evolved rapidly, contributing to advancements in various fields and influencing the way people communicate, work, and access information.

Key Component of Information Technology

- **Hardware:** This includes computers, servers, storage devices, and other physical equipment used for data processing.

- **Software:** Refers to the programs, applications, and operating systems that enable the execution of various tasks on hardware.

- **Networks:** Involves the communication infrastructure that enables the transfer of data between devices and systems. This can include local area networks (LANs), wide area networks (WANs), and the internet.

- **Databases:** Store and organize data in a structured manner, allowing for efficient retrieval and manipulation. Database management systems (DBMS) are used to manage these databases.

- **Cybersecurity:** Involves measures to protect IT systems, networks, and data from unauthorized access, attacks, and damage.

- **Cloud Computing:** Involves the delivery of computing services, including storage, processing power, and software, over the internet.

- **Information Systems:** Refers to the combination of hardware, software, data, people, and procedures that work together to process and manage information within an organization.

Introduction

- Information:
  - Knowledge obtain from investigation, study or instruction

- Communication:
  - Process in which two or more computers or devices transfer data, instructions, and information.

- Technology:
  - The application of scientific knowledge to the practical aims of human life.

Introduction (Conti..)

- Computer word derived from Latin language "Compute" which means to calculate.

  or

- Computer is a machine which takes Data (Input), Process it and make new readable Information (Output).

  or

- Computer is a machine or device that performs processes, calculations and operation based on instruction provided by a software or hardware programs.
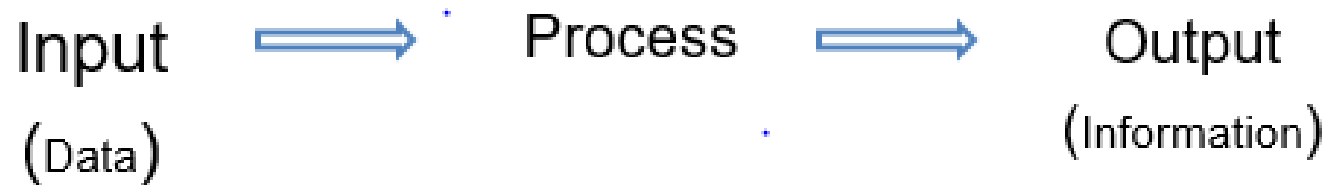
  or

- A computer is an electronic machine that can process data, store and retrieve data and performs calculations faster and efficiently that human.

How Computer Works ?

- Three main points of computer concept.

Input $\Longrightarrow$ Process $\Longrightarrow$ Output
(Data) (Information)

- Input
  - Give data or instruction to computer
- Process
  - Set of instructions stored in computer system
- Output
  - Set of results after processing the inputs

Characteristics of Computer

- There are some characteristics o Computer
  - Memory
  - Automation
  - Reliability
  - Versatility
  - Speed
  - Accuracy
  - diligence
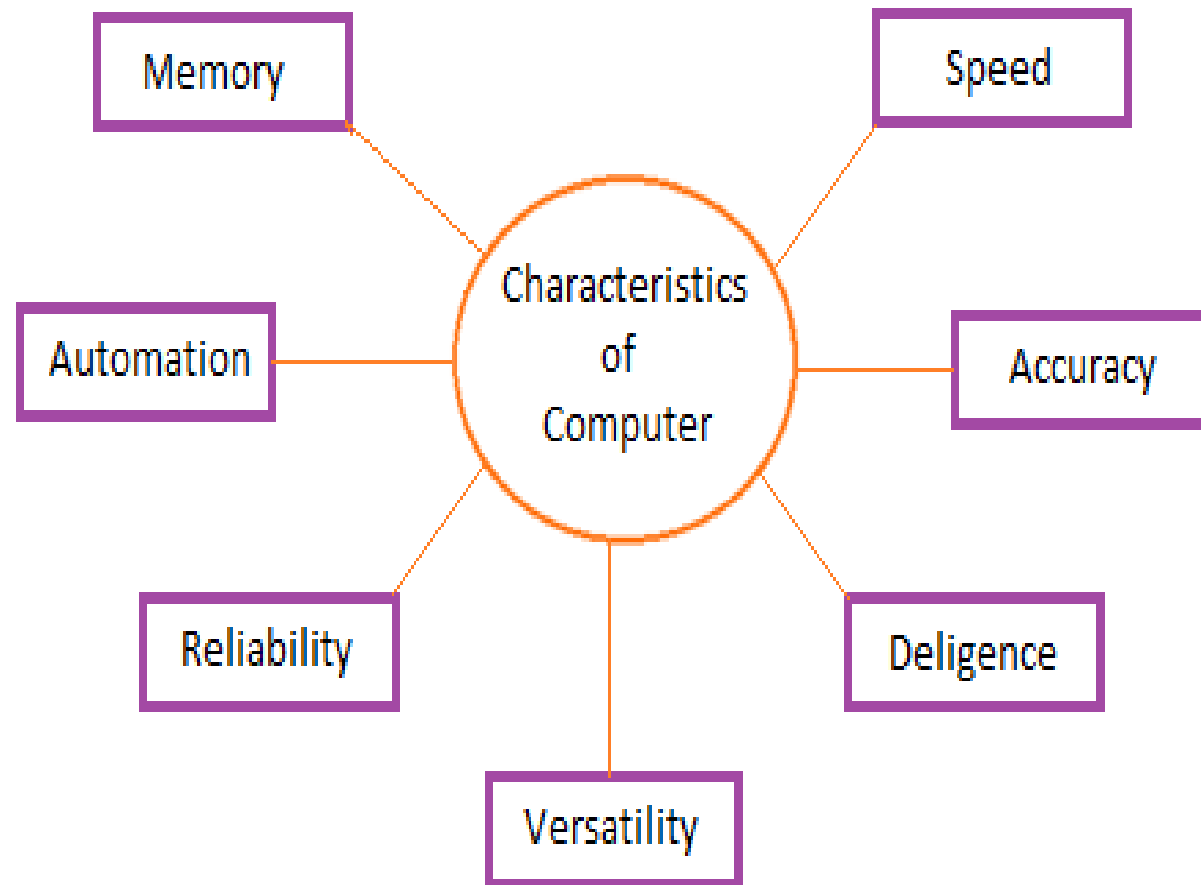
Characteristics of Computer (Conti..)

- Memory
  - Built-in memory called primary memory
  - Removable memory called secondary memory

- Automation
  - Accomplished using program
  - Complete a task with little human interaction

- Reliability
  - A computer is reliable as it gives consistent result for similar set of data i.e., if we give same set of input any number of times, we will get the same result.

- Versatility
  - Versatility refers to the capability of a computer to perform different kinds of works with same accuracy and efficiency.
 - Able to adapt or be adapted to many different functions or activities.

Characteristics of Computer (Conti..)

- Speed
  - A computer works with much higher speed and accuracy compared to humans while performing mathematical calculations. Computers can process millions (1,000,000) of instructions per second. The time taken by computers for their operations is microseconds and nanoseconds.

- Accuracy
  - Computers perform calculations with 100% accuracy. Errors may occur due to data inconsistency or inaccuracy.

- Diligence
  - A computer can perform millions of tasks or calculations with the same consistency and accuracy. It doesn't feel any fatigue or lack of concentration. Its memory also makes it superior to that of human beings.

History of Computer

- The first use of computer was recorded in 1613.

- Tally Stick
  - An ancient memory aid device to record and document number, quantities or even message.
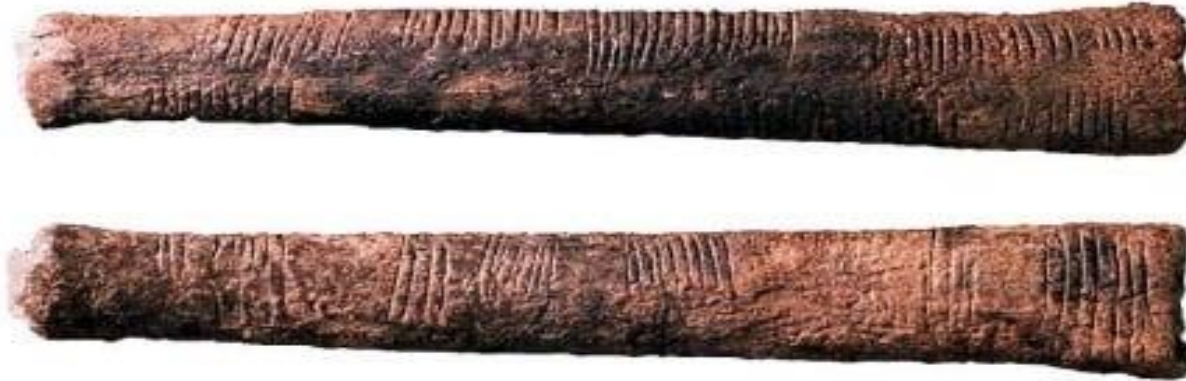
History of Computer (Conti..)

- Napier's Bones
    - Invented by John Napier in 1614
    - Allowed the operator to multiply, divide
    - Calculate Square and Cube roots by moving the rods

Source: https://en.wikipedia.org/wiki/Napier%27s_bones
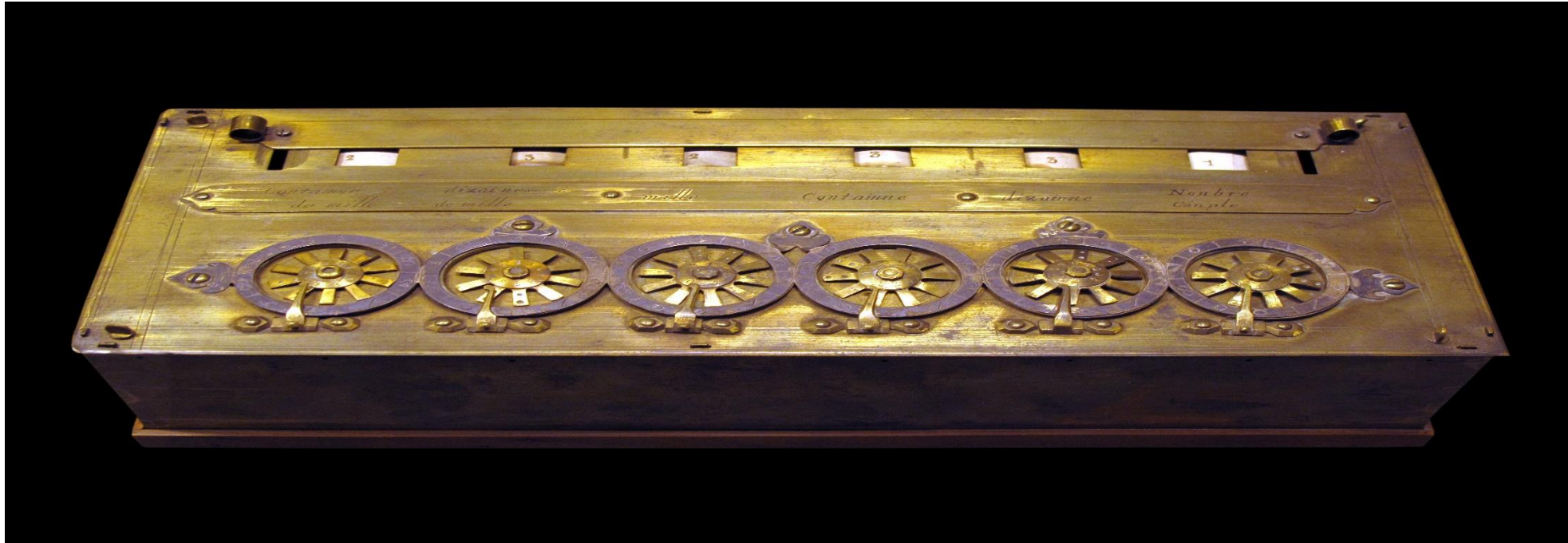
History of Computer (Conti..)

- Slide Rule
  - Invented by William oughtred in 1622
  - Based on Napier's idea
  - Used for Multiplication, division, roots, logarithm and trigonometry
  - Not normally used for addition and subtraction

Source: https://en.wikipedia.org/wiki/Slide_rule#/media/File:Sliderule.PickettN902T.agr.jpg
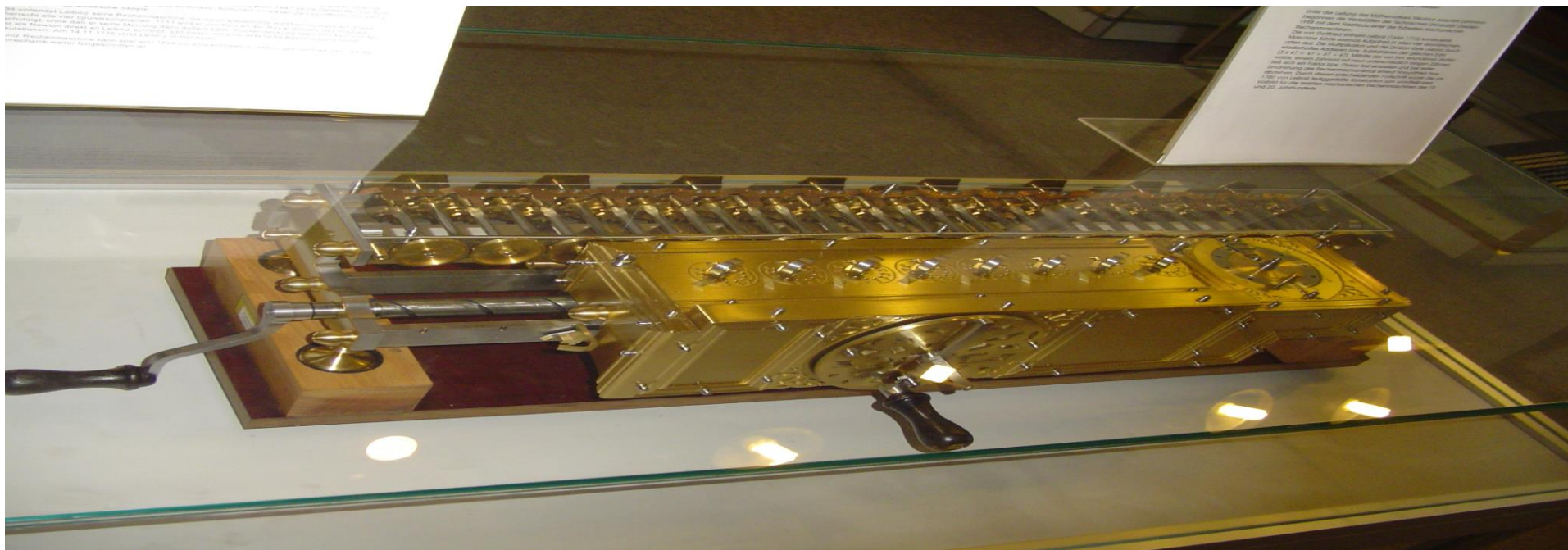
- Pascale
  - o Invented by Blaise Pascal in 1642
  - o It was its limitation for addition and subtraction
  - o It was too expensive

Source: https://en.wikipedia.org/wiki/Pascal%27s_calculator#/media/File:Pascaline-CnAM_823-1-IMG_1506-black.jpg
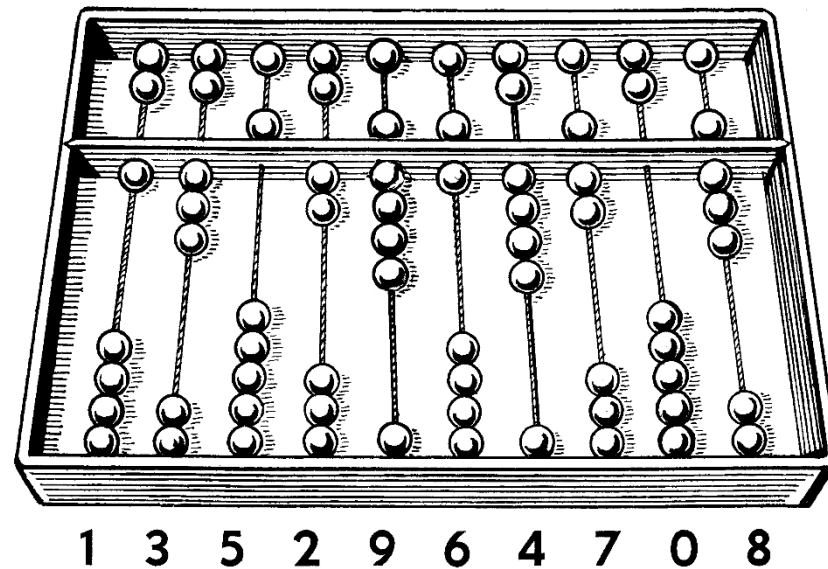
- Stepped Rockoner
    - o Invented by Gottfried Wilhelm Leibniz in 1672
    - o It can Add, Subtract, Multiply and Divide numbers automatically

Source: https://en.wikipedia.org/wiki/Stepped_reckoner#/media/File:Leibnitzrechenmaschine.jpg

- Abacus
  - o Invented in Babylonia in 2400 B. C.
  - o Performs basic arithmetic operations

Source: https://en.wikipedia.org/wiki/Abacus#/media/File:Abacus_(PSF).png

History of Computer (Conti..)

- First Computer Program
  - The first computer program was written by **Augusta Ada Byron** in 1840

Generations of Computer

- ## **First generation (1940-1956)**
  - o The first-generation computer had the following features and components

- Hardware
  - o The Hardware used in first generation computer was **Vacuum Tube** and **Punch Card**

- Feature
  - o It support machine language
  - o It had slow performance
  - o It occupied large space/size due to the use of vacuum tube
  - o It had a poor storage capacity
  - o It consumed a lot of electricity and generated a lot of Heat

Generations of Computer (Conti..)

- Memory
  - o The memory was 4000 bits

- Data Input
  - o The input was only provided through hard-wired programs in the computer, mostly through punched cards and paper tapes.

- Example
  - o ENIC (Electronic Numeric Integrator and Calculator)
  - o UNIVAC (Universal Automatic Computer 1)

Generations of Computer (Conti..)

- **Second generation (1956-1963)**
  - Several advancements in the first-gen computers led to the development of second-generation computers. Following are various changes in features and components of second-generation computers

- Hardware
  - The Hardware used in Second generation computer was **Transistor** and **Magnetic Tap**

- Feature
  - Batch Operating System (A Batch Operating System (BOS) is a computer system that allows multiple users to use it, without direct communication between them. It achieves this by keeping all users in separate 'batches', meaning they can't interact with each other directly)
  - Faster and Smaller in size
  - Reliable and energy efficient than the previous generation
  - Less costly than the previous generation

Generations of Computer (Conti..)

- Memory
  - The capacity of the memory was 32,000 bits

- Data Input
  - The input was provided by Punch Card

- Example
  - Honeywell 400
  - CDC 1604 (Control Data Corporation)
  - IBM 7030 (International Business Machine)

- **Third generation (1964-1971)**
  - o Following are the various components and features of the third-generation computers

- Hardware
  - The hardware used in the third generation of computers are
    - o Integrated Circuits made from semi-conductor materials
    - o Large capacity disks and magnetic tapes

- Feature
  - o Supports time-sharing OS (A time-sharing operating system is an operating system design that allows multiple users or processes to concurrently share the same system resources, such as the CPU, memory, and peripherals.)
  - o Faster, smaller, more reliable and cheaper than the previous generations
  - o Easy to access

Generations of Computer (Conti..)

- Memory
  - The capacity of the memory was 128,000 bits

- Data Input
  - The input was provided through keyboards and monitors

- Example
  - CDC 6600 (Control Data Corporation)
  - IBM 360/370 (International Business Machine)
  - PDP 8/11 (Programmed Data Processor)

Generations of Computer (Conti..)

- **Fourth generation (1972-2010)**
  - Following are the various components and features of the fourth-generation computers
- Hardware
  - The hardware used in the Fourth generation of computers are
    - ICs with Very Large-Scale Integration (VLSI) technology
    - Semiconductor memory
    - Magnetic tapes and Floppy
- Feature
  - Multiprocessing & distributed OS
  - Object-oriented high-level programs supported
  - Small & easy to use; hand-held computers have evolved
  - No external cooling required & affordable
  - This generation saw the development of networks and the internet
  - It saw the development of new trends in GUIs and mouse

Generations of Computer (Conti..)

- Memory
  - The capacity of the memory was 100 million bits

- Data Input
  - The input was provided through improved handheld devices, keyboard and mouse.

- Example
  - Apple II
  - VAX 9000 (Virtual Address eXtension)
  - CRAY 1 (super computers)

- **Fifth generation (2010-Present)**
  - o These are the modern and advanced computers. Significant changes in the components and operations have made fifth generation computers handy and more reliable than the previous generations.

- Hardware
  - The hardware used in the Fourth generation of computers are
    - o Integrated Circuits with VLSI (Very-Large Scale Integration) and Nano technology
    - o Large capacity hard disk with RAID (Redundant Array of Inexpensive Disks) support
    - o Powerful servers, Internet, Cluster computing

Generations of Computer (Conti..)

- Feature
    - Powerful, cheap, reliable and easy to use.
    - Portable and faster due to use of parallel processors and Super Large Scale Integrated Circuits.
    - Rapid software development is possible.

- Memory
    - The capacity of the memory is Unlimited

- Data Input
    - The input is provided through CDROM, Optical Disk and other touch and voice sensitive input devices.
- Example
    - IBM (International Business Machine)
    - Pentium
    - PARAM (PARAllel Machine)

Components of Computer System

- There are Two main component parts of Computer
    1. Hardware
    2. Software

- Hardware:
    o Physical parts of Computer system. Which we can see, and touch is called hardware. i.e., Keyboard, Mouse, Monitor, Printer

- Software:
    o Logical parts of computer system. Which we can see but can't touch.

Advantage of Computer

- Fast medium communication with compared to postal or telegraphs communication.

- Send any type of message or anything in written or photograph to any part of the world through internet facility.

- Download any type of material from the internet.

- Arithmetic problems can be easily sorted out through computer.

- A video conference a users can't only see each other, but they can talk to each other anywhere in the world.

Disadvantage of Computer

- Computer can't think and they can't do any job unless they are first programmed with specific instructions human being are design algorithms/programs for computer to perform a specific task.

- Computer can't decide. Computer is incapable of decision making as they do not possess the essential elements necessary to take a decision I: e Knowledge, Information, Intelligence and the ability to judge.

- Computer can't express their ideas. Computer can't express or explain any types of idea with human beings unless they are not programming it.

- Computer can't implement. Though/even computers are helpful in storage of data and can contain the contents of encyclopedia, but they can't implement any policies anywhere without human beings.

Recommended Book

- Rahman Ali and Asmat Ali (2021). Introduction to Computers and ICT (2nd Edition). Peshawar, Pakistan : Al-ilum Publication.