



PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

Hardware and Software

Prof. Sindhu R Pai

PCPS Theory Anchor - 2024

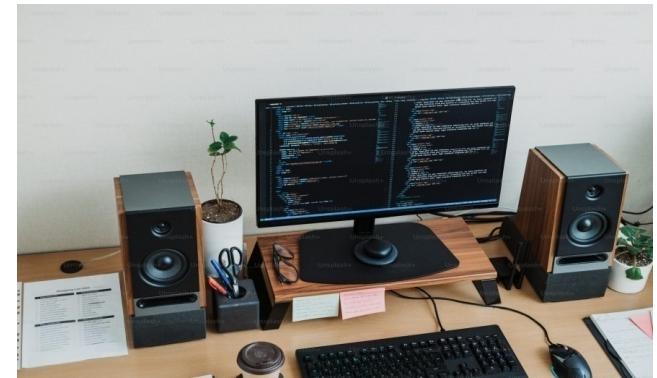
Department of Computer Science and Engineering

PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

Digital Computer



- Computer capable of solving problems by processing information expressed in **discrete form**.
- It operates on data, including magnitudes, letters, and symbols, that are expressed in binary code—i.e., using only the two digits 0 and 1.
- By manipulating combinations of binary digits, it can perform mathematical calculations, organize and analyze data, control industrial and other processes, and simulate dynamic systems such as global weather patterns.



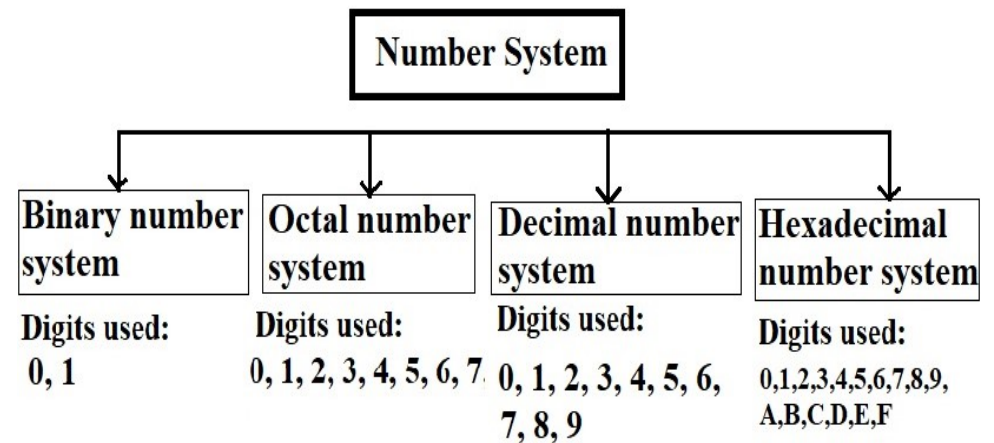
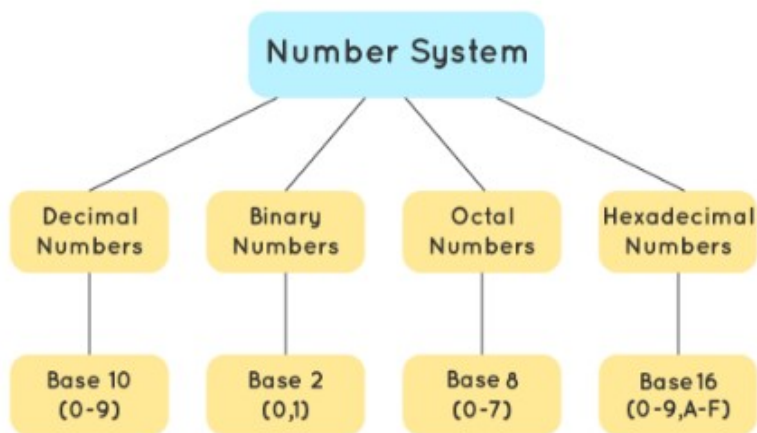
[A desktop computer sitting on top of a wooden desk photo – Computer science Image on Unsplash](#)



- Number systems in mathematics are used to express numbers in various forms and are understood by computers.
- Defined as the representation of numbers by using digits or other symbols in a consistent manner.
- A number is a mathematical value used for counting and measuring objects, and for performing arithmetic calculations. Numbers have various categories like natural numbers, whole numbers, rational and irrational numbers, and so on.
- The **value of any digit in number can be determined by a digit, its position in the number, and the base of the number system.**

PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

Number System





- **Binary number system (Base - 2)**

For representing numbers in **base 2**, there are two possible digits (0, 1) in which each column value is a power of two:

128	64	32	16	8	4	2	1
0	1	1	0	0	0	1	1

$$0 + 64 + 32 + 0 + 0 + 0 + 2 + 1 = 99$$

PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

Computer Hardware



Central processing unit (CPU)

The “brain” of a computer system.

Interprets and executes instructions.

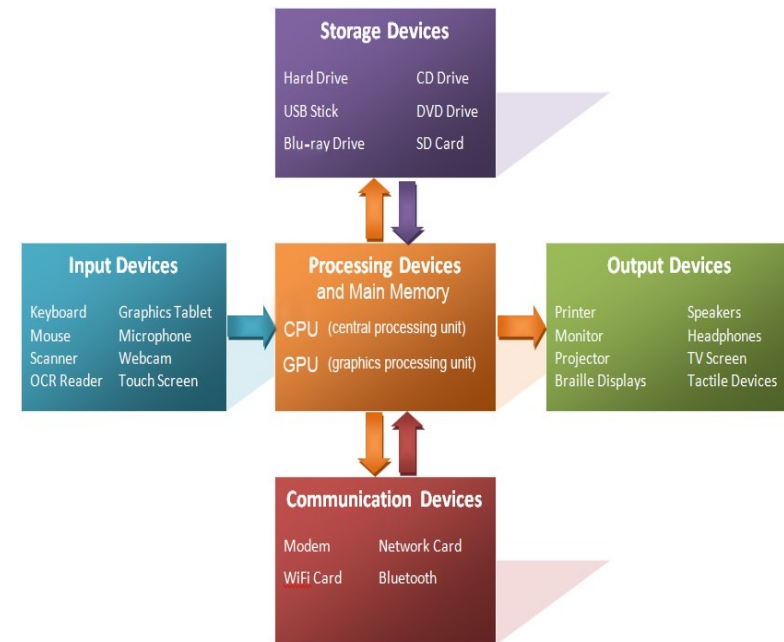
Main memory

A Memory where **currently executing programs reside**. It is **volatile**, the contents are lost when the power is turned off.

Peripheral components

Input devices, Output devices and Buses

Communication devices



Secondary memory

Provides **long-term storage of programs** and data. **Non-volatile**, the contents are retained when power is turned off. Can be magnetic (hard drive), optical (CD or DVD), or flash memory (USB drive).



PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

Computer Hardware



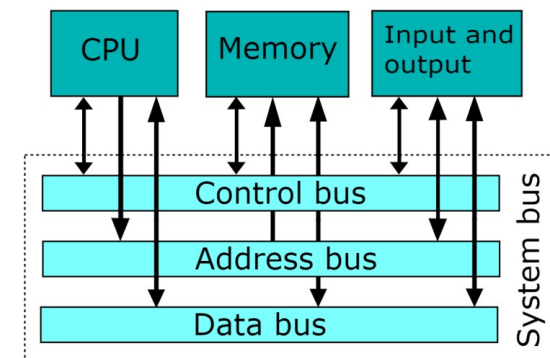
Input Devices – mouse, keyboard, scanner, microphone etc.

Output Devices – monitor, printer, projector, speakers etc

Buses – **Communication system that transfers data between components** inside a computer, or between computers.

- Internal Bus (System Bus: CPU and main memory)
- External Bus (Expansion Bus: printer and the computer)

Communication devices - Modem, WiFi card etc





A set of program instructions, including related data and documentation, that can be executed by computer.

- **System software:** Intrinsic to a computer system.
- **Application Software:** Specific purpose software which is used by user for performing specific task.

PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

Computer Software



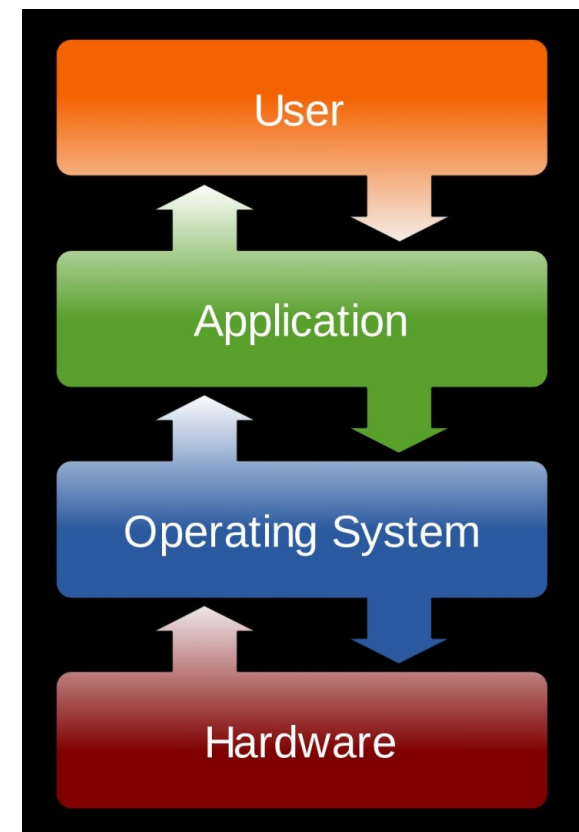
- The first computer programs ever written were for a mechanical computer designed by **Charles Babbage** in the mid-1800s.
- **Ada Lovelace** was the person who wrote these programs.
- She is referred to as **“the first computer programmer.”**



Ada Lovelace

A software that **manages and interacts with the hardware** resources of a computer.

Because an operating system is **intrinsic to the operation** of a computer, it is referred to as **system software**.



PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

System Software vs Application Software



S.No.	System Software	Application Software
1.	System software is used for operating computer hardware.	Application software is used by user to perform a specific task.
2.	System software is installed on the computer when operating system is installed.	Application software is installed according to user's requirements.
3.	In general, the user does not interact with system software because it works in the background.	In general, the user interacts with application software.
4.	System software can run independently. It provides a platform for running application software.	Application software can't run independently. They can't run without the presence of system software.
5.	Some examples of system software are compiler, assembler, debugger, driver, etc.	Some examples of application software are word processor, web browser, media player, etc.



THANK YOU

Department of Computer Science and Engineering

Dr. Shyalaja S S, Director, CCBD & CDSAML, PESU

Prof. Sindhu R Pai – sindhurpai@pes.edu

Prof. Chitra G M

Prof. Gayatri R S