

Integration of Computers and Technological Advancements

- Over the last 20 years, major technological advancements include:
 - Distributed computing.
 - Cloud computing.
 - AI improvements such as voice recognition, face recognition, and self-driving cars.

History of Programming

- **Charles Babbage (1822)**
 - Worked on improving calculating devices for navigation charts and astronomical tables.
 - Realized these devices were prone to human error and proposed the **Difference Engine**.
 - **Difference Engine:**
 - Used mechanical gears with numbers 0-9 etched onto them.
 - Operated manually using hand cranks to compute results.
- **Evolution of Babbage's Work**
 - Created improved designs, such as the **Difference Engine 2**.
 - Developed the concept of the **Analytical Engine**, considered the foundation of modern computing.
- **Ada Lovelace**
 - Documented how the Analytical Engine could perform a sequence of calculations, akin to a modern computer program.
- The **Analytical Engine** was never completed, partly due to lack of proper documentation.

Basics of How Computers Work

- Computers understand **binary code** (0 and 1):
 - **0**: Represents "off" (low electrical state).
 - **1**: Represents "on" (high electrical state).
- **Binary Representation Examples:**
 - Decimal 1 → Binary 1.
 - Decimal 2 → Binary 10.
 - Decimal 3 → Binary 11.

- Binary code is represented using **transistors** housed inside the **CPU** (the computer's brain).

Programming Concepts

- **Compiling or Interpreting**
 - Programming languages are converted into **machine code** (binary) for computers to execute.
- **Why Programming Languages Are Used**
 - Binary code is difficult and error-prone for humans to read/write.
 - Programming languages make it easier to communicate instructions to computers.
- **What is Programming?**
 - Providing a computer with a set of instructions in a format it can understand.
 - A skill that improves with practice.
- **Characteristics of Programming**
 - Initially challenging but becomes easier with familiarity.
 - A creative skill—problems can be solved in multiple ways.

Takeaways

- You now understand the brief history of programming and how computer programming works at a fundamental level.