# Hello World

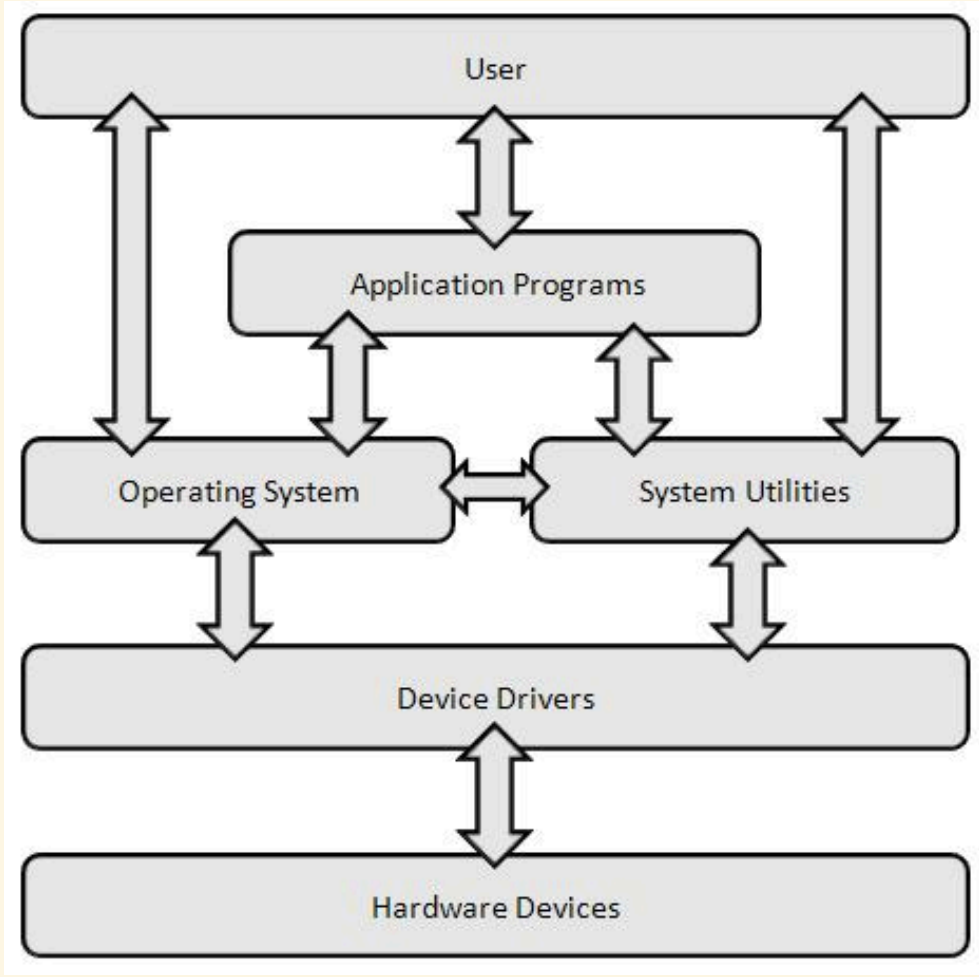
A Quick Introduction to Computers, Programming, and Python

# What Really is a Computer?

- **Electronic machine** that follows instructions
- Takes **input** → processes it → gives **output**
- Only understands **1s and 0s** (binary)
- Everything else is translation

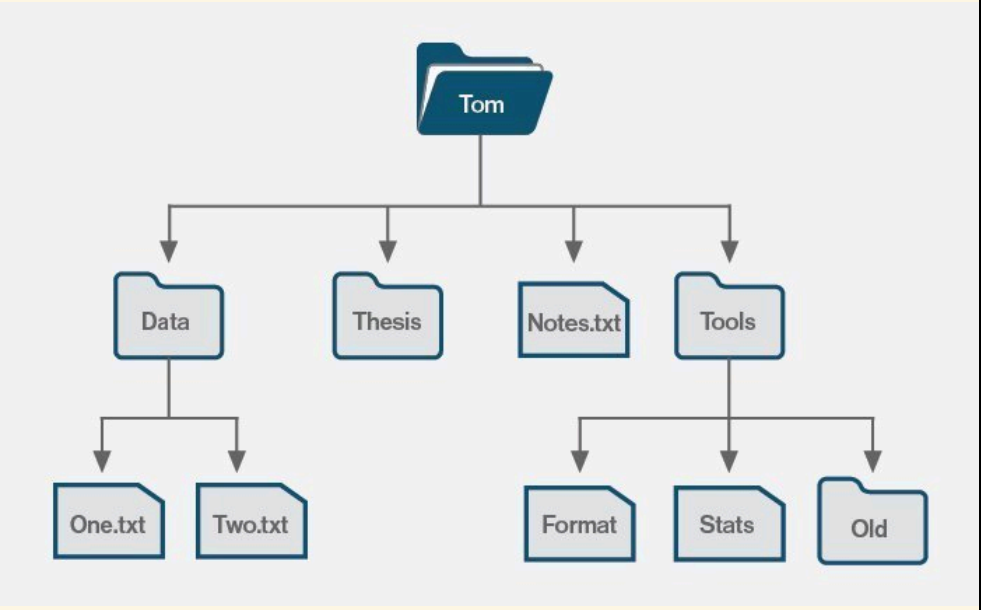
# Modern Computers are Layers of Abstraction

- **Hardware**: Physical components (CPU, RAM, etc.)
- **Operating System**: Manages hardware (Windows, macOS, Linux)
- **Programming Languages**: Human-readable instructions (Python, Java, etc.)
- **Applications**: Software that performs tasks (web browsers, games, etc.)



# What is a File?

- **Collection of data** stored on your computer in a **tree-like** structure
- Has a **path**, **name**, and **extension**
- File extensions indicate type:
  - `.txt` = text
  - `.py` = Python code
  - `.jpg` = image
- Files can be `created`, `read`, `written`, and `deleted`
- Some files can be `executed`, these are programs.



# Source Code vs Machine Code

## Source Code

- **Human-readable** instructions we write
- Looks like:

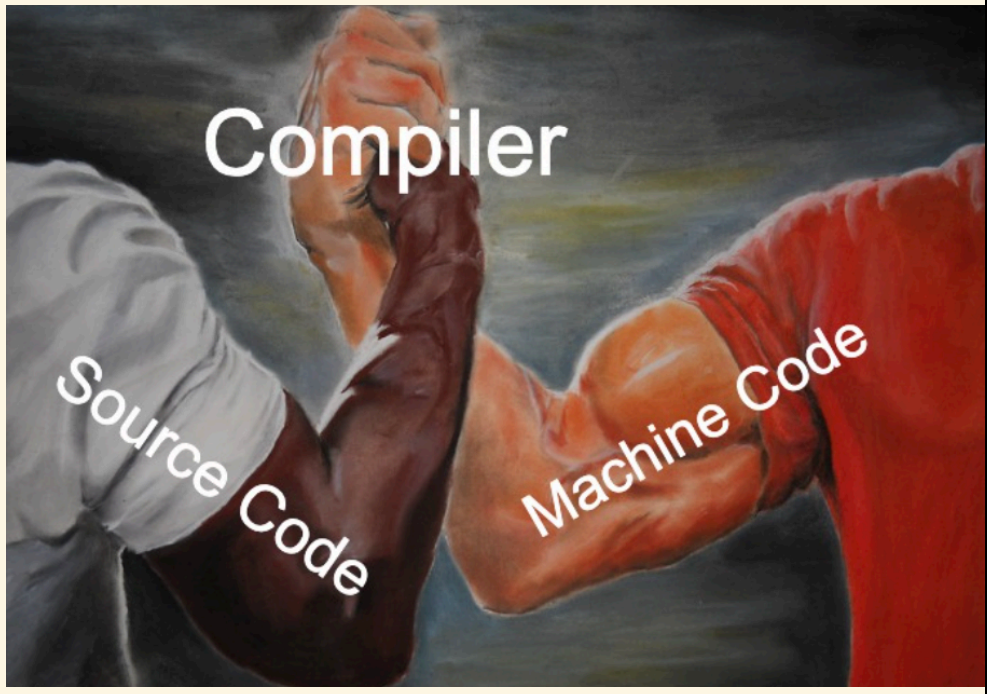
```
print("Hello World")
```

## Machine Code

- **Computer-readable** instructions
- Looks like:

```
48 89 e5     mov    %rsp,%rbp
48 83 ec 10  sub    $0x10,%rsp
bf 01 00 00  mov    $0x1,%edi
```

- **Source code** is translated to **machine code** by a **compiler**.

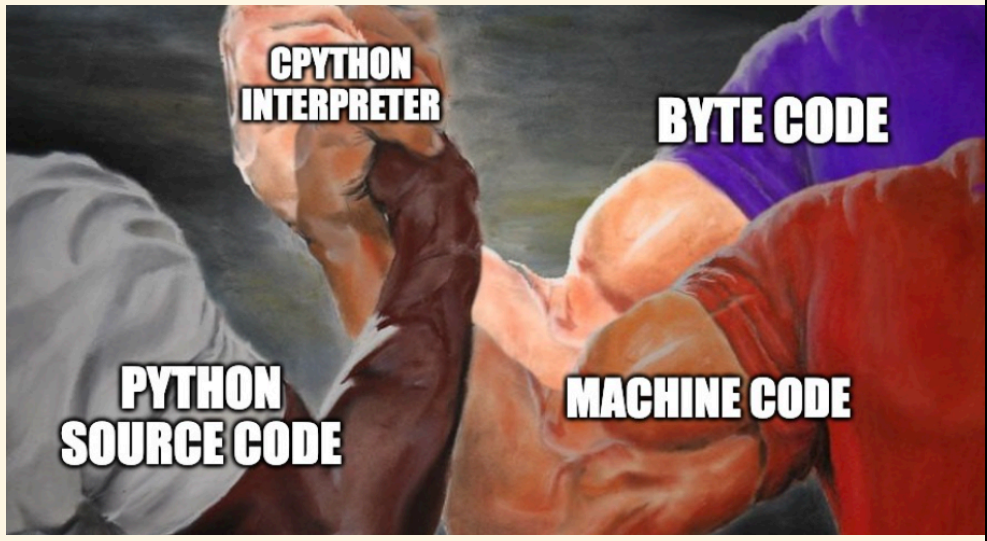


# CPython Interpreter

- What actually runs Python code
- **Two-step process:**
  1. Python source → **bytecode**
  2. Bytecode → **machine code**
- Looks like:

```
0 LOAD_GLOBAL              0 (print)
2 LOAD_CONST               1 ('Hello, World!')
4 CALL_FUNCTION            1
6 RETURN_VALUE
```

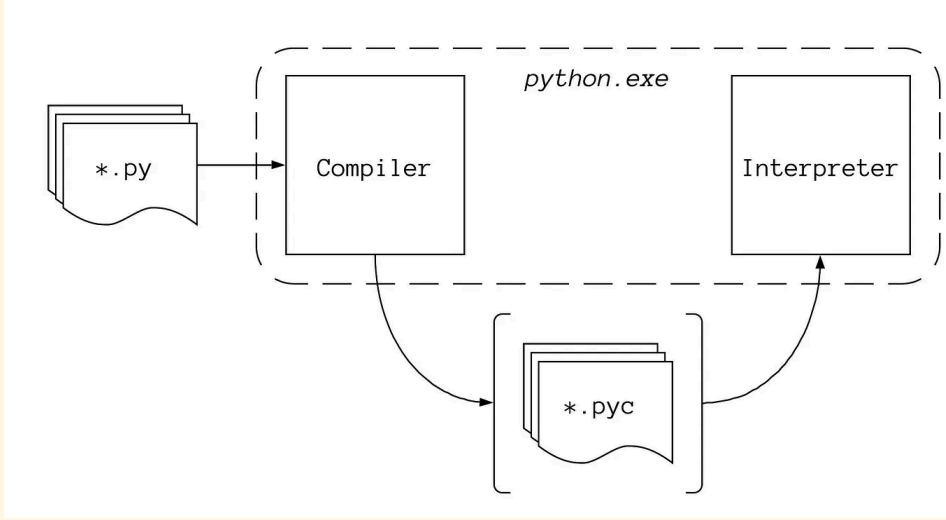
- Why two steps? **Portability** - same Python code runs everywhere.



# How Python Gets Executed

1. **You write** Python code in a `.py` file
2. **CPython interpreter** reads your code
3. **Converts** it to bytecode (behind the scenes)
4. **Computer executes** the bytecode
5. **You see** the result

*Python handles the translation for you!*



# Basic Input/Output

## Input

- **Getting information** from the user
- Keyboard, mouse, files, internet

## Output

- **Showing information** to the user
- Screen, speakers, files, internet

## In Python Code

- `input()` - get text from user
- `print()` - show text to user

## Output

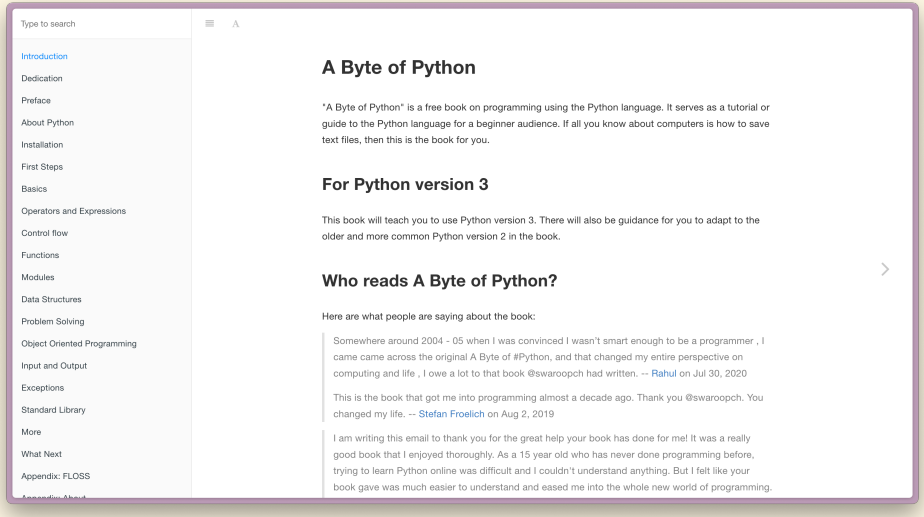
```
print("Hello, World!")
```

## Input and Output

```
name = input("Enter your name: ")
print(f"Hello, {name}!")
```

# A Byte of Python

- Written by **Swaroop Chitlur**
- All my slides for teaching Python are adapted from this book!
- Licensed under a **Creative Commons License**
- Creative Commons Attribution-Noncommercial-Share Alike 3.0 Unported License
- https://python.swaroopch.com/



# Comments

- Use `#` for comments
- They can be above:

```
# Note that print is a function
print('hello world')
```

- Or at the end

```
print('hello world')  # Note that print is a function
```

**Well commented code is easier to understand for future readers (including yourself).**

# Literal Constants

- Numbers: `5`, `1.23`
- Strings: `'This is a string'`, `"It's a string!"`
- Boolean: `True`, `False`
- Nothing!: `None`

# Numbers

Numbers are mainly of two types - **integers** and **floats**.

## Integers

- An example of an integer is `2` which is just a whole number.

## Floats

- Examples of floating point numbers ("floats") are `3.23` and `52.3e-4`.
- The `e` notation indicates powers of 10. `52.3e-4` => `52.3 * 10^-4^`.

# Strings

- Strings are used to represent text.
- You can use single quotes, double quotes, or triple quotes for multi-line strings.

```
'Hello'
"Hello"
'''
This is a
multi-line string
'''
```

- Strings are **immutable**

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# Variables Rules

- The first character of the identifier must be a letter of the alphabet or an underscore (_).
- The rest of the identifier name can consist of letters (uppercase ASCII or lowercase ASCII or Unicode character), underscores (_) or digits (0-9).
- Identifier names are case-sensitive. For example, `myname` and `myName` are not the same.

## Examples

- `age`, `name`, `foo`, `bar`
- `age2`, `name_2`, `foo_bar`
- `_age`, `_name` - starting with `_` denotes "private"
- `AGE`, `NAME` - ALL_CAPS denotes "constant"
- `i`, `j`, `k` - common for iterators in loops (more on this later)
- `df`, `x`, `y`, `X`, `Y` - bad variables but common in data science

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# Logical Operators

```
True and False
## False

True or False
## True

not True
## False
```

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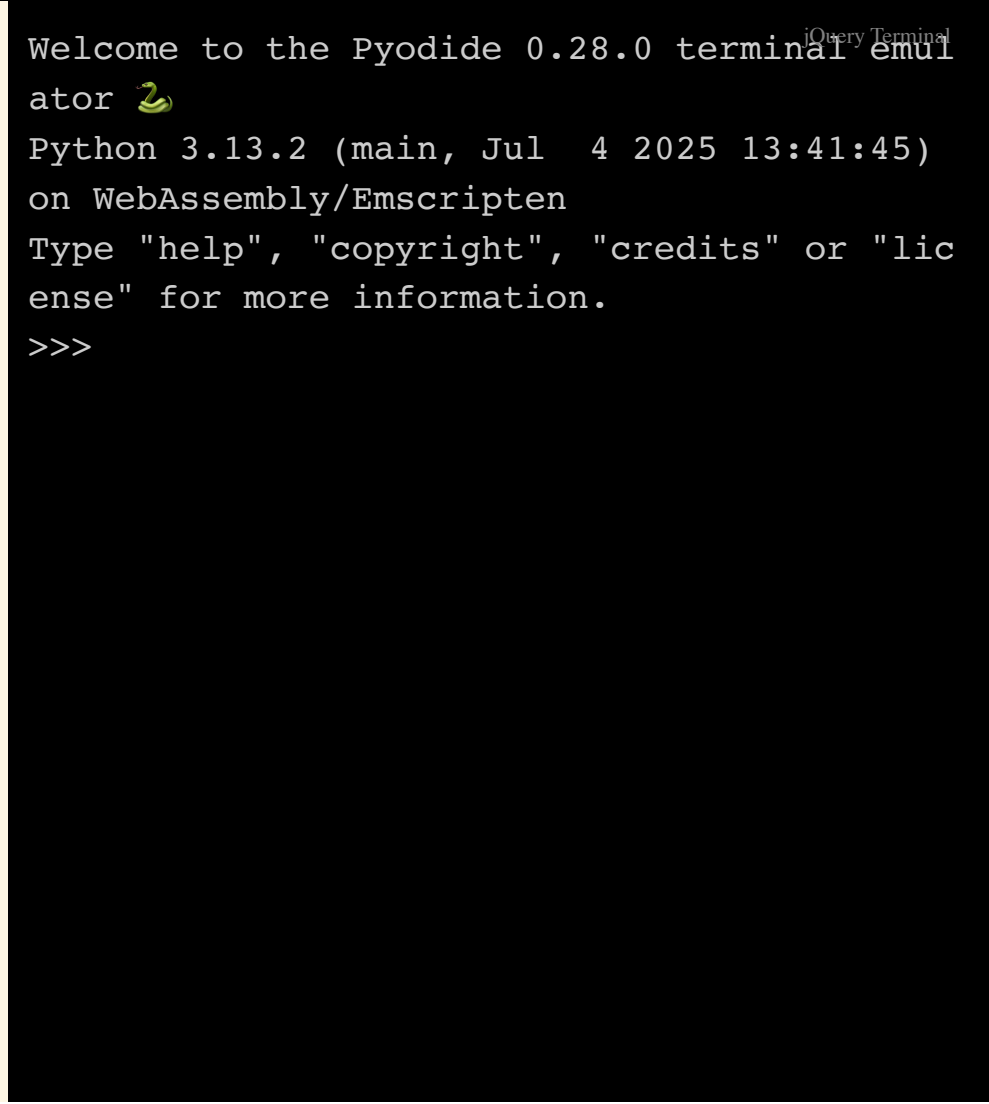
# REPL - Read-Eval-Print Loop

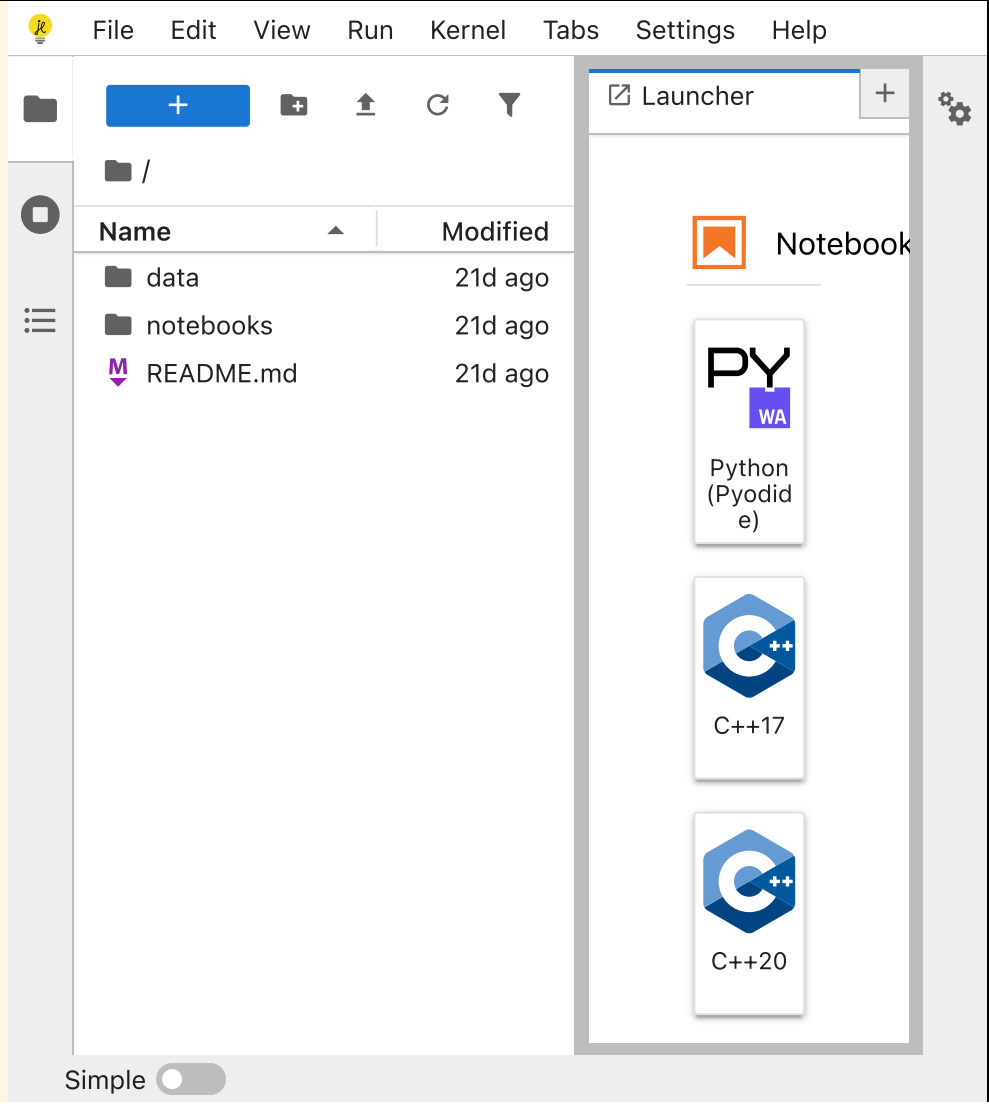
- **Interactive** way to run code
- **R**ead your code → **E**valuate it → **P**rint the result → **L**oop back
- Type code, hit Enter, see result immediately
- Perfect for **experimenting** and **learning**



# Jupyter Notebook

- **Web-based** coding environment
- Combines **code**, **text**, and **output** in one document
- Code goes in **cells** - run one cell at a time
- Like a **digital notebook** for programming
- Perfect for **data science** and **learning**

*Think: Google Docs + Python code*



# Exercise: Variables

bigd103.link/variables