

# 1. Introduction to Computer

The word —computer comes from the word —compute, which means, —to calculate. Hence, people usually thinks of computer as a calculating device that can perform arithmetic operations at high speed. In fact, the original objective for inventing a computer was to create a fast calculating machine. A computer **is an electronic data processing device**, which accepts and stores data input, processes the data input, and generates the output in a required format. Informally, the full form of Computer can be perceived as Common Operating Machine Particularly Used for Trade Education and Research.

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If we look at it in a very broad sense, any digital computer carries out the following five functions:

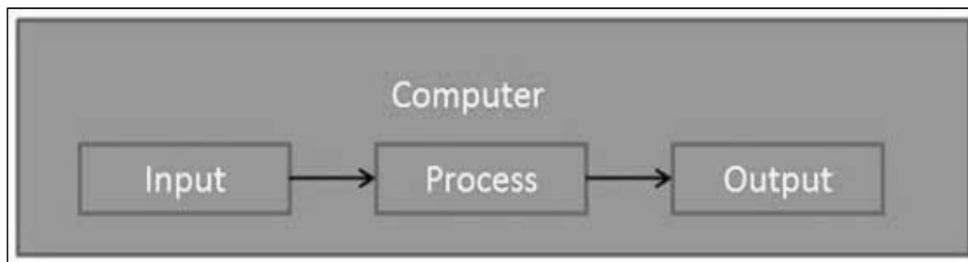
**Step 1** - Takes data as input.

**Step 2** - Stores the data/instructions in its memory and uses them as required.

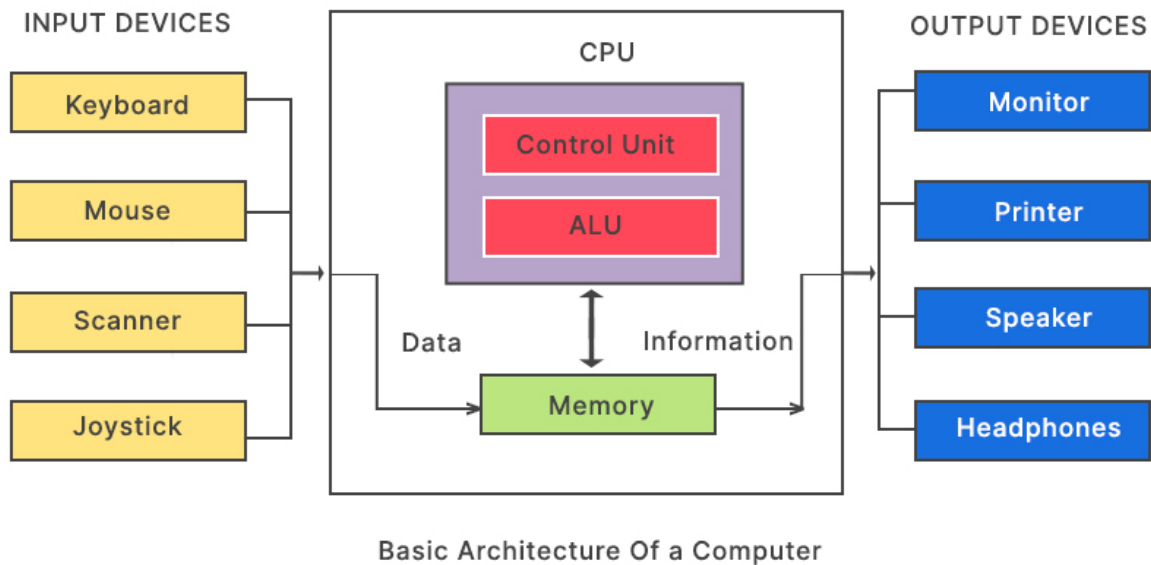
**Step 3** - Processes the data and converts it into useful information.

**Step 4** - Generates the output.

**Step 5** - Controls all the above four steps.



A more detail computer architecture:



**Hardware-** All the material parts of the computer

**Software-** Computer programs and instructions, not visible with sense organs.

**Peopleware-** People involved in using computer to perform given tasks.

## 2. Advantages/features of Computers

### -High Speed

- Computer is a very fast device.
- It is capable of performing calculation of very large amount of data.
- The computer has units of speed in microsecond, nanosecond, and even the picosecond.
- It can perform millions of calculations in a few seconds as compared to man who should spend many months to perform the same task.

Speed of CPU is measured in Hertz (Hz), KHZ, MHZ, GHZ.

1Hz= one cycle per second. 1KHZ=1000HZ, 1MHZ=1000 000Hz,

1GHZ=1000 000 000HZ (The speed of CPU of PCs is in MHz range)

### **Accuracy**

- In addition to being very fast, computers are very accurate.
- The calculations are 100% error free.
- Computers perform all jobs with 100% accuracy provided that the input is correct.

### **Storage Capability**

- Memory is a very important characteristic of computers.
- A computer has much more storage capacity than human beings.
- It can store large amount of data.
- It can store any type of data such as images, videos, text, audio, etc.

### **Diligence**

- Unlike human beings, a computer is free from monotony, tiredness, and lack of concentration.
- It can work continuously without any error and boredom.
- It can perform repeated tasks with the same speed and accuracy.

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## **Versatility**

- A computer is a very versatile machine.
- A computer is very flexible in performing the jobs to be done.
- This machine can be used to solve the problems related to various fields.
- At one instance, it may be solving a complex scientific problem and the very next moment it may be playing a card game.

## **Reliability**

- A computer is a reliable machine.
- Modern electronic components have long lives.
- Computers are designed to make maintenance easy.

## **Automation**

- Computer is an automatic machine.
- Automation is the ability to perform a given task automatically. Once the computer receives a program i.e., the program is stored in the computer memory, then the program and instruction can control the program execution without human interaction.

## **Reduction in Paper Work and Cost**

- The use of computers for data processing in an organization leads to reduction in paper work and results in speeding up the process.
- As data in electronic files can be retrieved as and when required, the problem of maintenance of large number of paper files gets reduced.
- Though the initial investment for installing a computer is high, it substantially reduces the cost of each of its transaction.

## **Disadvantages of Computers**

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Following are certain disadvantages of computers.

### **No I.Q.**

- A computer is a machine that has no intelligence to perform any task.
- Each instruction has to be given to the computer.
- A computer cannot take any decision on its own.

### **Dependency**

- It functions as per the user's instruction, thus it is fully dependent on humans.

### **Environment**

- The operating environment of the computer should be dust free and suitable.

### **No Feeling**

- Computers have no feelings or emotions.
- It cannot make judgment based on feeling, taste, experience, and knowledge unlike humans.

## **3. Development History**

Blais Pascal invented the first mechanical adding machine in 1642. Later, in the year 1671, Keyboard machines originated States around 1880 and we use them even today. Around the same period, Herman Hollerith came up with concept of punched cards that were extensively used as input medium in computers even in late 1970s. Machines and calculators made their appearance in Europe and America towards the end of the century.

Charles Babbage, a nineteenth century Professor at Cambridge University, is considered the father of modern digital computers. In order to have a better idea of the evolution of computers it is worthwhile to discuss of the well-known early computers. These are as follows:

1. The Mark-I Computer (1937-44). Also known as Automatic Sequence Controlled calculator, this was the first fully automatic calculating machine designed by

Howard A. Aiken of Harvard University in collaboration with IBM (International Business Machines) Corporation. It was an electro-mechanical

device (used both electronic and mechanical components) based on the techniques already developed for punched card machines.

2. The Atanasoff-Berry Computer (1939-42). Dr. John Atanasoff developed an electronic machine to solve certain mathematical equations. The machine was called the Atanasoff-Berry Computer, or ABC, after its inventor's name and his assistant, Clifford Berry. It used 45 vacuum tubes for internal logic and capacitors for storage.

3. The ENIAC (1943-46). The Electronic Numerical Integrator And Calculator (ENIAC) was the first all electronic computer. It was constructed at the Moore School of Engineering of the University of Pennsylvania, U.S.A. by a design team led by Professors J. Presper Eckert and John Mauchly.

The team developed ENIAC because of military needs. It was used for many years to solve ballistic related problems. It took up wall space in a 20 x 40 square feet room and used 18,000 vacuum tubes it could add two numbers in 200 microseconds and multiply them in 2000 microseconds.

Did You Know?

Baron Gottfried Wilhelm von Leibniz of Germany invented the first calculator for multiplication.

4. The EDVAC (1946-52). A major drawback of ENIAC was that its programs were wired on boards that made it difficult to change the programs. Dr. John Von Neumann later introduced the —stored program|| concept that helped in overcoming this problem. The basic idea behind this concept is that a sequence of instructions and data can be stored in the memory of a computer for automatically directing the flow of operations. This feature considerably influenced the development of modern digital computers because of the ease with which different programs can be loaded and executed on the same computer. Due to this feature, we often refer to modern digital computers as stored program digital computers. The Electronic Discrete Variable Automatic Computer (EDVAC) used the stored' program concept in its design. Von Neumann also has a share of

the credit for introducing the idea of storing both instructions and data in binary form (a system that uses only two digits - 0 and 1 to represent all characters), instead of decimal numbers or human readable words.

5. The EDSAC (1947-49). Almost simultaneously with EDVAC of U.S.A., the Britishers developed the Electronic Delay Storage Automatic Calculator (EDSAC). The machine executed its first program in May 1949. In this machine, addition operations took 1500 microseconds and multiplication operation: took 4000 microseconds. A group of scientists headed by Professor Maurice Wilkes at the Cambridge University Mathematical Laboratory developed this machine.

6. The UNIVAC I (1951). The Universal Automatic Computer (UNIVAC) was the first digital computer that was not —one of a kind. Many UNIVAC machines were produced, the first of which was installed in the Census Bureau in 1951 and was used continuously for 10 years. In 1952, the International Business Machines (IBM) Corporation introduced the IBM-701 commercial computer. In rapid succession, improved models of the UNIVAC I and other 700-series machines were introduced. In 1953, IBM produced the IBM-650, and sold over 1000 of these computers.

Did You Know?

UNIVAC marked the arrival of commercially available digital computers for business and scientific applications and was developed by General Electric Corporation in 1954.

## 4. Computer Generations

Sr. No.	Generation & Description
1	<b><u>First Generation</u></b> The period of first generation: 1946-1959. Vacuum tube based.
2	<b><u>Second Generation</u></b> The period of second generation: 1959-1965. Transistor based.
3	<b><u>Third Generation</u></b> The period of third generation: 1965-1971. Integrated Circuit based.
4	<b><u>Fourth Generation</u></b> The period of fourth generation: 1971-1980. VLSI microprocessor based.
5	<b><u>Fifth Generation</u></b> The period of fifth generation: 1980-onwards. ULSI microprocessor based.

### First generation:

The computers of first generation used vacuum tubes as the basic components for memory and circuitry for CPU (Central Processing Unit). These tubes, like electric bulbs, produced a lot of heat and the installations used to fuse frequently. Therefore, they were very expensive and only large organizations were able to afford it. In this generation, mainly batch processing operating system was used. Punch cards, paper tape, and magnetic tape was used as input and output devices. The computers in this generation used machine code as the programming language.





## **Second Generation Computers**

The period of second generation was from 1959-1965. In this generation, transistors were used that were cheaper, consumed less power, more compact in size, more reliable and faster than the first generation machines made of vacuum tubes. In this generation, magnetic cores were used as the primary memory and magnetic tape and magnetic disks as secondary storage devices.

In this generation, assembly language and high-level programming languages like FORTRAN, COBOL were used. The computers used batch processing and multiprogramming operating system.



## **Third Generation Computers**

The period of third generation was from 1965-1971. The computers of third generation used Integrated Circuits (ICs) in place of transistors. A single IC has many transistors, resistors, and capacitors along with the associated circuitry.

The IC was invented by Jack Kilby. This development made computers smaller in size, reliable, and efficient. In this generation remote processing, time-sharing, multi-programming operating system were used. High-level languages (FORTRAN-II TO IV, COBOL, PASCAL PL/1, BASIC, ALGOL-68 etc.) were used during this generation.



### **Fourth Generation Computers**

The period of fourth generation was from 1971-1980. Computers of fourth generation used Very Large Scale Integrated (VLSI) circuits. VLSI circuits having about 5000 transistors and other circuit elements with their associated circuits on a single chip made it possible to have microcomputers of fourth generation.

Fourth generation computers became more powerful, compact, reliable, and affordable. As a result, it gave rise to Personal Computer (PC) revolution. In this generation, time sharing, real time networks, distributed operating system were used. All the high-level languages like C, C++, DBASE etc., were used in this generation.



## Fifth Generation Computers

The period of fifth generation is 1980-till date. In the fifth generation, VLSI technology became ULSI (Ultra Large Scale Integration) technology, resulting in the production of microprocessor chips having ten million electronic components.

This generation is based on parallel processing hardware and AI (Artificial Intelligence) software. AI is an emerging branch in computer science, which interprets the means and method of making computers think like human beings. All the high-level languages like C and C++, Java, .Net etc., are used in this generation.

Computers can be broadly classified by their speed and computing power.

Sr. No.	Type	Specifications
1	PC (Personal Computer)	It is a single user computer system having moderately powerful microprocessor
2	Workstation	It is also a single user computer system, similar to personal computer however has a more powerful microprocessor
3	Mini Computer	It is a multi-user computer system, capable of supporting hundreds of users simultaneously.
4	Main Frame	It is a multi-user computer system, capable of supporting hundreds of users simultaneously. Software technology is different from minicomputer.
5	Supercomputer	It is an extremely fast computer, which can execute hundreds of millions of instructions per second.

## Application of computers in various fields

## Business

A computer has high speed of calculation, diligence, accuracy, reliability, or versatility which has made it an integrated part in all business organizations.

Computer is used in business organizations for:

- Payroll calculations
- Budgeting
- Sales analysis
- Financial forecasting
- Managing employee database
- Maintenance of stocks, etc.



## Banking

Today, banking is almost totally dependent on computers.

Banks provide the following facilities:

- Online accounting facility, which includes checking current balance, making deposits and overdrafts, checking interest charges, shares, and trustee records.
- ATM machines which are completely automated are making it even easier for customers to deal with banks.



## Healthcare

Computers have become an important part in hospitals, labs, and dispensaries. They are being used in hospitals to keep the record of patients and medicines. It is also used in scanning and diagnosing different diseases. ECG, EEG, ultrasounds and CT scans, etc. are also done by computerized machines.

Following are some major fields of health care in which computers are used.

- **Diagnostic System** - Computers are used to collect data and identify the cause of illness.
- **Lab-diagnostic System** - All tests can be done and the reports are prepared by computer.
- **Patient Monitoring System** - These are used to check the patient's signs for abnormality such as in Cardiac Arrest, ECG, etc.
- **Pharma Information System** - Computer is used to check drug labels, expiry dates, harmful side effects, etc.
- **Surgery** - Nowadays, computers are also used in performing surgery.



## Engineering Design

Computers are widely used for Engineering purpose.

One of the major areas is CAD (Computer Aided Design) that provides creation and modification of images. Some of the fields are:



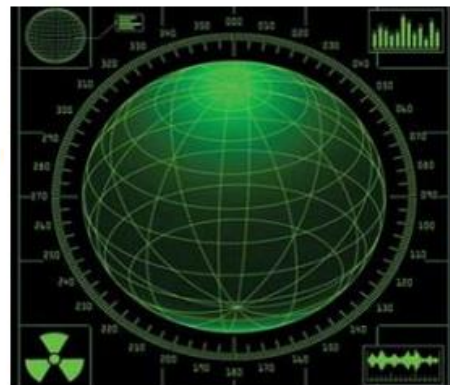
- **Structural Engineering** - Requires stress and strain analysis for design of ships, buildings, bridges, airplanes, etc.
- **Industrial Engineering** - Computers deal with design, implementation, and improvement of integrated systems of people, materials, and equipment.
- **Architectural Engineering** - Computers help in planning towns, designing buildings, determining a range of buildings on a site using both 2D and 3D drawings.



## Military

Computers are largely used in defence. Modern tanks, missiles, weapons, etc. Military also employs computerized control systems. Some military areas where a computer has been used are:

- Missile Control
- Military Communication
- Military Operation and Planning
- Smart Weapons



## Communication

Communication is a way to convey a message, an idea, a picture, or speech that is received and understood clearly and correctly by the person for whom it is meant. Some main areas in this category are:

- E-mail
- Chatting
- Usenet
- FTP
- Telnet
- Video-conferencing



## Government

Computers play an important role in government services. Some major fields in this category are:

- Budgets
- Sales tax department
- Income tax department
- Computation of male/female ratio
- Computerization of voters lists
- Computerization of PAN card
- Weather forecasting

