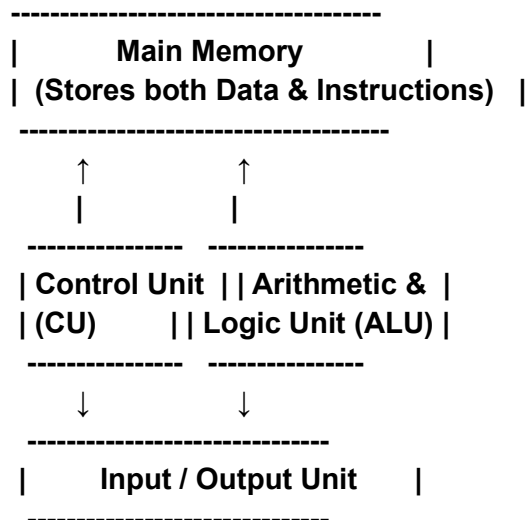**Name: Omolafe Joshua Favour**
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1. Von Neumann Architecture

The Von Neumann Architecture is a computer architecture model proposed by John von Neumann in 1945. It is based on the idea that a computer's program and data are stored in the same memory unit.

Diagram of Von Neumann Architecture

Below is a simple representation of the Von Neumann Architecture:

```
-------------------------------------
|          Main Memory          |
| (Stores both Data & Instructions)  |
 -------------------------------------
        ↑               ↑
        |               |
  ----------------  ----------------
 | Control Unit  | | Arithmetic &  |
 | (CU)          | | Logic Unit (ALU) |
  ----------------  ----------------
        ↓               ↓
  -------------------------------
 |      Input / Output Unit     |
  -------------------------------
```

Components of Von Neumann Architecture:

1. **Memory Unit (RAM) – Stores both data and instructions.**

2. **Control Unit (CU) – Fetches instructions from memory, decodes, and executes them.**

3. **Arithmetic and Logic Unit (ALU) – Performs arithmetic (addition, subtraction) and logical operations.**

4. **Input/Output Unit (I/O) – Handles interaction with external devices (keyboard, monitor).**

5. **Buses (Data Bus, Address Bus, Control Bus) – Transfers information between components.**

Advantages of Von Neumann Architecture
Simplicity – Uses a single memory for instructions and data, making design easier.
Flexibility – Can execute different programs by loading new instructions into memory.
Cost-Effective – Less hardware needed compared to separate memory systems.
Efficient Use of Memory – Instructions and data share memory, reducing hardware requirements.

Limitations of Von Neumann Architecture
Von Neumann Bottleneck – Since instructions and data share the same memory bus, CPU speed is limited by memory access speed.
Slow Execution – The CPU has to wait while fetching instructions and data sequentially.
Security Issues – Since both instructions and data are stored in the same memory, malicious programs can modify instructions (self-modifying code).

2. Stored Program Concept
The Stored Program Concept means that both instructions (programs) and data are stored in the same memory unit of a computer. This idea was first introduced by John von Neumann and is the foundation of modern computing.
Key Features of the Stored Program Concept:

1. Instructions are treated like data and stored in memory.

2. Programs can be modified and updated without changing the hardware.

3. Execution occurs sequentially – Fetch → Decode → Execute.

Example of Stored Program Concept in Action (Python Code)
python CopyEdit def add_numbers(a, b):   return a + b

result = add_numbers(5, 3) # Function stored in memory, executed later print(result) # Output: 8

- Here, add_numbers() is stored as instructions in memory.

- It is retrieved and executed when needed.

Significance of the Stored Program Concept
- Led to general-purpose computers capable of running multiple programs.

- Enabled software development instead of modifying hardware for every task.

- Allowed for operating systems, programming languages, and AI advancements.