Early Computing

In the 1930s, <mark>Alan Turing</mark> (dramatized by Benedict Cumberbach in *The Imitation Game*), imagined a **universal computing machine** which could store both its data, **and** its <mark>programs</mark> in memory. 1940s-era computers, such as the ENIAC, **had no programs** as such. Instead, they were **hard-wired** to perform specific calculations. Programming them entailed rewiring their circuit cabinets, a process that could take several days.

Turing's ideas were realized in 1946, when mathematician and physicist <mark>John Von Neumann</mark> described the first real **stored program** computer system, the EDVAC, whose **machine language** instructions were stored in memory as a **binary numeric code**.

```
1000 1011 0100 1110 0000 0110
```

To run a program on the **EVAC**, each instruction was <mark>fetched</mark> from memory by the CPU Control Unit (CU) and then stored in **registers** on the CPU. The instruction was then <mark>decoded</mark> and <mark>executed</mark> by the CPU's Arithmetic/Logic unit (ALU). Finally, the results were written back into memory where they could be examined. This sequence-read, decode, execute and store-is known as the instruction cycle; it's how every computer works.