

INTRODUCTION TO INFORMATION TECHNOLOGY AND COMPUTERS.

Information technology refers to the use of computer systems, digital devices, software and networks to store, retrieve, process and transmit information. In finance, IT is the backbone of market data pipelines, algorithmic trading, infrastructure, risk aggregation platforms and portfolio optimization environment.

A computer is an electronic machine capable of executing arithmetic and logical operations automatically according to programmed instructions.

TYPES OF COMPUTERS.

Computers come in various categories based on size, processing capability and purpose. Classification of computers can be done according to performance, architecture portability and intended application.

1. Supercomputer- it is extremely fast, powerful and capable of performing trillions of calculations per second. Used for climate simulations, nuclear research, space exploration and advanced scientific modeling.

2. Mainframe computers- large and has a multi-user computer system designed for high volume data processing. Used in banks, airlines and government agencies for transaction processing and large databases.

3. Minicomputer- a mid-sized system that is more powerful than a microcomputer but smaller than a mainframe. Used in laboratories, research facilities.

4. Microcomputer (personal computers)- small, affordable computer intended for personal use.

CLASSIFICATION OF COMPUTERS BY SIZE AND POWER.

- Personal computer (PC)- single user, microprocessor based.
- Work station- single-user, large RAM.
- Minicomputer- Multiprocessing, mid-range power.
- Mainframe-High reliability, high concurrency.
- Super computer-extremely fast, parallel compute.

MAJOR COMPONENTS OF A COMPUTER.

a) Central Processing Unit (CPU)

- Brain of the computer responsible for executing instructions, performing calculations and controlling other components.

b) Random Access Memory (RAM)

- It is temporary memory used for storing active data and instructions being accessed by the CPU. It is volatile and clears when powered off. Adding more RAM in a computer enhances the system performance. Maximum amount of RAM that can be installed is limited by the motherboard.

c) Hard Disk Drive (HDD)

- Use magnetic platter to store data permanently. It provides large capacity at a lower cost.

d) Solid state devices (SSD)

- Stores data electronically using flash memory. Provides faster speeds, reliability and durability.

e) Motherboard

-It is the central circuit board that connects all components and allows communication between them.

f) Power supply unit (PSU)

-Converts AC electricity from the wall into usable DC power for computer components.

g) Graphics Processing Unit (GPU)

-Is specialized for graphics rendering and parallel computations.

h) Input devices

-Devices used to enter data into the computer example keyboards, mouse, joystick.

i) Output devices

-Devices that display results such as monitors, speakers, headphones and printers. Output devices takes binary information from the computer and converts it into a form that is easily understood by the user.

Computer Hardware Basics

-Hardware forms the tangible foundation of computing systems. Without hardware software cannot function.

Definition

-Hardware refers to all physical parts of a computer system including processors, memory, storage, input/output devices and peripherals.

Importance- hardware determines system speed, functionality, reliability and efficiency.

Application- used in data centers, personal computer, servers, robotics, industrial machines and research equipment.

Computer software basics.

-Software enables computers to perform meaningful tasks by providing instructions and user interfaces.

-Covers the type of software, statistical software tools and programming tools like python, R.

-Python is taught here because it is a software tool used for statistical analysis.

Definition

-Software refers to programs that operate hardware and allows users to execute tasks such as computation, communication, and data processing.

Importance- without software, hardware is non-functional. Software controls operations, manages hardware resources and enables problem solving.

Application- used in spreadsheets, operating systems browsers, mobile apps, databases and cloud computing services.

System software

-Used to manage and operate the computer hardware.

a) Operating system (OS)

Functions:

-Manages hardware.

-Provides user interface.

-Manages files and folders.

b) Utility programs

-Helps maintain and protect the system.

Application Software

-Used to perform specific tasks for the user.

a) General Purpose Software

-Microsoft word-documentation.

-Microsoft excel spreadsheets.

-Power point-presentations.

-Web browsers-chrome

b) Specialized statistical software

-Used for statistical analysis and data processing python, SPSS, SAS.

Types of software.

-Classification of software into groups based on roles.

System software- controls hardware and manages system operations. Includes operating systems, device drivers and utilities.

Operating system (OS)- manages hardware resources and provides an interface between the user and computer e.g Windows.

Utility software- performs maintenance tasks such as antivirus scanning, file management, disk cleanup and optimization.

Application software- programs designed for specific tools such as word processing, game etc.

Programming software- tools used to write debug and test programs includes compilers, interpreters and IDEs like VS code.

Mobile application software- apps developed for smartphones and tablets.

Web-based software- software accessed over the internet through a browser such as Doc and Gmail.

AI and Data Analysis software- programs for statistical analysis and machine learning including python.

Software library.

Collection on pre written code, routines, functions, classes or resources that developers and applications can reuse to perform common tasks.

Programming libraries.

1.Pandas -used for data frame manipulation.

-imported as pd

2.Matplotlib- data visualization

-imported as plt

3.Plotly-data visualization

-imported as px

4.Seaborn- data visualization

- imported as sns

5.Numpy- numerical computation

- imported as np

Data and data files.

-Data serves as the foundation for statistics, computing and information systems.

-It covers types of data, file formats (CSV, XLSX, TXT) how data is stored and organized.

-No programming language.

Definition.

-Data refers to raw facts that have not yet been processed.

-Data files are digital containers used to store structured and unstructured information.

Importance.

-Reliable data is essential for accurate statistical analysis, decision-making and information management.

Disk storage fundamentals.

-Disk storage fundamentals involve understanding how data is stored on physical disks.

-Disk storage supports the permanent preservation of data and fast access to files and application.

Definition -disk storage refers to devices such as HDDs, SSDs and cloud storage platforms used for long term data retention.

Importance- storage drives determine data access speed, reliability and system performance.

Application -used in backup systems, cloud storage, data bases, enterprise servers, multimedia libraries and personal computers.

Disk storage – disk storage devices like hard disk drives HDDs or Solid State drives SSDs, store data on physical media.

Data retrieval- when you access data, the disk storage device reads or writes the data to the physical media.

How disk storage works.

Data is written to concentric circles called tracks on the disk surface. Each track is divided into small segments called sectors which are the smallest addressable units of storage.

Types of disk storage.

Hard disk drives (HDDs)-traditional disk storage devices that use spinning disks and mechanical heads to read/write data.

- It has magnetic platters with write heads that move

- High capacity, relatively low cost per byte

- Mechanical nature implies slower access time.

Solid state drives (SSDs)-flash based storage devices that store data in interconnected flash memory chips.

No moving parts-much faster access.

Increasingly used in data analysis machines for speed.

Advantages.

High capacity-disk storage devices can store large amount of data.

Cost effectiveness -disk storage is generally more affordable than other storage options like RAM.

Non-volatile-data is retained even when power is turned off.

Disadvantages.

Mechanical failure-HDDs are prone to mechanical failure due to moving parts.

Limited lifespan-SSDs have a limited number of write cycles before they start to degrade.

Data fragmentation- data can become fragmented leading to performance issues.

The bus.

The bus is the communication backbone linking CPU, memory, storage and I/O systems.

A computer bus consists of a set of parallel wires connecting the processor to the other devices of the computer.

Three major types of computer buses.

1. Data bus- it is a bi-directional(2-way) bus which carries information and data to and from the processor.

- it usually carries data for processing.

NB; The data bus determines the bus width of the microprocessor (microcomputers use it and they usually have all the required functions on one chip). Its size indicates the moving capability of information of the chip.

2. Address bus- it is unidirectional(1-way) bus from the processor to the external devices.

- usually contains the address of the memory location or device to be acted on.

- the size of the address bus tells you how much memory the chip can handle.

3. Control bus- it is a unidirectional(1-way) bus that carries command signals from the processor.

These signals are necessary to coordinate the activities of the entire system.

NB; Buses are implemented as actual communication lines. They may be internal buses, which are usually laid down as a circuit on the chip itself, or they may be external buses implemented as cables.

MEASURING THE MEMORY SIZE OF A COMPUTER.

The size of a computer's memory is the no. of units of storage it contains. The unit of storage can be a Bit, a Byte or a Word.

A Bit- is the smallest unit of storage and can be used to store a 0 or a 1.

-used to measure data transfer speeds eg megabits.

A Byte- is a unit of data in most computer systems that consists of 8 bites.

Bytes are used for storage.

A character is any letter, digit or symbol which can be obtained by pressing a key on the keyboard.

A word is a collection of bits. The number of bits in a word is called the word size.

Memory sizes		Characters
1 Byte	A group of bites	1
1 Kilobyte (KB).	1,000 bytes	1,024
1Megabyte (MB).	1,000,000 bytes	1,048,576
1Gigabyte (GB).	1,000,000,000 bytes	1,073,741,824
1 Terabyte (Tera).	1,000,000,000,000 bytes	1,099,511,627,776

