



OLLSCOIL NA GAILLIMHE
UNIVERSITY OF GALWAY

CT101 Computing Systems

Dr. Bharathi Raja Chakravarthi

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University
ofGalway.ie

Dr. Bharathi Raja Chakravarthi

Professional Background:

- PhD (Computer Science) NUI Galway (2016-2020)
- PostDoc- NUI Galway (2020-2022)
- Associate Editor- Expert System with Application
- Editorial Member- Computer Speech and Language
- Area Chair: EACL 2023, COLING-LREC 2024
- Organizer:
 - LTEDI (2021,2022,2023),
 - DravidianLangTech(2021,2022,2023)

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- Google Scholar:

<https://scholar.google.com/citations?user=irCI028AAAAJ&hl=en>



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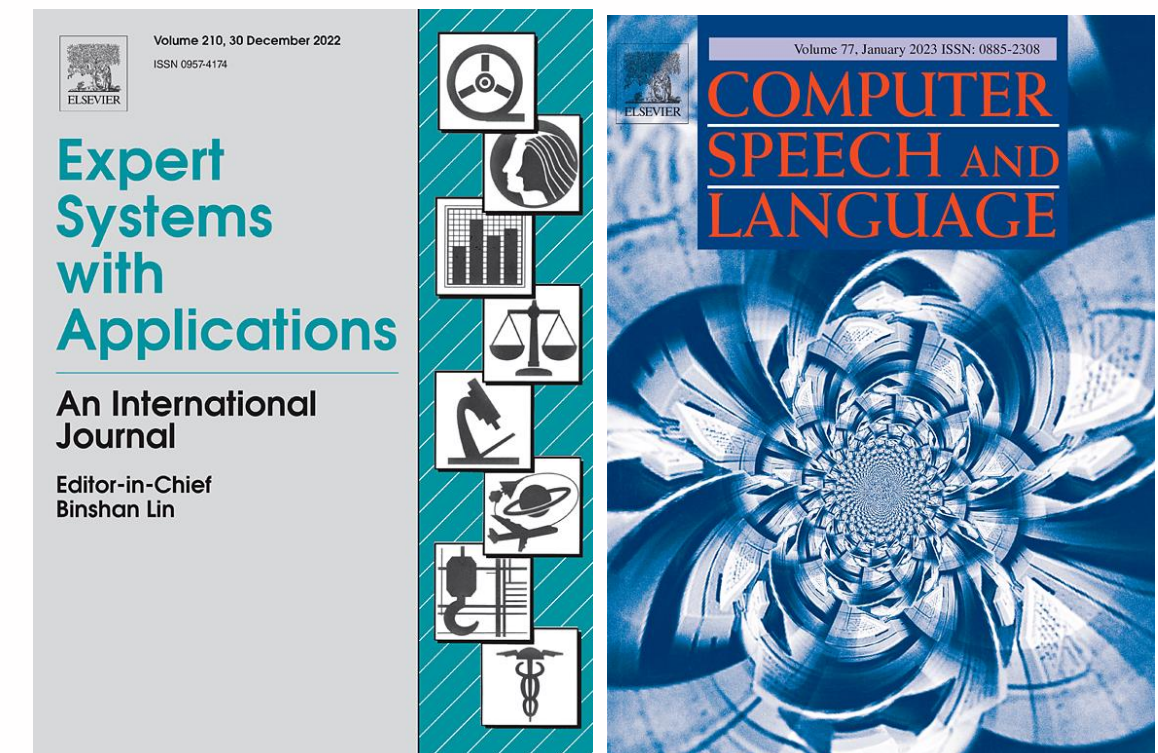


Assistant Professor / Lecturer-Above-the-Bar, School of
Computer Science, University of Galway
Verified email at insight-centre.org - [Homepage](#)

Natural Language Processing
Under-resourced languages
Multimodal Machine Learning Hate Speech Detection
Fake News Detection

ARTICLES CITED BY PUBLIC ACCESS CO-AUTHORS

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Citations	2994	2994
h-index	32	32
i10-index	59	59



EACL 2023

Grading

- Sem 1 (50% marks)
 - 15% - 2 assignments each carry 7.5 marks
 - Remaining 35% from written exams in Sem 2
- Sem 2 (50% Marks)
 - 2 assignments each carry 7.5 marks
 - Remaining 35% from written exams in Sem 2



Teaching Assistants

- If you need help with the assignments, please approach one of the lab tutors (ideally during the lab sessions)



Conor Gilmartin,

My interests are in Artificial Intelligence ,
Multi-Agent Systems and Game Theory
Email: C.GILMARTIN9@universityofgalway.ie



Befy Gladson Ravi,

My Interest are in Deep Learning, Machine
Learning and NLP.
Email: B.GladsonRavi1@universityofgalway.ie



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Labs

- You will be solving exercise during the labs.
- You will be solving the assignments during the labs.
- These labs sessions will help you to prepare for written exams.
- TAs will only assist you, they will not provide you the solutions.



Assignments

- Assignments need to be completed individually (no group work).
- The graders (that is, the lab tutors) are advised to check all submissions for plagiarism.
- **Plagiarism => 0** marks for both involved parties (copier & copied) on entire assignment.
- You can read more about plagiarism here:
<https://www.universityofgalway.ie/media/studentservices/files/Code-of-Practice-for-Dealing-with-Plagiarism.pdf>



Lecture Notes

- You can download the lecture notes from Canvas.
- Normally, they appear there shortly before the respective lecture.
- Sometimes I might update the notes sometime after the lecture.



Exam

- A written closed-book exam (2 hrs) at the end of the 2nd semester.
- Exam material, unless explicitly announced otherwise: all lecture notes



Background Expected

- Language:
 - Reasonable reading and writing in English
 - Understanding of subject, verb and object
- Math:
 - Numbers, add, subtract, multiply, divide
 - Exponentiation, logarithms (we will review)
 - Logic: and, or, not
- Computer Literacy: read email, browse web



Course Theme

- System Knowledge
 - How the physical components **(Hardware)** of a computer (processors, memory, disk drives, and network infrastructure) and the logical components **(Software)** of a computer (operating systems, compilers, and libraries) work together to enable application programs to be run.
- Why study theory?
 - Develop your programming skills to be more efficient.
 - Capable of locating and eliminating bugs in a timely manner
 - Capable of comprehending and adjusting for optimal program performance




Measuring Computers

- 1 bit = smallest unit of information
 - True or False
 - 0 or 1
 - If we start with 2 possible choices, and get 1 bit, we can eliminate one of the choices
- 1 Gigabyte = 1024 Megabytes,
1 Megabyte = 1024 Kilobytes,
1 Kilobyte = 1024 Bytes,
1 Byte = 8 bits
> (* 1024 1024 1024 8)



Power of Laptop

Save Compare



Latitude 5540 Laptop

Order Code s016l554015ukie_vp

★★★★☆ 4.4 (604)

Specs Customise →

Processor

13th Gen Intel® Core™ i5-1345U

OS

Windows 11 Pro

Graphics

Intel 13th Generation i5-1345U vPro, Intel Integrated Graphics, TBT4

Memory

16 GB DDR4

Storage

512 GB SSD

Display

15.6-in. display Full HD (1920X1080)

Save Compare



Latitude 3330 Laptop

Order Code s206l333013ukie_vp

★★★★☆ 4.0 (115)

Specs Customise →

Processor

11th Gen Intel® Core™ i7-1195G7

OS

Windows 10 Pro (Includes free upgrade to Windows 11 Pro)

Graphics

Integrated Intel® Iris® X® Graphics i7-1195G7 processor with 8G memory for clamshell

Memory

8 GB, LPDDR4x, 4266 MHz, integrated

Storage

256 GB SSD

Display

13.3-in. display Full HD (1920X1080)

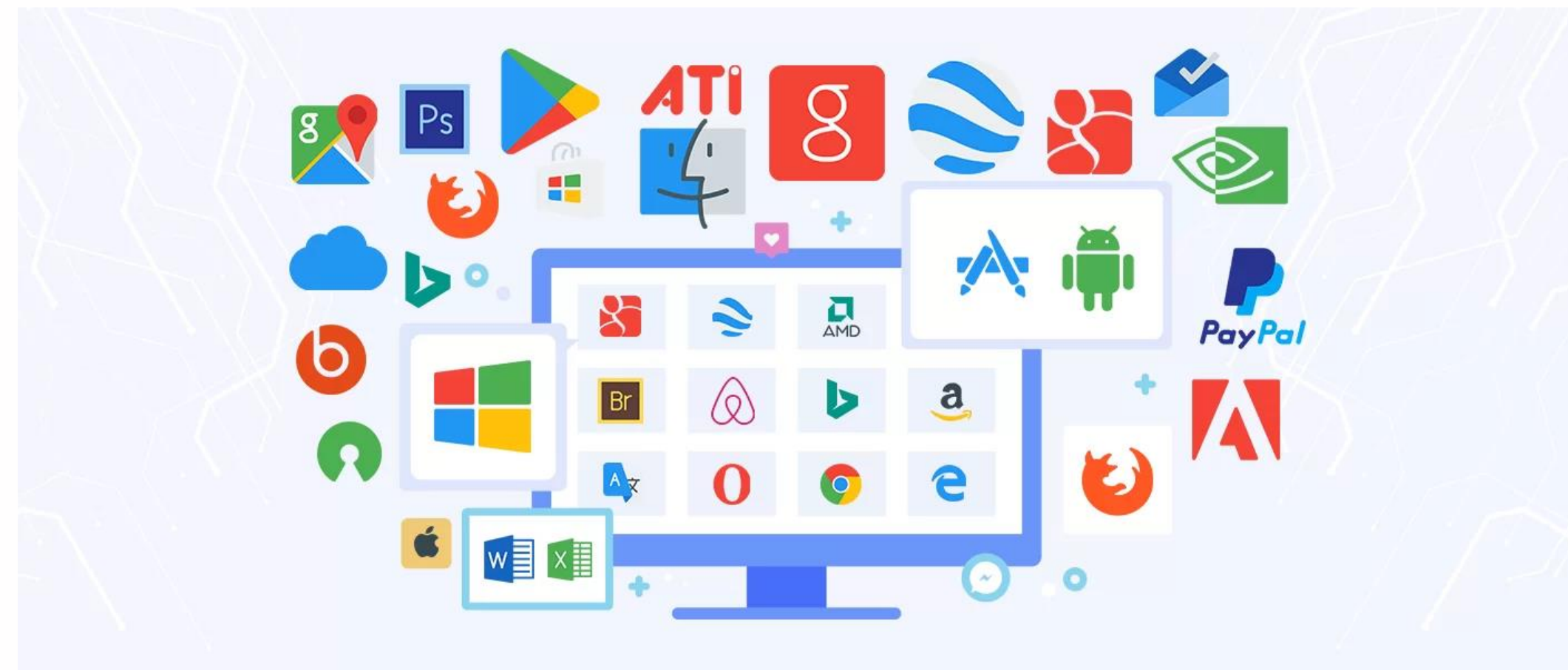
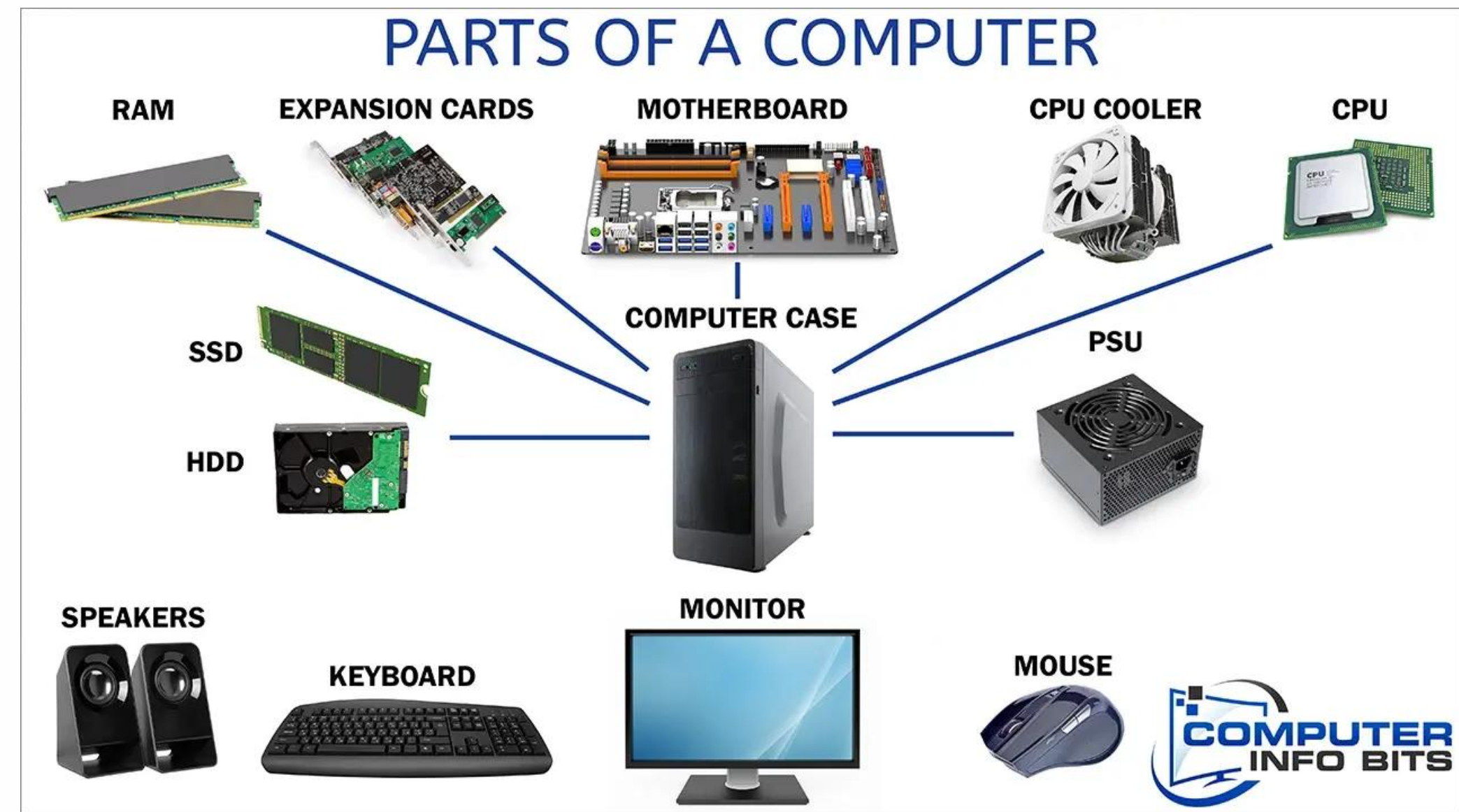


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Reference: <https://www.dell.com/en-ie/shop/scc/sr/laptops/latitude-laptops>

Hardware and Software

- Computer Hardware would include all the parts of a computer.
- Computer Software includes the programs that are installed.. Or the instructions for completing tasks.

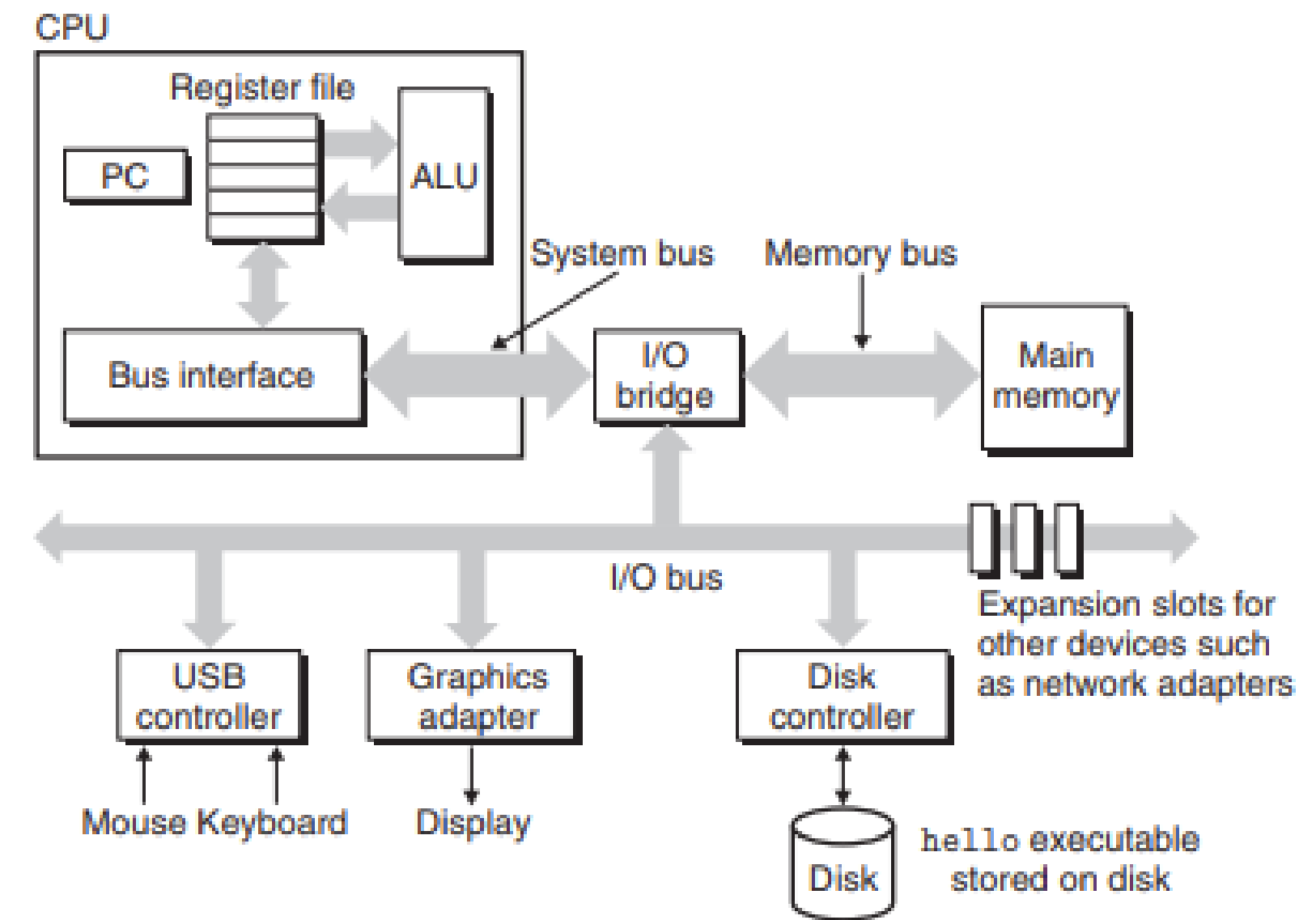


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Image credits: <https://computerinfobits.com/parts-of-computer-and-their-functions/>
<https://www.goodcore.co.uk/blog/types-of-software/>

Hardware Organization

- Input/output (I/O) devices are the system's connection to the external world.
- The main memory is a temporary storage device that holds both a program and the data it manipulates while the processor is executing the program.
- The central processing unit (CPU), or simply processor, is the engine that interprets (or executes) instructions stored in main memory.



Input Devices

- I/O operations are accomplished through a wide assortment of external devices that provide a means of exchanging data between the external environment and the computer.
- **Human readable**:-Suitable for communicating with the computer user
- **Machine readable**:-Suitable for communicating with equipment
- **Communication**:-Suitable for communicating with remote devices



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Output Devices

- An output device is any piece of computer hardware that converts data into a human-perceivable. It may be textual, graphical, tactile, audible, or video-based.

- Human readable**:-Suitable for communicating with the computer user

- Machine readable**:-Suitable for communicating with equipment

- Communication**:-Suitable for communicating with remote devices



Central Processing Unit

- Converts data into information
- Control center
- Set of electronic circuitry that executes stored program instructions
- Two parts
 - Control Unit (CU)
 - Arithmetic Logic Unit (ALU)

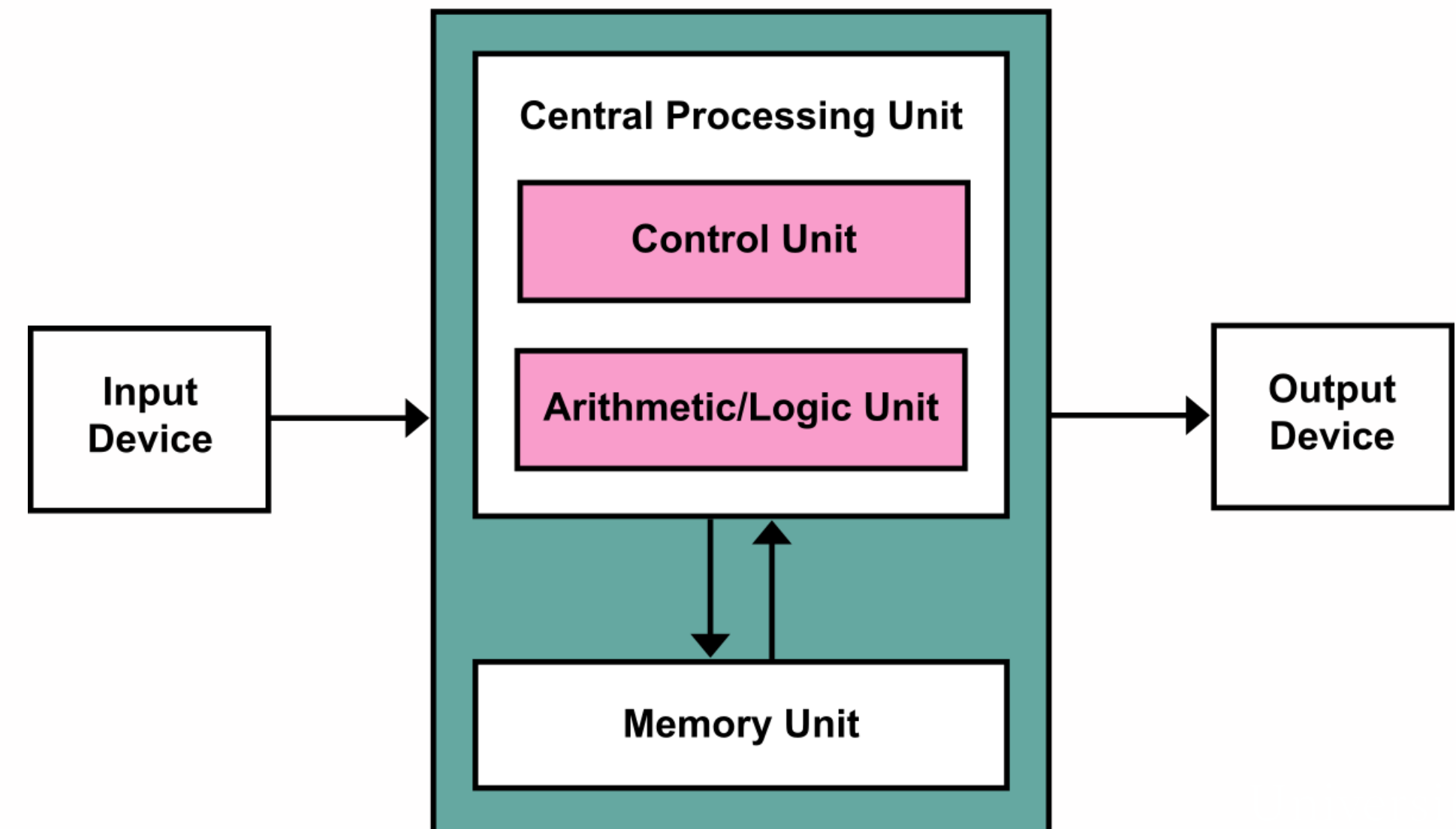
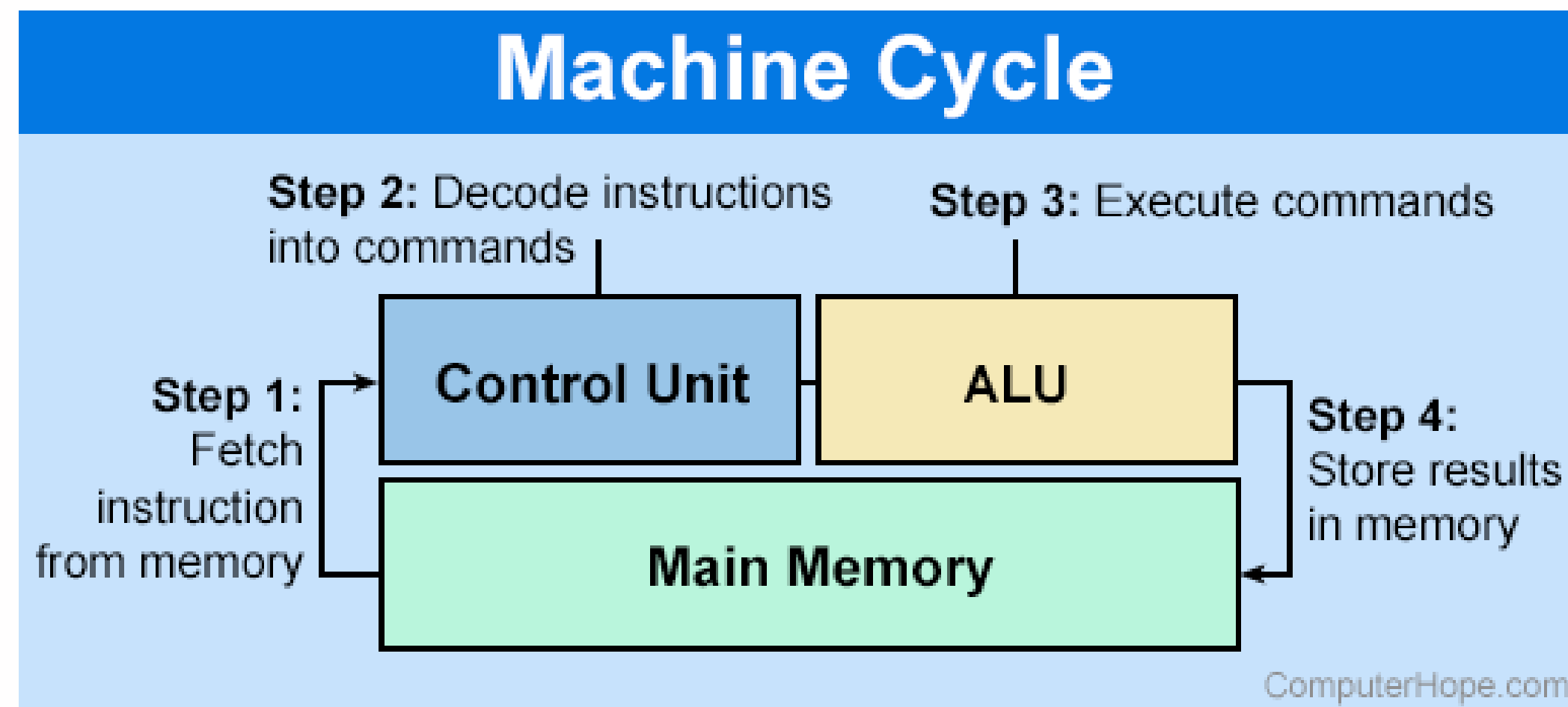


Image Credits: https://en.wikipedia.org/wiki/Von_Neumann_architecture



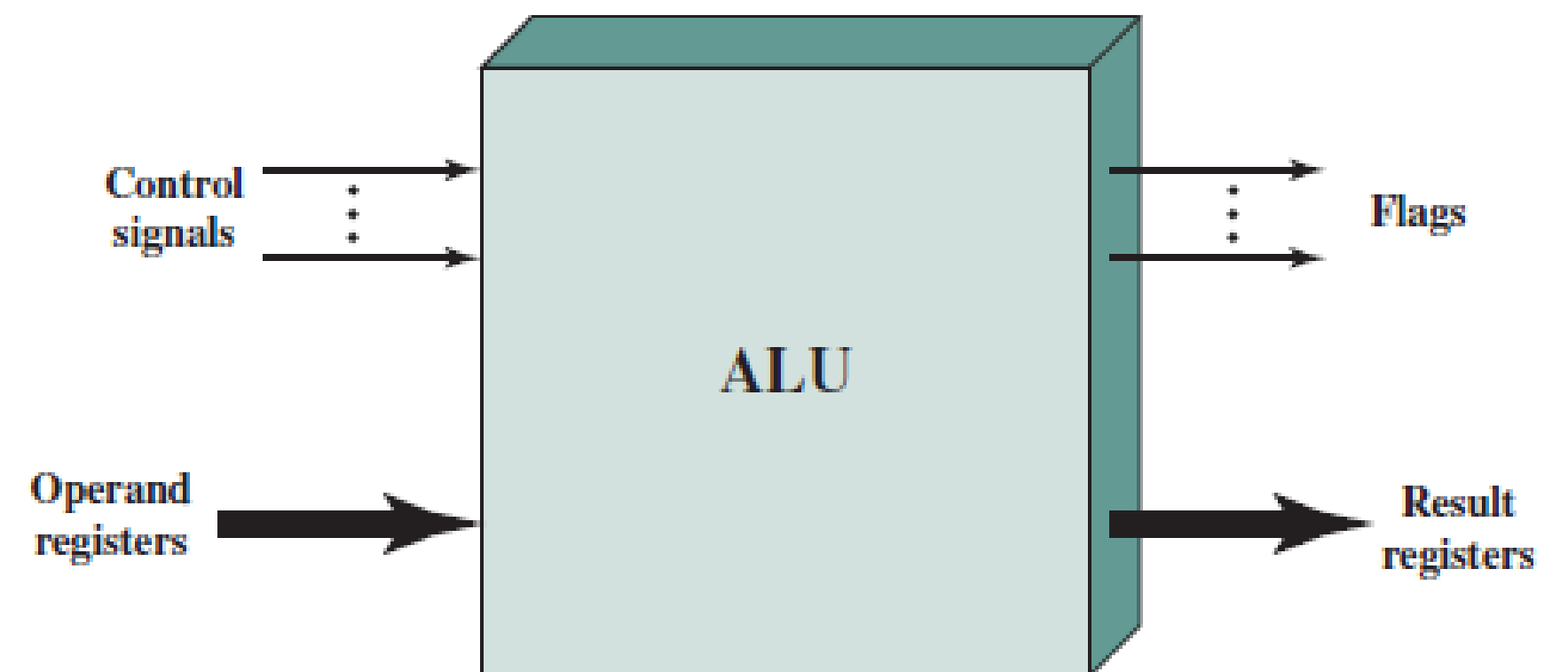
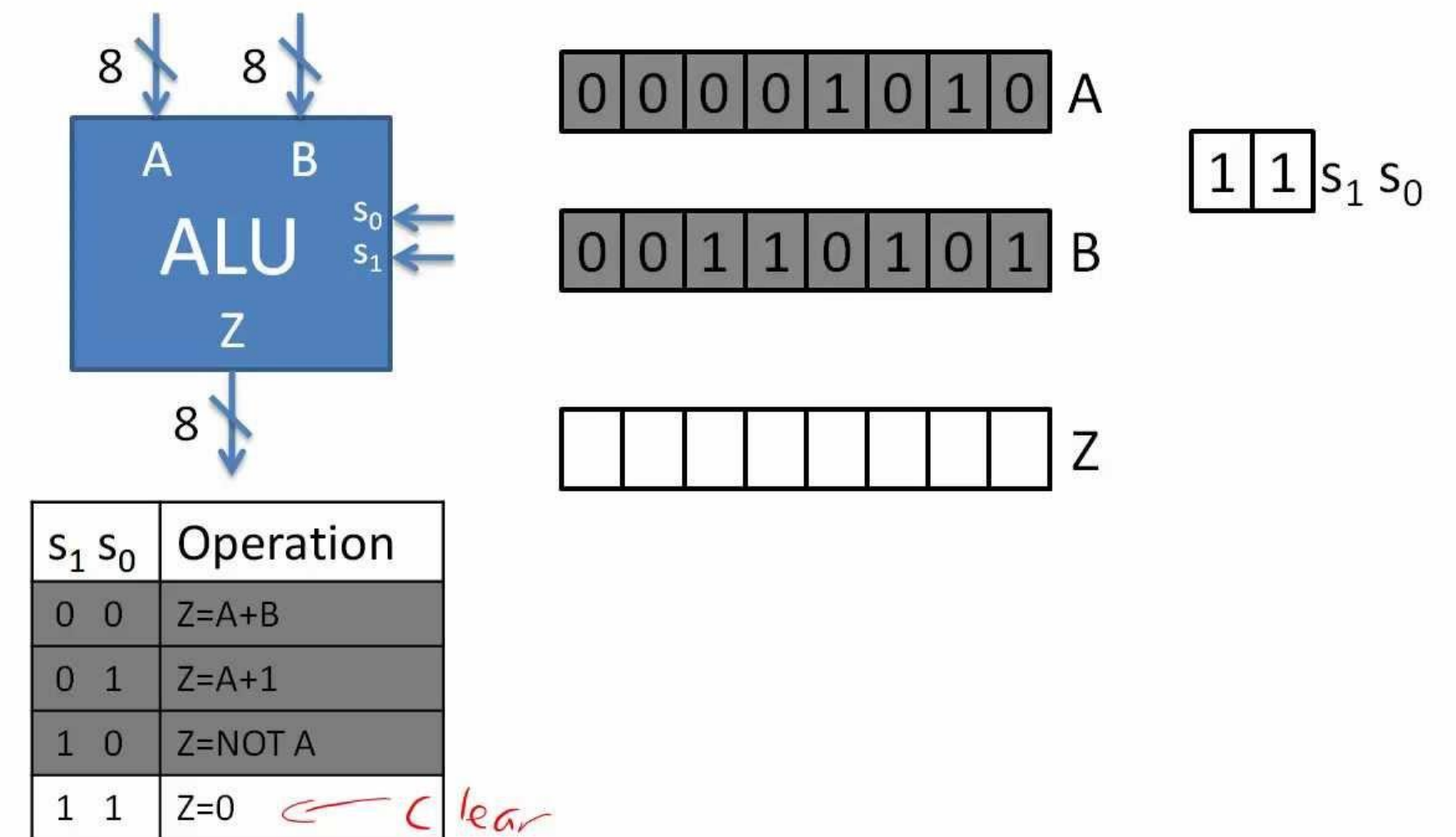
Control Unit

- A computer's control unit or CU is the circuitry that **directs processor operations**.
- It instructs the computer's logic unit, memory, and input and output devices on **how to respond to programme instructions**.
- The control unit is responsible for communicating to the computer's memory, arithmetic/logic unit, and input/output devices how to respond to the instructions sent by the processor.



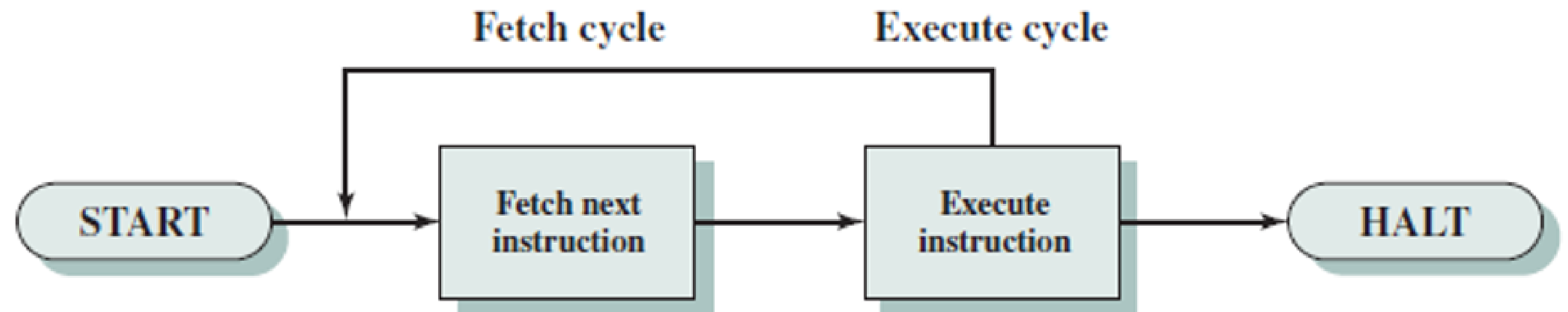
Arithmetic and Logic Unit

- Perform all processes related to arithmetic and logic operations such as addition, subtraction, and shifting operations, including Boolean comparisons (XOR, OR, AND, and NOT operations).
- Logical Operations
- Arithmetic Operations
- Bit-shifting Operations



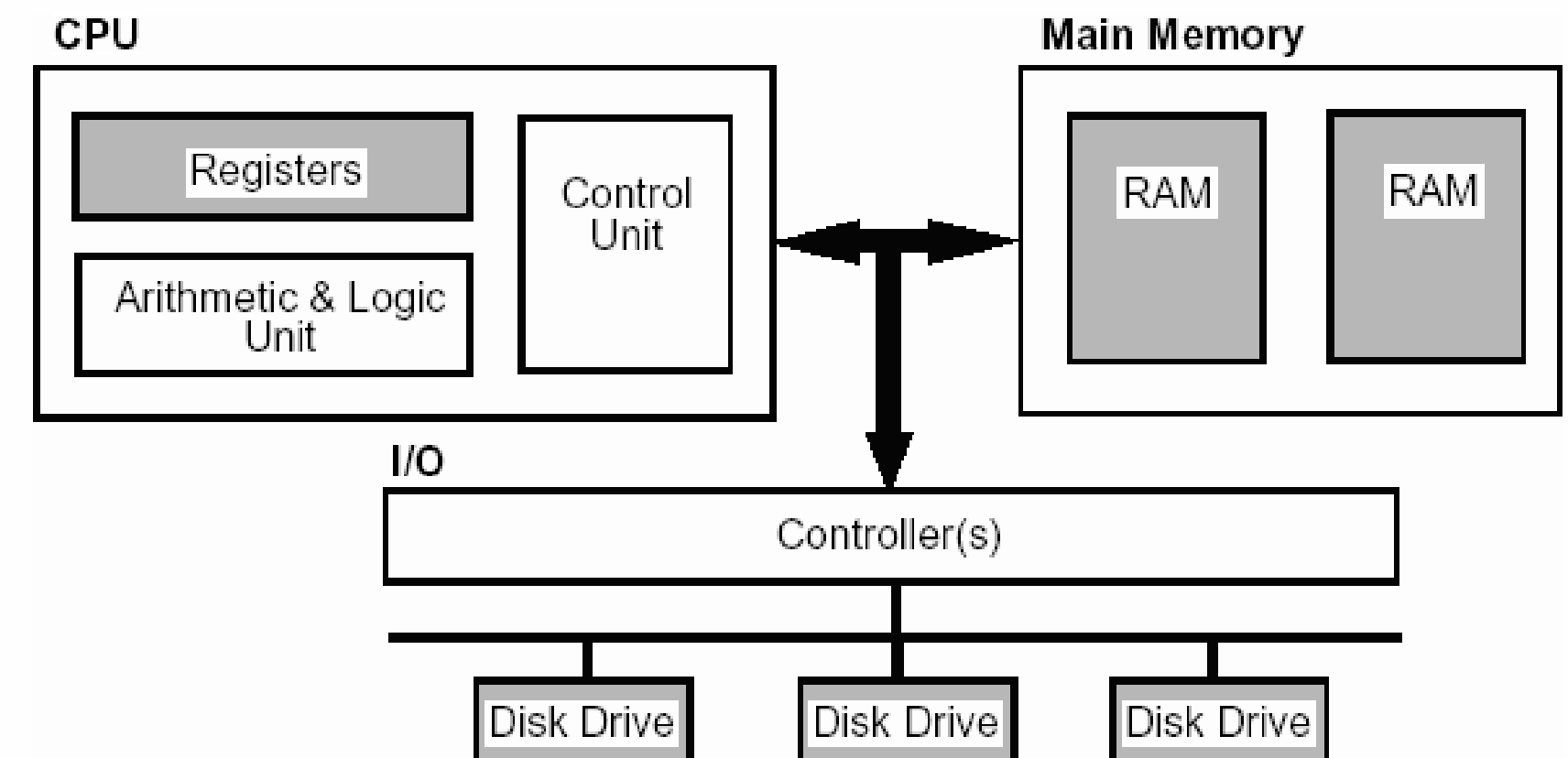
Instruction Fetch Cycle

- The CPU retrieves instructions from memory during the seek cycle.
- In the decode cycle, the CPU interprets the instruction and determines the required operation.
- The CPU performs the operation specified by the instruction during the execute cycle. This may entail reading or writing data to or from memory, performing arithmetic or logical operations on data, or manipulating the program's control flow.



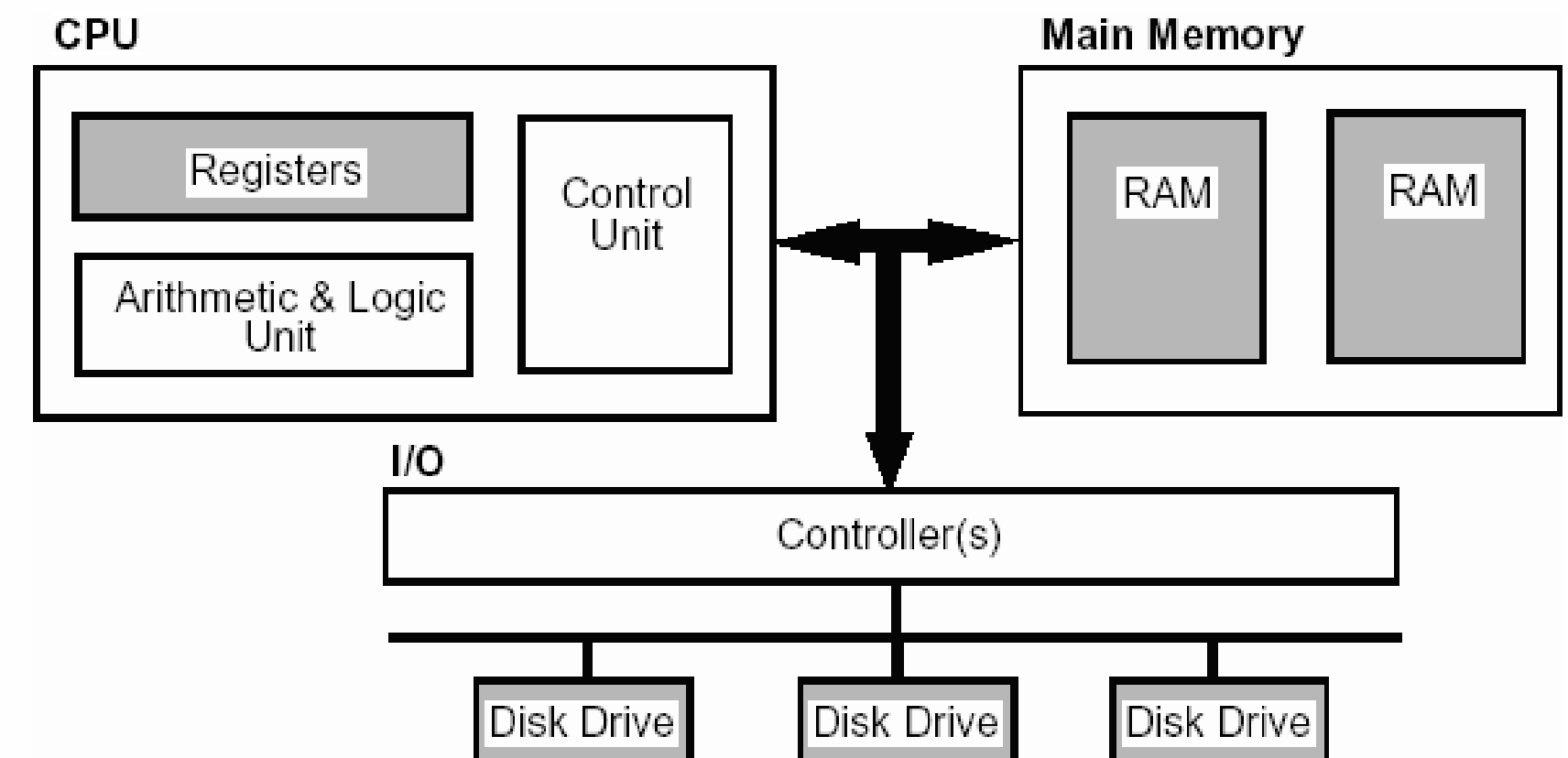
Memory

- The main memory is the primary storage component of a computer system.
- This memory is associatively large and rapid, and it stores programmes and data during computer operations.



Data Storage Devices

- External memory, also known as "secondary memory", refers to a storage device that can retain or store data persistently.
- They may be either embedded or removable storage units.
- Hard disc or solid-state drives, USB flash drives, and compact discs are examples.

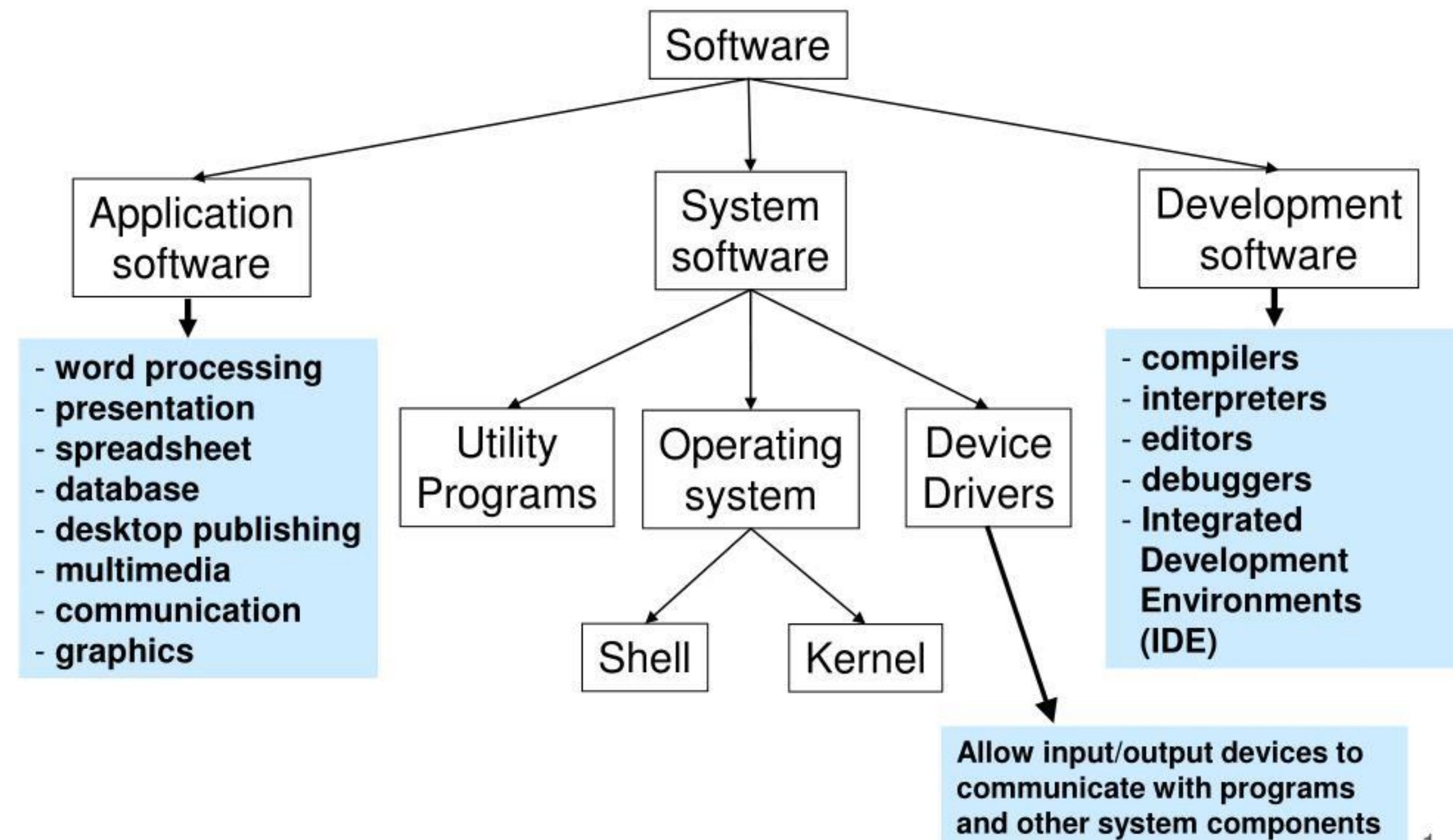


Software

- Software is a compilation of instructions, data, or computer programmes used to operate machines and perform specific tasks.
- It is the opposite of hardware, which refers to the external components of a computer.
- In this context, "software" refers to all of the operating programmes, scripts, and applications on a device.

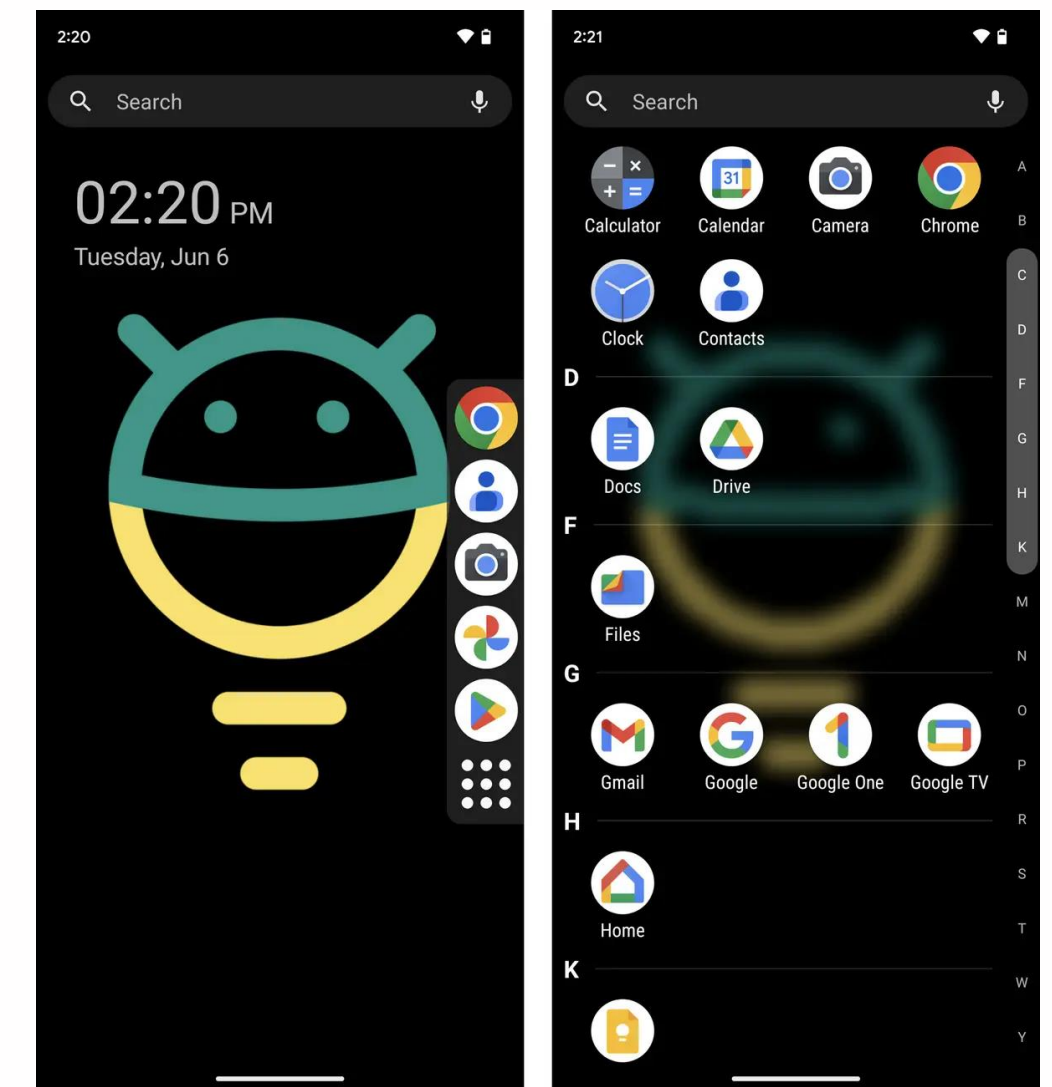


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Graphical User Interface

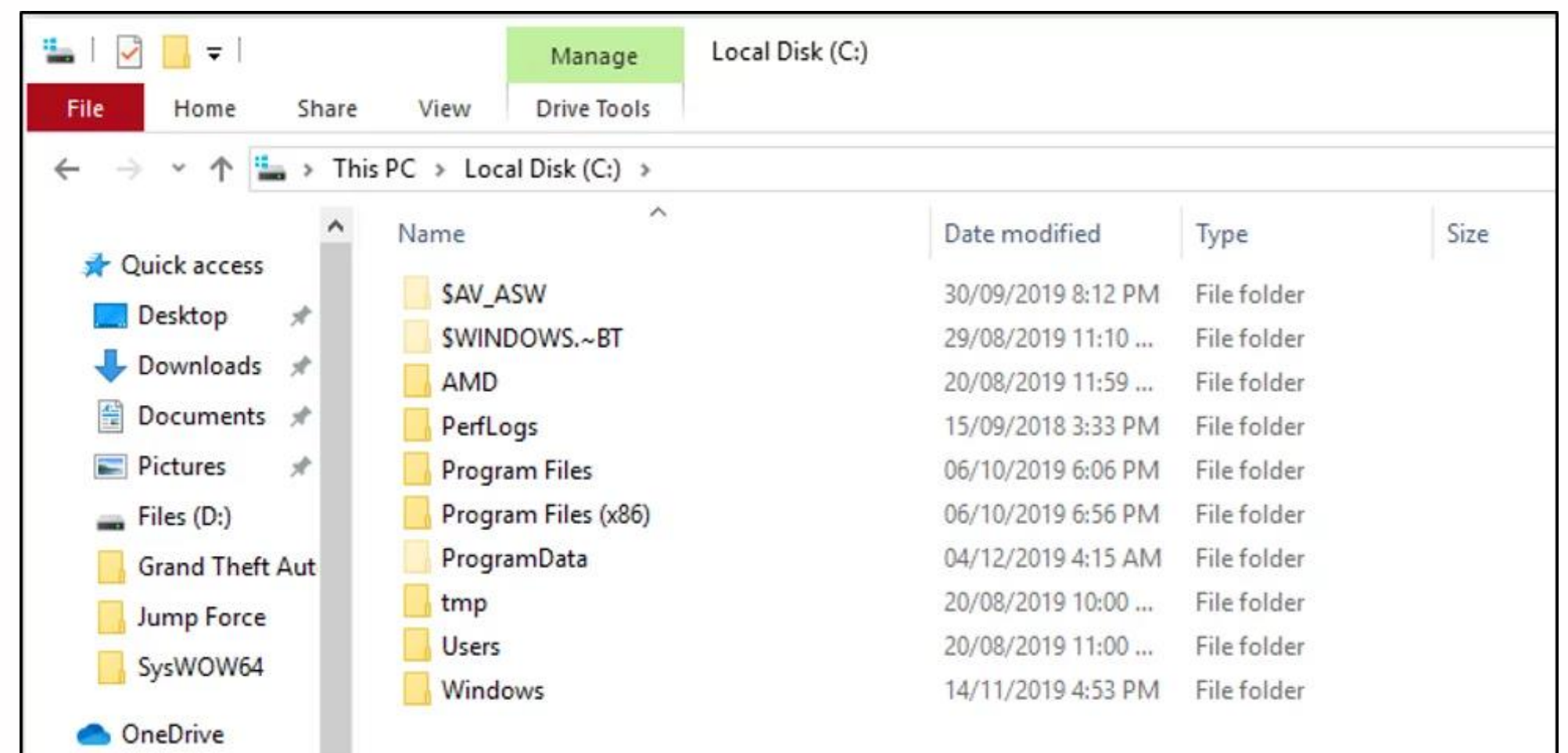
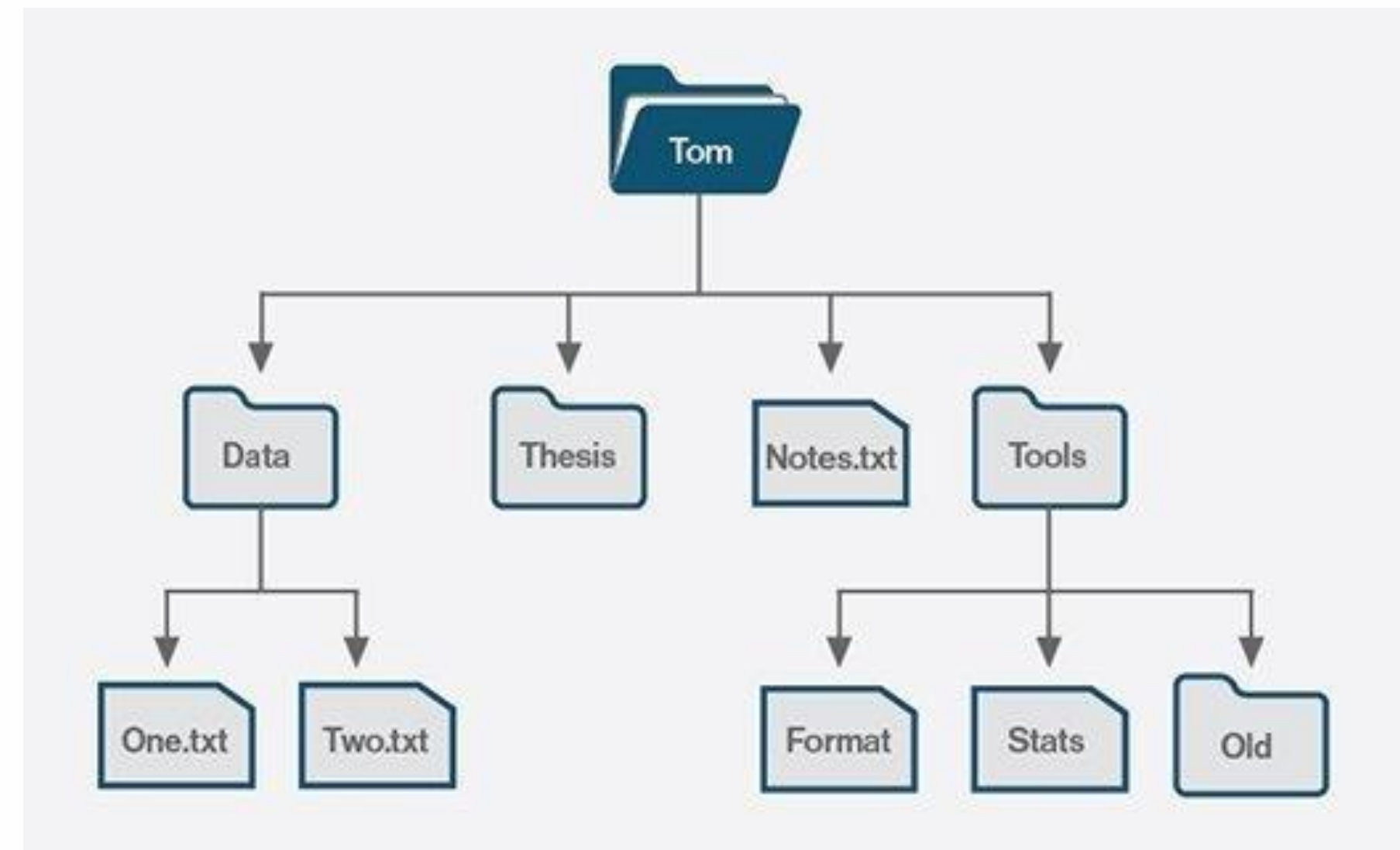
- A graphical user interface (GUI) is a digital interface in which a user interacts with graphical components such as icons, buttons, and menus.



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File System

- A computer's file system determines how files are named and where they are logically arranged for storage and retrieval.
- Without a file system, information stored would not be separated into individual files, making it difficult to identify and retrieve.
- Operating systems (OS) such as Microsoft Windows, macOS, and Linux-based systems can have distinct file systems.





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Thank *you*

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