

Introduction to Computing

Introduction to Computing – Study Notes

1. What Is Computing?

Aspect	Description
Definition	The systematic processing of information using algorithms, hardware, and software to solve problems, automate tasks, or generate new knowledge.
Core Components	1. Hardware – physical devices (CPU, memory, storage, I/O). 2. Software – programs, operating systems, applications. 3. Data – raw facts that become information after processing.
Goal	Transform input (data) into useful output (information, actions) efficiently, reliably, and securely.

2. Fundamental Concepts

2.1 Algorithms

- **Definition:** A finite, step-by-step set of instructions for solving a problem.
- **Properties:** Precise, deterministic (or probabilistic), and has a clear termination condition.
- **Examples:** Sorting a list, searching a database, calculating a sum.

2.2 Data Representation

Type	Typical Representation	Example
Numbers	Binary (bits) ? integers, floating-point	1010? = 10??
Text	ASCII, Unicode (UTF-8/16)	“A” ? 01000001
Images	Raster (pixel grids) or vector (geometric primitives)	JPEG, SVG
Audio	Sampled waveforms, compressed formats	MP3, WAV
Video	Sequence of frames + audio stream	MP4, AVI

2.3 Programming Languages

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- **Low-level:** Machine code, assembly – close to hardware, high control, low portability.
- **High-level:** Python, Java, C#, JavaScript – abstracted syntax, easier development, portable.
- **Domain-specific:** SQL (databases), HTML/CSS (web markup), R (statistics).

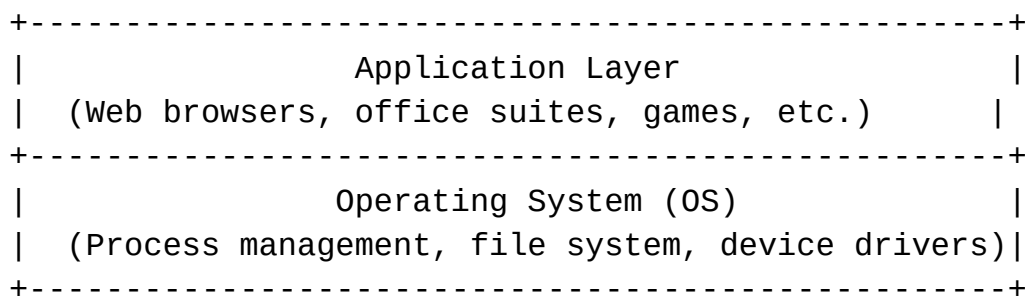
2.4 Computational Thinking

1. **Decomposition** – Break complex problems into manageable parts.
 2. **Pattern Recognition** – Identify commonalities to reuse solutions.
 3. **Abstraction** – Focus on essential details, ignore irrelevant ones.
 4. **Algorithm Design** – Formulate step-wise procedures to achieve goals.
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3. Hardware Overview

Component	Function	Typical Examples
CPU (Central Processing Unit)	Executes instructions, performs arithmetic/logic operations	Intel Core i7, ARM Cortex A78
Memory (RAM)	Temporary storage for active data & instructions	DDR4, LPDDR5
Storage	Persistent data retention	SSD, HDD, NVMe
Input Devices	Capture user or environmental data	Keyboard, mouse, camera, sensors
Output Devices	Present results to the user	Monitor, printer, speakers
Network Interface	Enables data exchange over networks	Ethernet, Wi-Fi, Bluetooth

4. Software Layers



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	System Software	
	(Utilities, runtime libraries, language runtimes)	
+-----+		
	Firmware / BIOS	
	(Hardware initialization, low-level control)	
+-----+		
	Hardware	
+-----+		

- **Application software** solves specific user tasks.
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