INTRODUCTION TO COMPUTER

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From Abacus to AI: A Journey Through Computer Fundamentals

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- What is a Computer?
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INTRODUCTION TO COMPUTING

Objectives of the Course:

- Understand foundational concepts in computing.
- Develop problem-solving skills through algorithms and programming.
- Learn about key computer science sub-fields and their real-world applications.
- Gain hands-on experience with basic computing tools and techniques.

MAJOR SUB-FIELDS OF COMPUTER SCIENCE

- **Artificial Intelligence (AI):** Machines mimicking human intelligence. **Usage:** Voice assistants, self-driving cars.
- **Data Science:** Analyzing large datasets to extract insights. **Usage:** Business analytics, healthcare predictions.
- **Cybersecurity:** Protecting systems and data from attacks. **Usage:** Secure online banking, privacy protection.
- **Software Engineering:** Designing and developing software. **Usage:** Apps, operating systems.
- **Human-Computer Interaction (HCI):** Enhancing usability of technology. **Usage:** Smartphone interfaces, VR systems.

OVERVIEW OF COMPUTER FUNDAMENTALS

- Definition
- Importance
- Evolution of computers

OVERVIEW OF COMPUTER FUNDAMENTALS

- **Definition of Computers:** Computers are electronic devices capable of receiving, processing, and storing data to perform various tasks and calculations. They consist of hardware components and software programs that work together to process information.

OVERVIEW OF COMPUTER FUNDAMENTALS

- **Importance of Computers:** Computers have become an essential part of our daily lives, revolutionizing the way we work, communicate, access information, and solve problems. They enable us to automate tasks, increase productivity, enhance communication, and access a vast amount of information.

HIGHLIGHTING THE IMPORTANCE OF COMPUTERS

- **Automation and Efficiency:** Computers automate routine tasks and processes, significantly improving efficiency and productivity. They can perform complex calculations, process large amounts of data, and execute repetitive tasks with high accuracy and speed, saving time and effort.
- **Information Access and Communication**: Computers provide access to a vast amount of information through the internet. They enable quick and convenient communication through email, instant messaging, video calls, and social media platforms, connecting people globally and facilitating knowledge sharing.
- **Education and Learning:** Computers play a crucial role in education, providing access to digital resources, online courses, and interactive learning platforms. They enhance educational experiences through multimedia content, simulations, and virtual reality tools. Computers also enable distance learning, making education accessible to individuals regardless of their geographical location.
- **Business and Industry:** Computers are essential for businesses of all sizes. They facilitate efficient management of operations, including inventory control, financial transactions, and customer relationship management. Computers also enable businesses to analyze data, make informed decisions, and improve overall productivity.
- **Research and Innovation:** Computers empower researchers and scientists to conduct complex simulations, analyze vast datasets, and develop advanced models and algorithms. They are instrumental in various fields, including scientific research, medicine, engineering, and environmental studies, fostering innovation and progress.
- **Creative Expression and Entertainment:** Computers enable artistic expression through graphic design, music production, video editing, and digital art. They also provide entertainment through gaming, streaming platforms, and multimedia experiences.
- **Personal and Everyday Use:** Computers have become an integral part of our daily lives, assisting us with tasks such as personal finance management, online shopping, content consumption, and social interactions. They offer convenience, entertainment, and access to various services.

OVERVIEW OF COMPUTER FUNDAMENTALS

- **Evolution of Computers:** The evolution of computers traces back to the early mechanical and electromechanical devices, such as the abacus and mechanical calculators. Over time, advancements in technology led to the development of electronic computers, mainframe computers, personal computers, and mobile devices. The progression of computers has witnessed exponential growth in processing power, storage capacity, and connectivity.

OVERVIEW OF THE MAJOR STAGES IN THE EVOLUTION OF COMPUTERS

- First Generation (1940s-1950s): The first electronic computers were developed during this period. They used vacuum tubes for circuitry and magnetic drums for memory. Examples include the ENIAC and UNIVAC I.
- Second Generation (1950s-1960s): Transistors replaced vacuum tubes, resulting in smaller, more reliable computers. Magnetic core memory was introduced, offering improved storage capacity. High-level programming languages, such as FORTRAN and COBOL, were developed.
- Third Generation (1960s-1970s): Integrated circuits (ICs) were introduced, allowing multiple transistors to be fabricated on a single chip. This led to smaller, more powerful, and more affordable computers. The development of operating systems, such as UNIX, and the emergence of minicomputers marked this era.
- Fourth Generation (1970s-1980s): Microprocessors, which combined the central processing unit (CPU) on a single chip, were introduced. Personal computers (PCs) became widely available, with companies like IBM and Apple leading the way. The graphical user interface (GUI) and networking technologies began to emerge.
- Fifth Generation (1980s-present): This generation saw the development of powerful microprocessors, advanced operating systems, and the internet. Artificial intelligence (AI), expert systems, and parallel computing became areas of research and development.
- Sixth Generation (present and beyond): This phase represents the ongoing advancements in computing technologies. It includes developments such as quantum computing, artificial intelligence, machine learning, and the internet of things (IoT).

Throughout the evolution of computers, there has been a continuous trend towards smaller size, increased processing power, enhanced memory capacity, improved efficiency, and greater connectivity. These advancements have transformed computers from room-sized machines to portable devices that fit in our pockets, revolutionizing the way we live, work, and communicate.

COMPUTER APPLICATIONS

- Computer applications refer to software programs designed to perform specific tasks or functions for users. These applications span across various fields and industries, contributing significantly to productivity, communication, entertainment, and more.

APPLICATIONS OF COMPUTERS

- Word Processing
- Spreadsheets
- Internet
- Digital Audio or Video Composition
- Desktop Publishing
- Government
- Traffic Control
- Legal System
- Retail Business
- Sports
- Travel and Tourism
- Hospitals
- Business and Industry
- Geology
- Database Management System
- Enterprise Resource Planning
- Astronomy
- Weather Forecasting
- Simulation
- Education Applications
- Online Banking
- Industry and Engineering
- Robots
- Decision Support Systems
- Expert Systems
- Healthcare

Some major types of computer applications include:

- **Word Processing:** Applications like Microsoft Word, Google Docs, and LibreOffice help create, edit, and format text documents.
- **Spreadsheets:** Programs such as Microsoft Excel and Google Sheets allow users to organize, analyze, and manipulate data using tables and formulas.
- **Database Management:** Applications like MySQL, Oracle, and Microsoft Access are used to store, manage, and retrieve large datasets efficiently.
- **Web Browsers:** Browsers like Google Chrome, Mozilla Firefox, and Microsoft Edge provide access to the internet and online resources.
- **Graphics and Design:** Software such as Adobe Photoshop, CorelDRAW, and AutoCAD is used for image editing, graphic design, and computer-aided drafting.
- **Multimedia:** Applications like VLC Media Player and Adobe Premiere enable users to view, create, and edit multimedia content like videos, music, and animations.

- **Communication:** Tools like Zoom, Skype, and Slack facilitate real-time communication via voice, video, or chat, essential for personal and business use.
- **Enterprise Resource Planning (ERP):** Programs like SAP and Oracle ERP help manage business processes, from supply chain operations to financial transactions.
- **Educational Applications:** Software like Moodle, Blackboard, and Google Classroom is used in education for teaching, learning, and classroom management.
- **Gaming:** Games like Minecraft, Fortnite, and other entertainment applications are popular for leisure and interactive experiences.
- **Artificial Intelligence (AI) Applications:** AI-driven applications, such as voice assistants (Siri, Alexa), machine learning models, and automated systems, are used for tasks like natural language processing, image recognition, and data analytics.


TYPES OF COMPUTER

CLASSIFICATION OF COMPUTERS

1. According to Purpose

2. According to Types of Data Handled

3. According to Size, Capacity and Speed

A. According to Purpose

1. General-purpose Computer

- *Designed to handle a variety of problems and to meet different needs*
- *Used for varied applications*

2. Special-purpose Computer

These are computers designed to handle a specific problem or to perform a specific task. Examples of special-purpose computers are those used for collecting highway tolls, airline reservations, weather forecasting, satellite tracking, oil exploration, and industrial process control.

B. According to Types of Data Handled

1. Analog Computers

The term analog is taken from the word "analogous" which means "similar". Analog computers deal with continuously changing physical data (such as pressure, temperature, and current).

2. Digital Computers

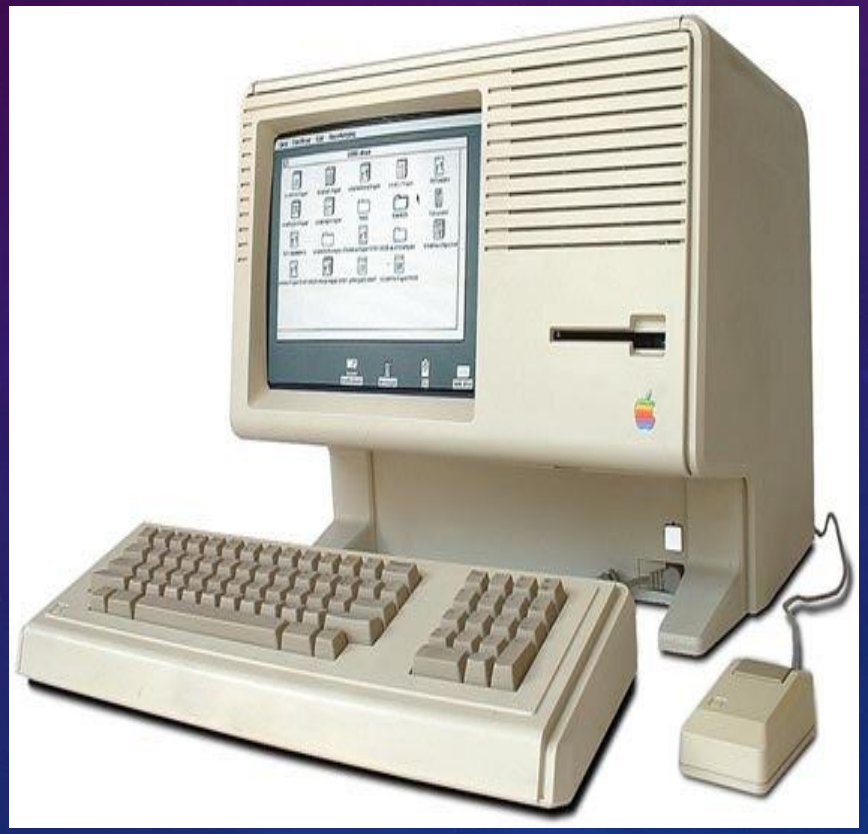
These are computers that specialized in counting. Unlike the analog computer which receives data in continuous form, the digital computer handles values that are discrete (separate or distinct) in form. Since most business data are in discrete form, the digital computer is readily adaptable to business data applications, especially when repetitive arithmetic operations are involved and when 100 percent accuracy is demanded.

3. Hybrid Computers

These computers are machines that incorporate in a single computer both analog and digital signals. These computers are used in working out special types of problems in science and various areas of engineering, such as space vehicle simulation and the training of astronauts.

Analog Computer

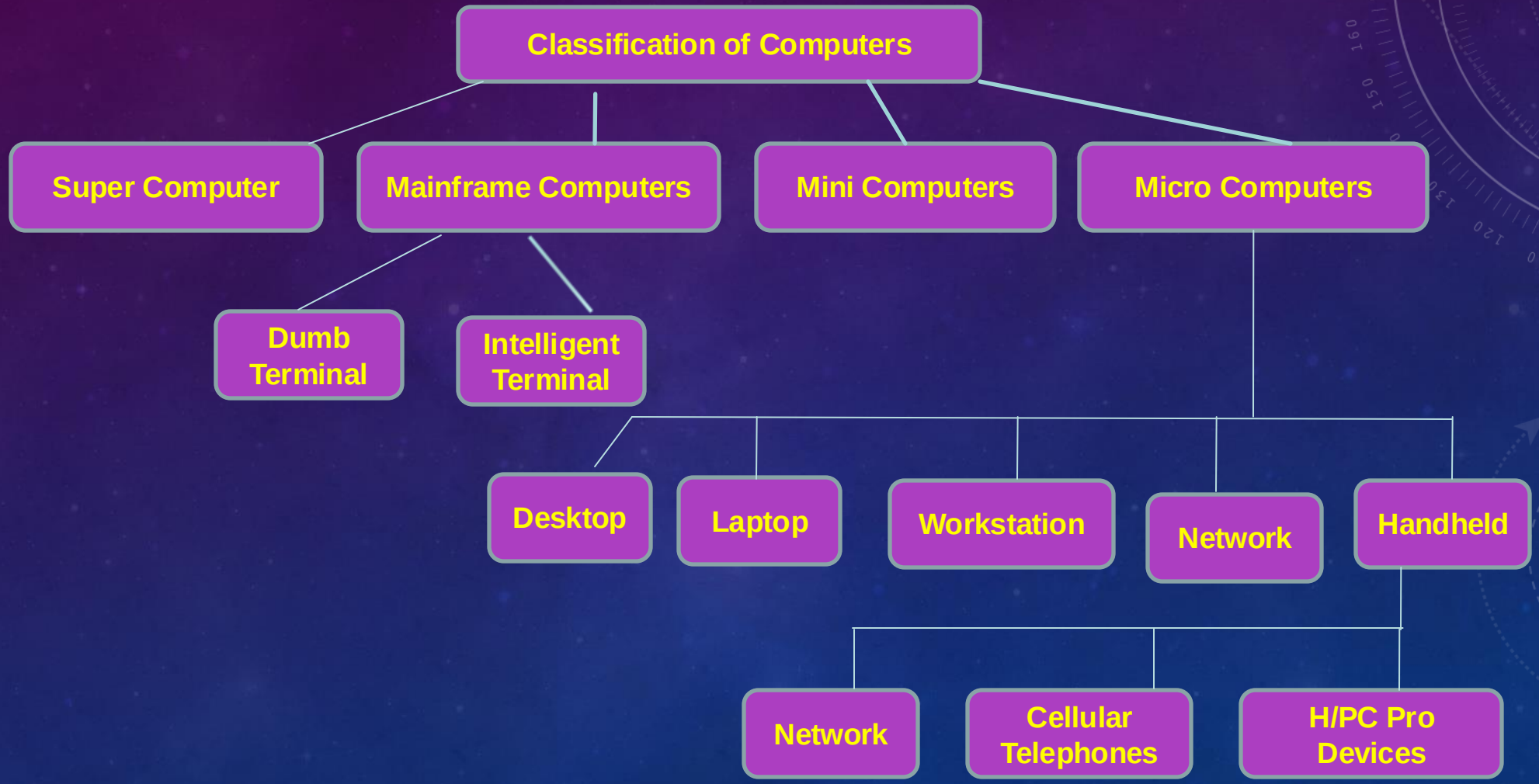
Digital Computer



Hybrid Computer

CLASSIFICATION OF COMPUTERS

Computers can be broadly classified into four categories based on their speed, amount of data that they can hold, and price.



C. According to Size, Capacity and Speed

1. Supercomputers

- These are the biggest, fastest and most expensive computers.
- Applications range from nuclear weapons development to accurate weather forecasting and other applications where maximum speed and power are so important that costs are just secondary.
- Used primarily for scientific applications that are mathematically extensive. The aerospace, automotive, chemical, electronics and petroleum industries use supercomputers extensively.
- speed is measured in teraflops (trillions of operations per second). These types of computers derive much of their speed from the use of multiple processors.

IBM'S BLUE/ GENE L

EARTH SIMULATOR

FIGURE 1-27 This IBM supercomputer requires an area the size of two basketball courts to house its more than 2,000 miles of wiring (enough wiring to connect Washington, D.C., to Phoenix, Arizona).

2. ***Mainframes***

- Large, expensive, powerful computer that can handle hundreds of thousands of connected users simultaneously
- Stores tremendous amount of data and information
- Used by large companies such as banks, airlines, and insurance
- Requires an environment with closely monitored humidity and temperature.
- Cost considerably less than supercomputers
- Used for extensive input-output operations
- People access programs on a mainframe via terminals.
- The term *mainframe* has fallen out of use in favor of **enterprise server.**

MAINFRAME COMPUTER SYSTEM

MAINFRAME

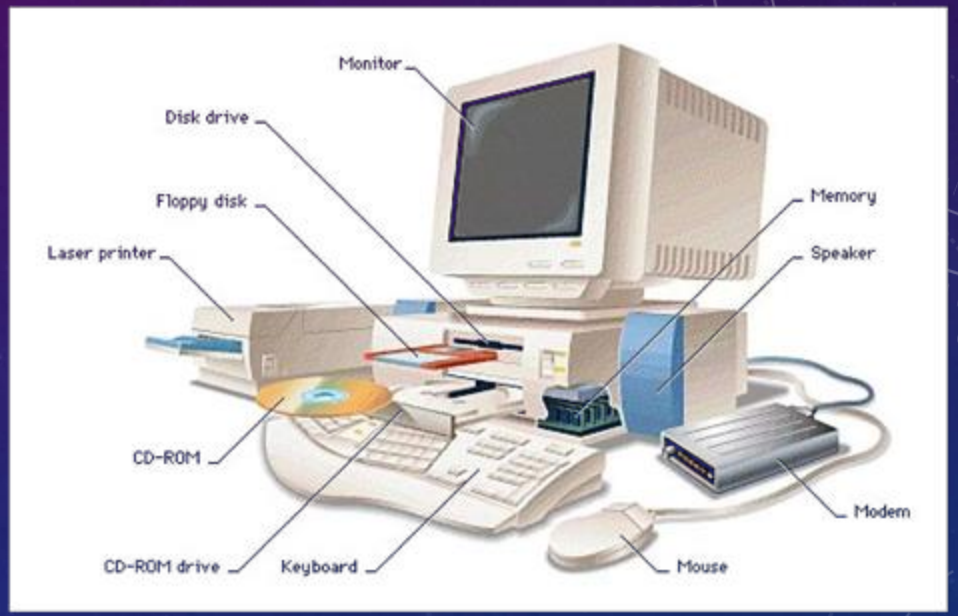
3. Midrange Server

- Is more powerful and larger than a workstation computer
- Typically supports several hundred and sometimes up to a thousand connected computers at the same time
- Used to be known as *minicomputers*

4. Microcomputers

- sometimes called “single-chip processor” or “system-on-a chip”, this computer is a digital computer system that uses a microprocessor, a read-only memory and a random-access memory.

MIDRANGE SERVER



MICROCOMPUTER

CATEGORIES OF MICROCOMPUTER

- ***PC***

The personal computer (PC) defines a computer designed for general use by a single person. While a **Mac** is a PC, most people relate the term with systems that run the Windows operating system. PCs were first known as **microcomputers** because they were a complete computer but built on a smaller scale than the huge systems in use by most businesses.

- ***Desktop***

A PC that is not designed for portability. The expectations with desktop systems are that you will set the computer up in a permanent location. Most desktops offer more power, storage and versatility for less cost than their portable brethren.

- ***Laptop*** - Also called **notebooks**, laptops are portable computers that integrate the display, keyboard, a pointing device or trackball, processor, memory and hard drive all in a battery-operated package slightly larger than an average hardcover book.

- **Tablet PC –** is a special type of notebook computer that allows you to write or draw on the screen using a digital pen.

- ***Palmtop*** - More commonly known as Personal Digital Assistants (PDAs), palmtops are tightly integrated computers that often use flash memory instead of a hard drive for storage. These computers usually do not have keyboards but rely on touchscreen technology for user input. Palmtops are typically smaller than a paperback novel, very lightweight with a reasonable battery life. A slightly larger and heavier version of the palmtop is the **handheld computer**.

- ***Workstation***

A desktop computer that has a more powerful processor, additional memory and enhanced capabilities for performing a special group of task, such as 3D Graphics or game development

APPLE'S POWERMAC G5

- ***Wearable*** - The latest trend in computing is wearable computers. Essentially, common computer applications (e-mail, database, multimedia, and calendar/scheduler) are integrated into watches, cell phones, visors and even clothing!

COMPUTER HARDWARE

- Central processing unit (CPU)
- Memory (RAM and ROM)
- Input and output devices
- Storage devices

CENTRAL PROCESSING UNIT (CPU)

- The central processing unit (CPU) is a crucial component of a computer system. It serves as the "brain" of the computer, responsible for executing instructions, performing calculations, and coordinating the activities of other hardware components.
- The CPU performs the essential processing tasks, including executing instructions, performing calculations, and managing data movement. Its speed, cores, cache, and architecture impact the overall performance and capabilities of the computer.

KEY POINTS ABOUT THE CPU

- **Function:** The primary function of the CPU is to fetch, decode, and execute instructions, which are stored in the computer's memory. It performs arithmetic and logical operations, controls data movement, and manages the flow of information within the computer.
- **Components:** The CPU consists of several components, including the arithmetic logic unit (ALU), control unit, and registers. The ALU performs mathematical and logical operations, while the control unit manages the execution of instructions and coordinates the activities of other hardware components.
- **Clock Speed:** The CPU operates at a specific clock speed, measured in gigahertz (GHz). The clock speed determines how many instructions the CPU can execute per second. Higher clock speeds generally result in faster processing, but other factors, such as the architecture and efficiency of the CPU, also impact performance.
- **Cores:** Modern CPUs often have multiple cores, allowing them to execute multiple instructions simultaneously. Each core operates independently and can handle separate tasks, improving overall performance and multitasking capabilities.
- **Cache Memory:** The CPU has built-in cache memory, which is a small but fast storage area that holds frequently accessed instructions and data. Cache memory helps reduce the time required to fetch data from the computer's main memory, improving overall performance.
- **Performance and Upgrades:** The performance of the CPU is influenced by factors such as clock speed, number of cores, cache size, and architectural improvements. Upgrading the CPU can enhance overall system performance, but it is often limited by compatibility with the motherboard and other hardware components.

MEMORY (RAM AND ROM)

- Memory is an essential component of a computer system that stores data and instructions for processing. There are two primary types of memory: RAM (Random Access Memory) and ROM (Read-Only Memory).
- Both RAM and ROM are critical components of a computer system. RAM provides temporary storage for data and instructions during active computer operations, while ROM stores permanent instructions that are necessary for booting up the computer and initializing the hardware. Together, RAM and ROM work in tandem to ensure the efficient functioning of a computer.

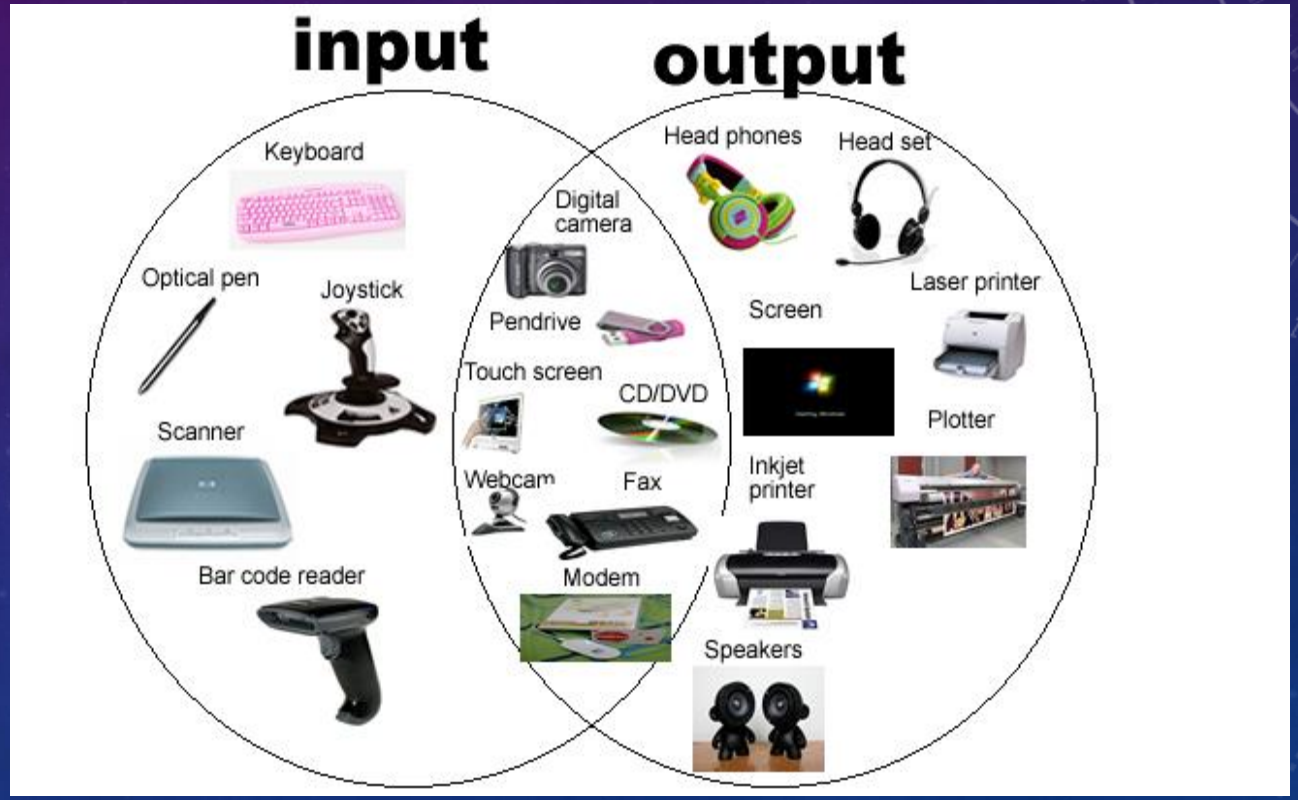
MEMORY (RAM AND ROM)

1. RAM (Random Access Memory):
    1. **Function:** RAM is the temporary or volatile memory that provides fast and temporary storage for data and instructions that are actively being used by the CPU.
    2. **Accessibility:** RAM allows for random access, meaning data can be read from or written to any location in the memory with equal speed.
    3. **Speed:** RAM provides fast read and write speeds, allowing for quick access to data by the CPU.
    4. **Data Retention:** RAM is volatile, meaning its contents are lost when the power is turned off. Therefore, it is used for temporary storage during active computer operations.
    5. **Capacity:** The capacity of RAM is measured in gigabytes (GB) and determines the amount of data that can be stored temporarily.

2. ROM (Read-Only Memory):
    1. **Function:** ROM is non-volatile memory that stores permanent instructions and data that are essential for booting up the computer and initializing the hardware.
    2. **Accessibility:** ROM is read-only, meaning data stored in ROM cannot be modified or overwritten.
    3. **Speed:** slower compared to RAM
    4. **Data Retention:** ROM retains its data even when the power is turned off.
    5. **Usage:** ROM is used to store firmware, BIOS, and other essential instructions that are required during the computer's startup process.
    6. **Types of ROM:**
        1. PROM (Programmable Read-Only Memory): Can be programmed by the user once with permanent data or instructions.
        2. EPROM (Erasable Programmable Read-Only Memory): Can be erased and reprogrammed using ultraviolet light.
        3. EEPROM (Electrically Erasable Programmable Read-Only Memory): Can be erased and reprogrammed electronically.

INPUT AND OUTPUT DEVICES

- Input and output devices allow users to interact with the computer system, input data or commands, and receive output in various forms, such as visual, audio, or printed. They play a crucial role in enabling users to communicate with and utilize the capabilities of the computer effectively.



INPUT AND OUTPUT DEVICES

- Input and output devices are essential components of a computer system that enable communication between the user and the computer.

- Input devices:

1. Keyboard: Used to input text, commands, and other characters into the computer.
2. Mouse: Enables the user to move the cursor on the screen and make selections.
3. Touchscreen: Allows users to interact directly with the screen by touching it with their fingers or a stylus.
4. Scanner: Converts physical documents or images into digital formats by scanning them.
5. Microphone: Captures audio input, allowing users to record sound or provide voice commands.
6. Webcam: Captures video input, enabling video conferencing or recording videos.

- Output devices:
- Monitor/Display: Displays visual output, including text, images, videos, and graphical user interfaces.
- Printer: Produces hard copies of documents or images on paper.
- Speakers/Headphones: Output audio for playing sound, music, or other audio content.
- Projector: Displays computer output on a larger screen or projection surface.
- Plotter: Produces high-quality, large-scale prints or drawings based on computer-generated data.

STORAGE DEVICES

- Storage devices are components of a computer system that are used to store and retrieve data. They provide long-term storage for files, documents, software, and other digital information.

COMMON TYPES OF STORAGE DEVICES

1. **Hard Disk Drive (HDD):** It is a magnetic storage device that uses rotating disks coated with a magnetic material to store data. HDDs offer large storage capacity and are commonly used in desktop and laptop computers.
2. **Solid State Drive (SSD):** SSDs are faster and more reliable than HDDs as they use flash memory chips to store data. They have no moving parts, resulting in faster data access times and improved system performance. SSDs are commonly used in laptops and desktop computers for faster storage and boot times.
3. **USB Flash Drive:** Also known as thumb drives or pen drives, these small portable devices use flash memory to store data. They are widely used for transferring and storing files, as they are compact, easy to use, and can be plugged into a USB port.
4. **Optical Discs:** CDs, DVDs, and Blu-ray discs are optical storage media. They use lasers to read and write data on the disc's surface. Optical discs are commonly used for software installation, data backup, and media storage.
5. **Memory Cards:** Compact and portable, memory cards are commonly used in digital cameras, smartphones, and other portable devices for storing photos, videos, and other data. Examples include Secure Digital (SD) cards, microSD cards, and CompactFlash (CF) cards.
6. **Network Attached Storage (NAS):** NAS devices are dedicated storage systems connected to a network. They provide centralized storage for multiple computers and allow for easy file sharing and access over the network.

COMPUTER SOFTWARE

- Operating systems
- Application software
- Programming languages

OPERATING SYSTEMS

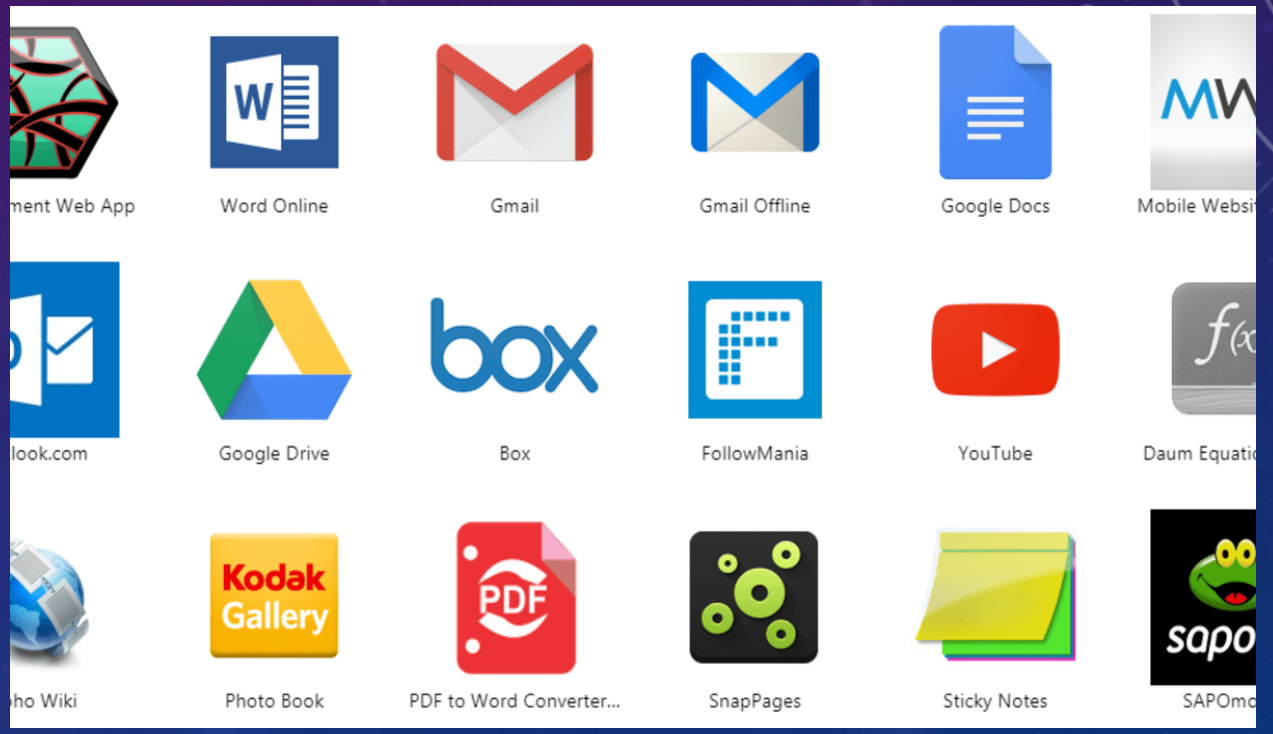
- Popular operating systems include Windows, macOS, Linux, and Unix, each with its own features, user interfaces, and target platforms. The choice of operating system depends on factors such as the computer hardware, user preferences, and specific application requirements.

KEY ASPECTS AND FUNCTIONS OF OPERATING SYSTEMS

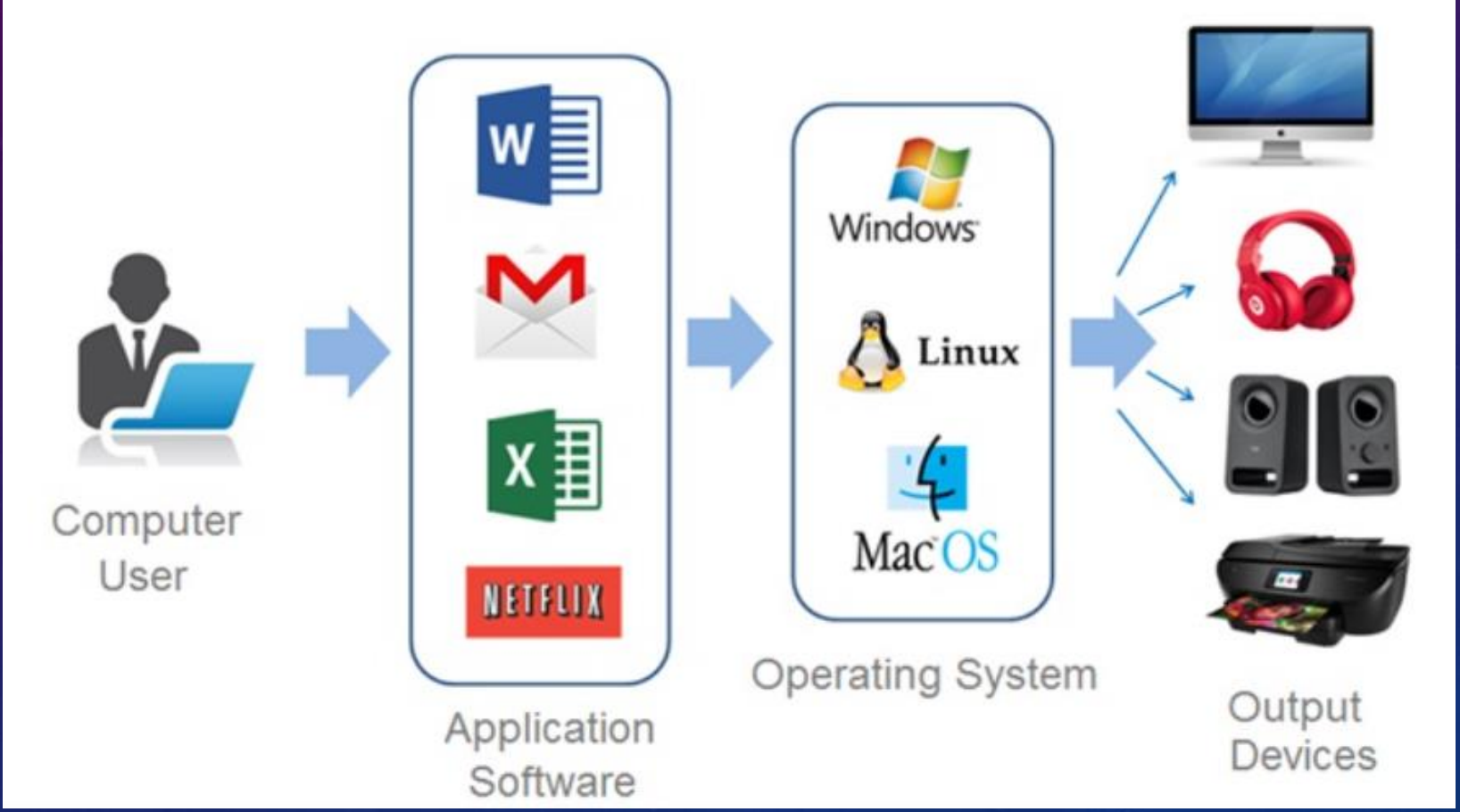
- **User Interface:** The operating system provides a user interface that allows users to interact with the computer. There are different types of user interfaces, including graphical user interfaces (GUIs) with icons and menus, and command-line interfaces (CLIs) that rely on text-based commands.
- **Process Management:** The operating system manages the execution of processes or programs on the computer. It allocates system resources, such as CPU time, memory, and input/output devices, to different processes, ensuring efficient and fair utilization of resources.
- **Memory Management:** The OS manages the computer's memory resources, allocating and deallocating memory to different programs and processes. It ensures that memory is efficiently utilized, preventing conflicts and providing virtual memory capabilities if needed.
- **File System Management:** The operating system provides a file system that organizes and manages files on storage devices. It enables users to create, read, write, and delete files, and provides features like file permissions, file organization, and file system security.
- **Device Management:** The OS handles communication with input and output devices such as keyboards, mice, printers, and storage devices. It manages device drivers, which are software components that enable the operating system to interact with hardware devices.
- **Networking:** Many operating systems include networking capabilities, allowing computers to connect and communicate over networks. They provide network protocols, configuration settings, and tools for network communication and data transfer.
- **Security:** Operating systems implement security measures to protect the computer system and user data. This includes user authentication, access control mechanisms, firewall protection, and antivirus software integration.

APPLICATION SOFTWARE

- Application software, also known as applications or apps, refers to programs and software designed to perform specific tasks or provide specific functionality for users. Unlike operating systems, which manage the computer's hardware and resources, application software is focused on delivering functionality and solving specific user needs.



COMPUTER SYSTEM ARCHITECTURE



Application software plays a crucial role in fulfilling specific user needs and enhancing productivity across various domains, including business, education, entertainment, communication, and creative pursuits. Users can select and install application software based on their requirements and preferences to accomplish specific tasks efficiently.

https://youtu.be/M-6WvDU9JNg

KEY POINTS ABOUT APPLICATION SOFTWARE

1. **Purpose:** Application software is developed to serve various purposes and cater to different user needs. Examples include word processors, spreadsheet programs, web browsers, media players, graphic design software, video editing tools, and communication applications.
2. **Functionality:** Application software provides specific functionality and tools for performing tasks. For instance, word processing software allows users to create, edit, and format text documents, while spreadsheet software enables users to perform calculations, create charts, and analyze data.
3. **User Interfaces:** Application software typically has a user-friendly interface that allows users to interact with the program and access its features. Graphical user interfaces (GUIs) with icons, menus, and buttons are commonly used to enhance usability and ease of navigation.
4. **Installation and Execution:** Application software is installed on the operating system and executed when needed. Users can launch the application from the operating system's user interface or by clicking on the application's icon.
5. **Compatibility:** Application software is often developed for specific operating systems or platforms. For example, some applications are designed specifically for Windows, while others are developed for macOS, Linux, or mobile platforms such as iOS and Android.
6. **Customization and Updates:** Application software may allow customization options to suit the user's preferences. Additionally, software developers frequently release updates and patches to enhance functionality, improve security, and address bugs or performance issues.
7. **Examples:** Common examples of application software include Microsoft Office Suite (Word, Excel, PowerPoint), web browsers (Chrome, Firefox), email clients (Outlook, Gmail), media players (VLC, iTunes), photo editing software (Adobe Photoshop), and video conferencing applications (Zoom, Microsoft Teams).

PROGRAMMING LANGUAGES

- Programming languages are formal languages used to write instructions or code that can be executed by a computer. They provide a set of rules and syntax for writing programs, which are then translated into machine-readable instructions by compilers or interpreters.
- The choice of programming language depends on factors such as the task at hand, target platform, available resources, and personal preference. Programmers select languages based on their suitability for specific applications, ease of use, performance requirements, and the availability of supporting tools and libraries.

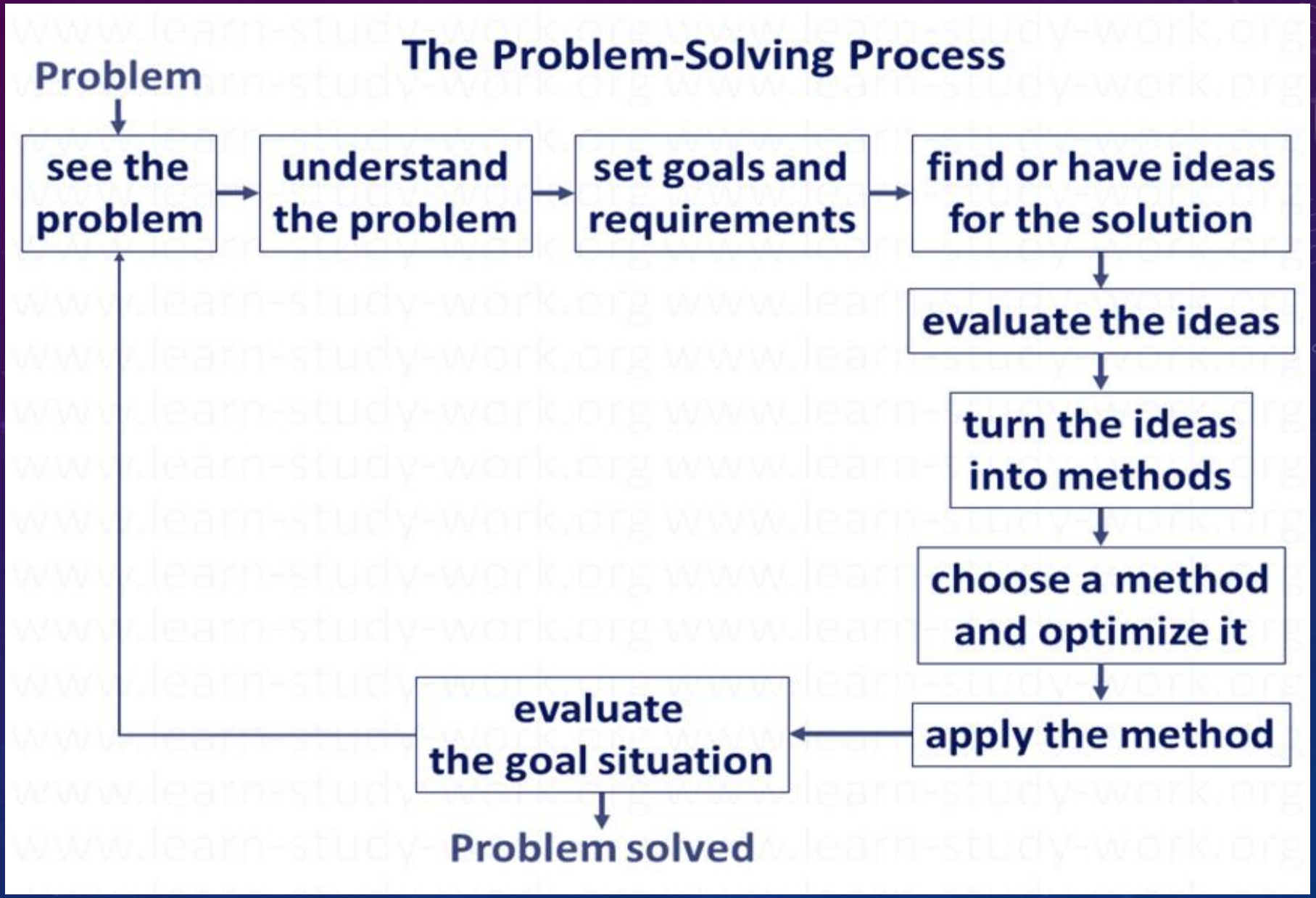
KEY POINTS ABOUT PROGRAMMING LANGUAGES

1. **Purpose:** Programming languages are used to develop software applications, websites, scripts, algorithms, and various other computational tasks. They enable programmers to write instructions to perform specific tasks and automate processes.
2. **Syntax and Structure:** Each programming language has its own syntax, which determines how code is written and structured. Syntax rules define the grammar and structure of the language, including statements, variables, data types, functions, and control flow constructs.
3. **Types:** Programming languages can be categorized into different types based on their design and purpose. Common types include procedural languages (e.g., C, Pascal), object-oriented languages (e.g., Java, C++), functional languages (e.g., Haskell, Lisp), and scripting languages (e.g., Python, JavaScript).
4. **Level of Abstraction:** Programming languages vary in their level of abstraction, which refers to the amount of detail and control provided to the programmer. Low-level languages, such as assembly languages, provide close control over hardware resources, while high-level languages offer more abstraction and simplify programming tasks.
5. **Libraries and Frameworks:** Programming languages often have associated libraries and frameworks that provide pre-written code and functionality to expedite development. These libraries and frameworks offer reusable modules, functions, and tools that simplify common programming tasks and enhance productivity.
6. **Portability:** Programming languages may have different levels of portability, indicating the ease with which code can be executed on different platforms or operating systems. Some languages, like Java, are designed to be highly portable, while others may be more platform-specific.
7. **Examples:** There are numerous programming languages available today, each with its own features and strengths. Some widely used languages include Python, Java, C++, JavaScript, Ruby, Swift, Go, and PHP. Each language has its own use cases, strengths, and communities.

INTRODUCTION TO PROBLEM SOLVING

PROBLEM SOLVING

- **Problem:** a set of questions concerning some entities representing the universe of the problem.
- **Problem statement:** description of the properties of the entities and of the relation between input data and the problem solution.
- **Solving method:** procedure to construct the solution starting from the input data.
- **Problem solving:** is the process of finding solutions to complex or simple issues by breaking them down into smaller, manageable steps. In computing, problem solving often involves analyzing a problem, creating a strategy, and implementing a solution through programming.


The Problem-Solving Process
Problem
see the problem
understand the problem
set goals and requirements
find or have ideas for the solution
evaluate the ideas
turn the ideas into methods
choose a method and optimize it
apply the method
evaluate the goal situation
Problem solved

STEPS IN PROBLEM SOLVING

- **Understanding the Problem:** Clearly define the problem. Understand what is given and what needs to be achieved.
- **Plan the Solution:** Break down the problem into steps (algorithm) and decide on the tools or operations needed.
- **Implementation:** Execute the plan, often by coding in a programming language.
- **Testing and Debugging:** Verify the solution by testing with various inputs and fixing errors.
- **Optimization:** Improve the efficiency of the solution, if necessary.

SEQUENTIAL PROBLEM SOLVING

- In computing, many problems are solved using a **sequential approach** where instructions are executed one after the other in a specific order.
- **Example 1: How to Make Tea (Sequential Steps)**
    1. Boil water.
    2. Add tea leaves.
    3. Let the tea steep for a few minutes.
    4. Add sugar or milk as desired.
    5. Pour the tea into a cup.
    6. Serve.

SEQUENTIAL PROBLEM SOLVING

- **Example 2: Adding Two Numbers**

1. Start.
2. Get the first number from the user.
3. Get the second number from the user.
4. Add the numbers together.
5. Show the result.
6. End.

SEQUENTIAL PROBLEM SOLVING

- **Example 3: Conversion of Length from Feet to Inches**

  1. Start.
  2. Input the length in feet.
  3. Convert feet to inches using the formula: inches = feet × 12.
  4. Output the result in inches.
  5. End.

SEQUENTIAL PROBLEM SOLVING

- **Example 4: Temperature Conversion (Celsius to Fahrenheit)**

  1. Start.
  2. Input the temperature in Celsius.
  3. Convert Celsius to Fahrenheit using the formula: Fahrenheit = (Celsius × 9/5) + 32.
  4. Output the temperature in Fahrenheit.
  5. End.

SEQUENTIAL PROBLEM SOLVING

- **Solve some more examples of problem solving using sequential steps:**
  - Finding the Largest of Two Numbers
  - Calculate Area of a Circle
  - Calculate the Average of Three Numbers
  - Counting the Number of Words in a Sentence
  - Calculate the Simple Interest
  - Convert Kilometers to Miles
  - Check if a Number is Even or Odd
  - Calculate the Factorial of a Number
- **http://sofia.cs.vt.edu/cs1114-ebooklet/chapter4.html**

ALGORITHMS IN PROBLEM SOLVING

- An **algorithm** is a step-by-step method to solve a problem. It's like a recipe: follow specific steps to achieve the desired outcome.

- **Characteristics of an Algorithm:**

  Definiteness: Each step should be clear and unambiguous.

  Input: There should be zero or more inputs supplied externally.

  Output: There should be at least one output produced.

  Finiteness: The algorithm must terminate after a finite number of steps.

  Effectiveness: Each step must be basic enough to be performed easily.

- **Writing Algorithms**

  Algorithms can be written using **natural language**, **flowcharts**, or **pseudocode**.

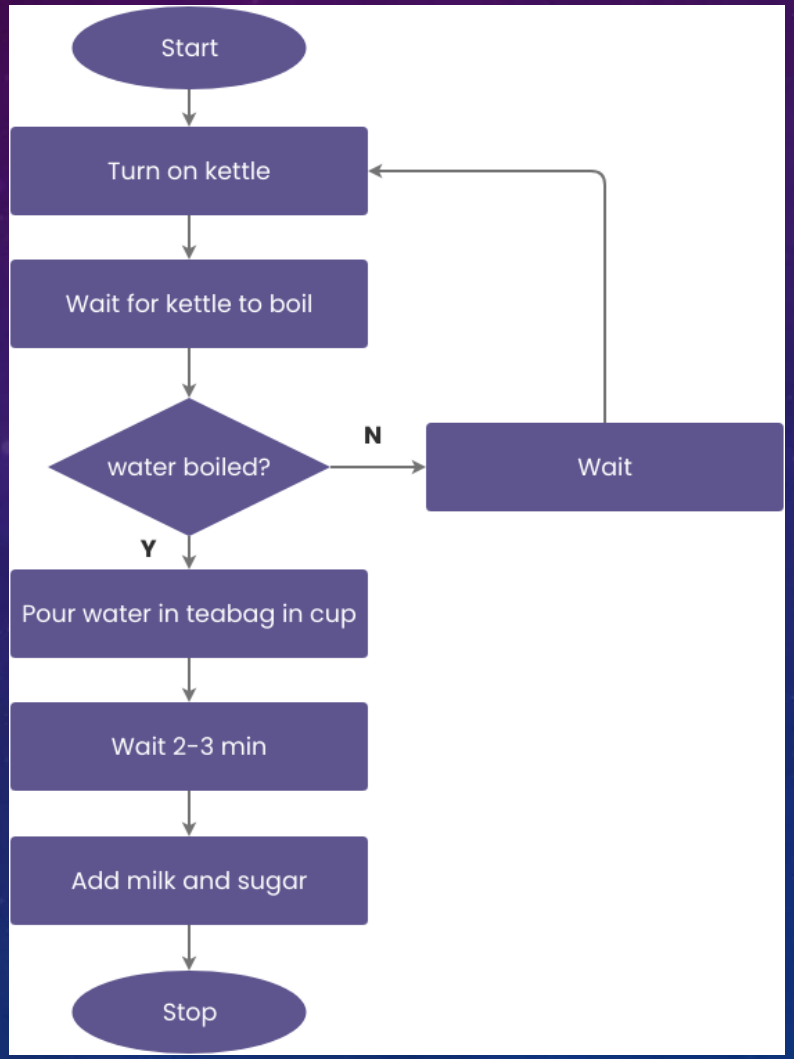
- Algorithmic problem solving comes in two phases. These include:
    1. derivation of an algorithm that solves the problem, and
    2. conversion of the algorithm into code.
- It is worth noting that an algorithm is a sequence of steps, not a program.
- Same algorithm can be used in different programs, or the same algorithm can be expressed in different languages, because an algorithm is an entity that is abstracted from implementation details.
- An algorithm can be expressed in the following ways:
    1. human language
    2. pseudo code
    3. flow chart

FLOWCHART

- A flowchart is one way to represent an algorithm and uses the following symbols.

Symbol	Name	Description
	Terminal	Indicates the beginning and ending of an algorithm.
	Flow Line	Shows the order of operation by connecting one symbol to the next symbol.
	Input/Output	An action where either input is received from outside the program (from the user, a text file, etc.) or the program is outputting information (on the screen, to a file, to a printer, etc.)
	Process	The execution of any mathematical operation or other built-in instruction(s).
	Call-Process	An action defined elsewhere (in another flowchart).
	Decision	An action where a decision is made where the outcome is either true or false (Boolean).
	Flow Connector	Multiple arrows converge at a flow connector.
	Off-Page Connector	Indicates that the flowchart continues on another page.

FLOWCHART OF TEA MAKING



MAKING TEA: C SOURCE CODE

```c
#include <stdio.h>
int main() {
int choice;
printf("Tea Menu:\n"); // Display menu
printf("1. Black Tea\n");
printf("2. Lemon Tea\n");
printf("3. Milk Tea\n");
// Get user's choice
printf("Enter your choice (1-3): "); scanf("%d", &choice); // Make tea based on user's choice
switch(choice) {
case 1: printf("Making Black Tea...\n"); // Code for making black tea
break;
case 2: printf("Making Lemon Tea...\n"); // Code for making lemon tea
break;
case 3: printf("Making Milk Tea...\n"); // Code for making milk tea
break; default: printf("Invalid choice!\n");
}
return 0;
}
```

THANK YOU!