Introduction to Python Programming

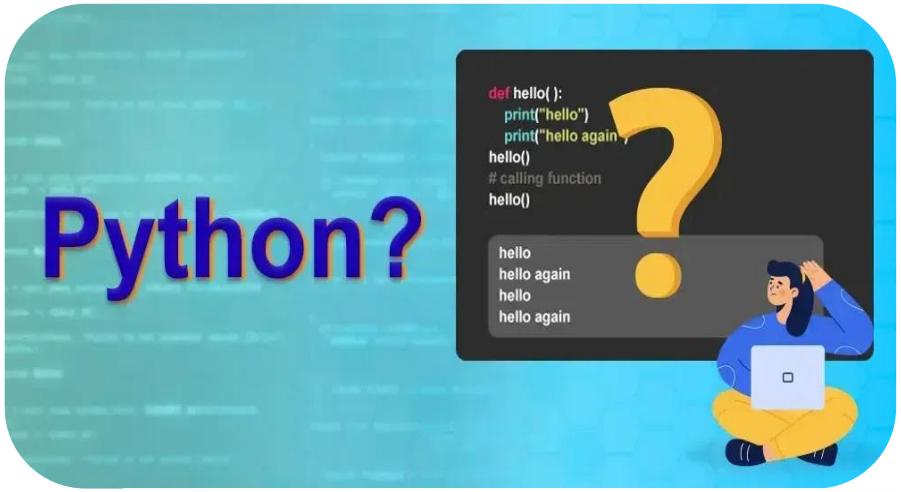
Dr. Muhammad Sajjad
RA. Ayaz Khan

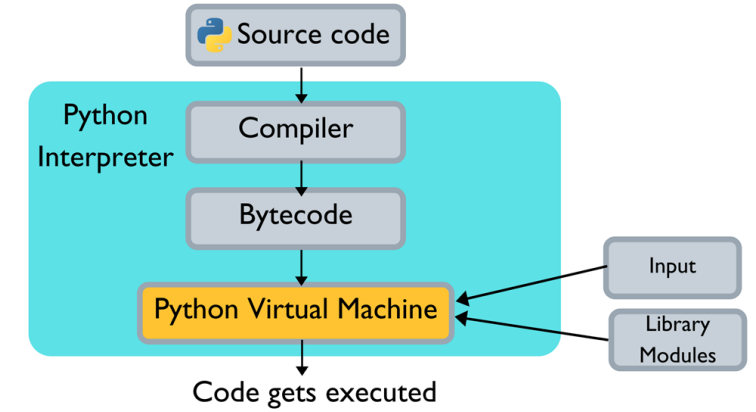
Overview

- **Introduction to Python**
  - Understanding Python and its applications.
- **Key Features of Python Programming**
  - Exploring Python's simplicity, readability, and versatility.
- **Setting Up the Python Environment**
  - Installing Python and setting up your programming environment.
- **Basic Python Syntax**
  - Learning the fundamental syntax and structure of Python code.
- **Writing Your First Python Program**
  - Hands-on experience: Creating and running your first Python script.

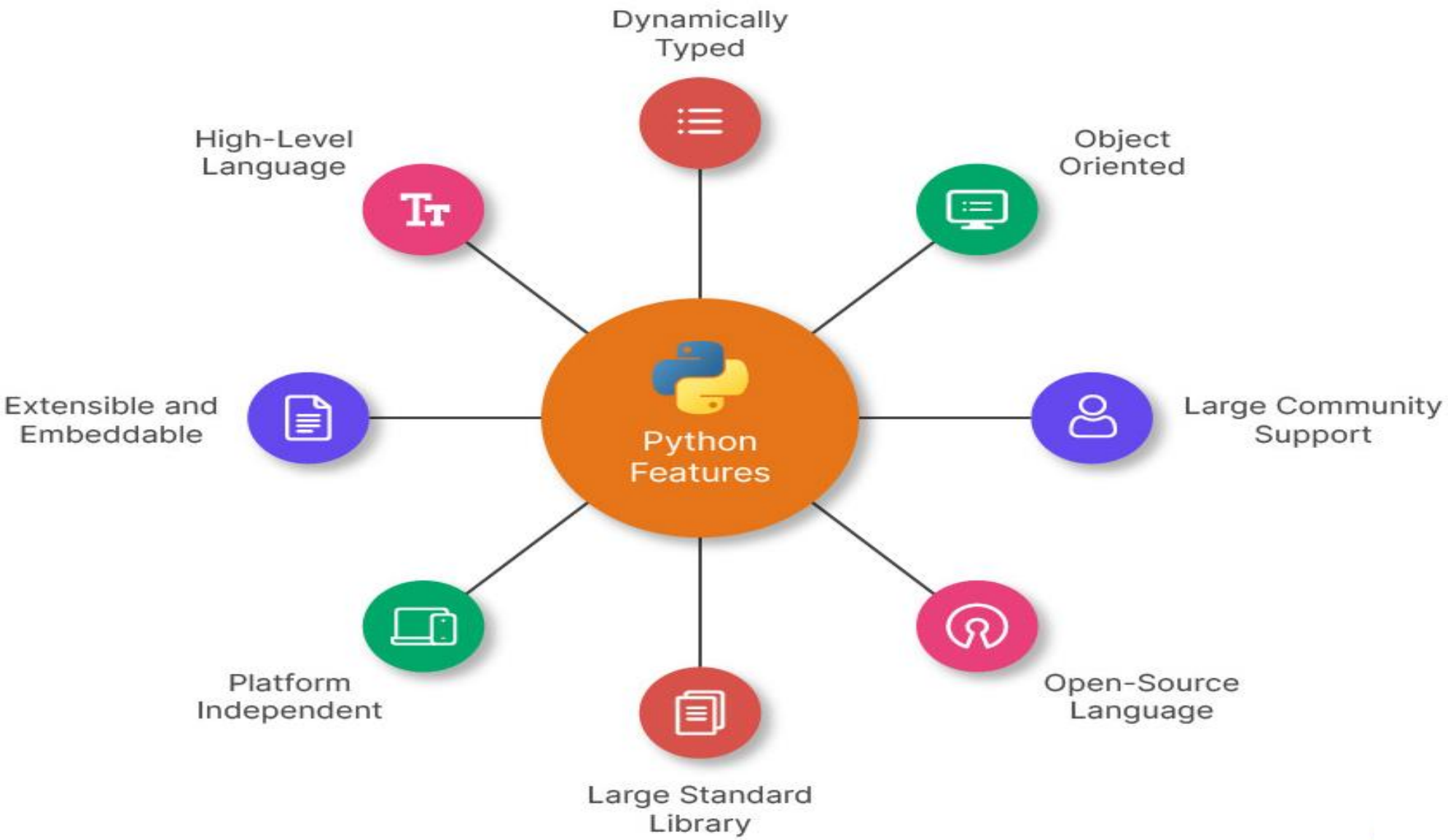
Introduction to Python

- **What is Python?**
  - High-level, interpreted programming language.
  - Used in web development, data analysis, automation, etc.
- **Why Python?**
  - Easy to learn with simple syntax.
  - Large community and extensive libraries.
  - Versatile and widely adopted across industries.





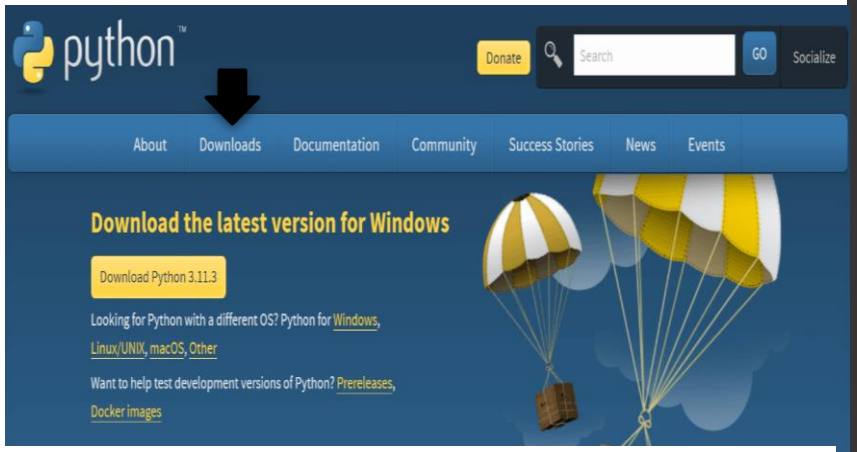
Key Features of Python Programming



Setting Up the Python Environment

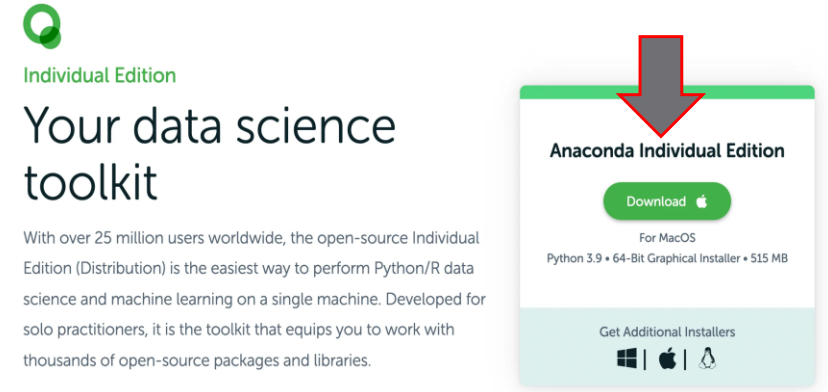
Step 1: Install Python via Anaconda Distribution

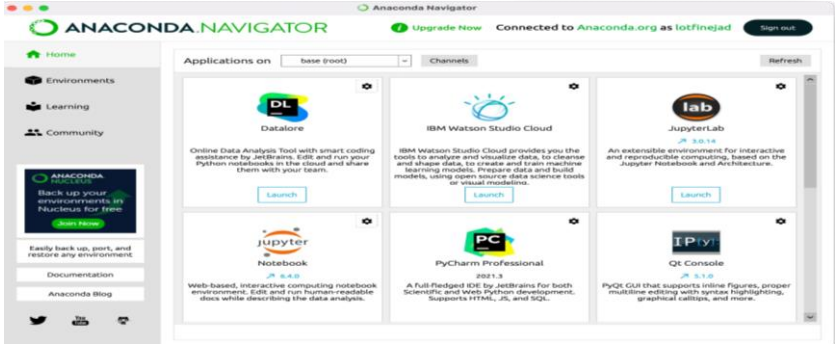
- Download the Anaconda distribution from the official website.
- Follow the installation instructions for your operating system.
  - **Windows/Mac/Linux**: Install the setup file and proceed through the default installation options.
- Anaconda includes Python, Jupyter Notebook, and essential libraries, making it easier for you to start coding right away.



Step 2: Set Up Jupyter Notebook

- **Open Anaconda Navigator**: Once installed, launch the Anaconda Navigator from your system.
- **Launch Jupyter Notebook**:
  - In the Anaconda Navigator window, find and click on **Jupyter Notebook** to launch it.
- **Create a New Notebook**:
  - Jupyter Notebook will open in your web browser.
  - Click on **New** in the top-right corner and select **Python 3**.
  - A new notebook will open where you can start writing and running Python code.
- **Start Coding**:
  - In the new notebook, type your Python code in the cells and press **Shift + Enter** to execute.

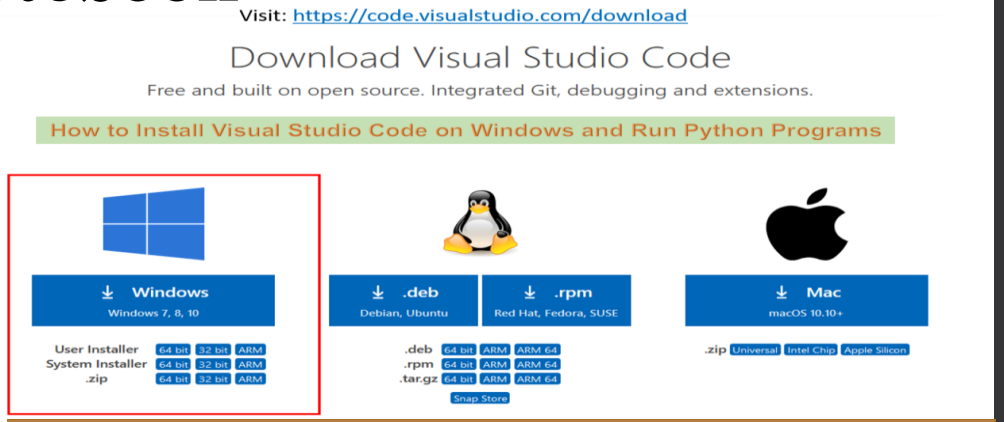




Using Visual Studio Code for Jupyter Notebook

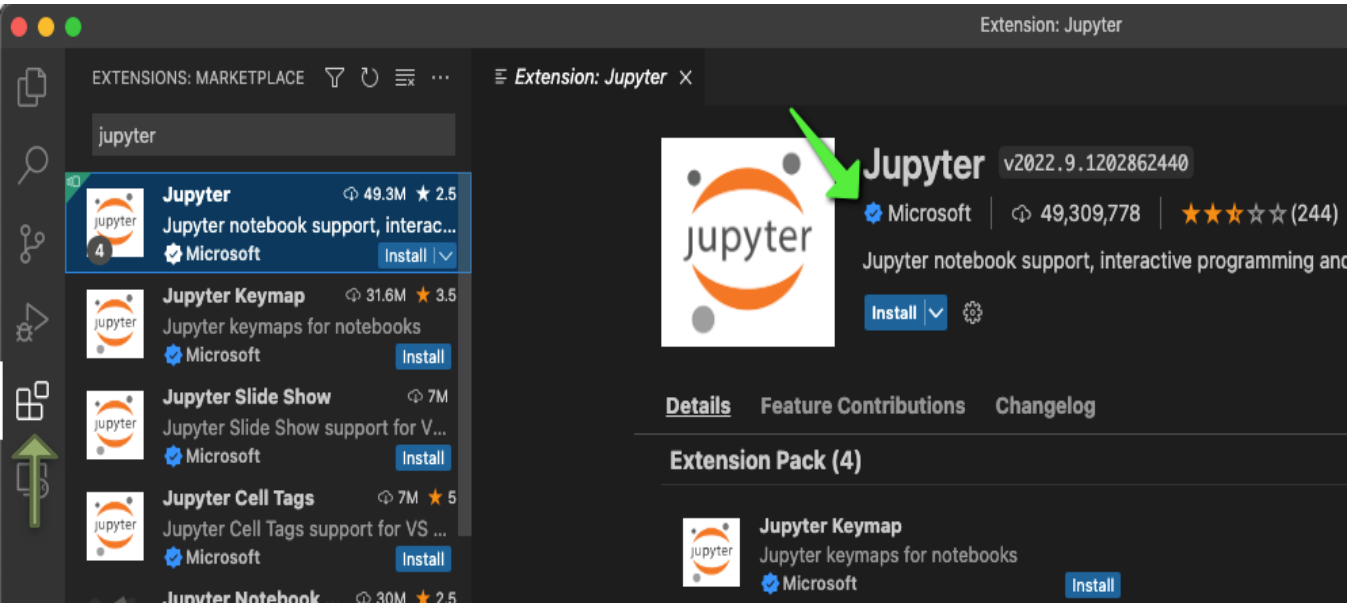
Install Visual Studio Code (VS Code)

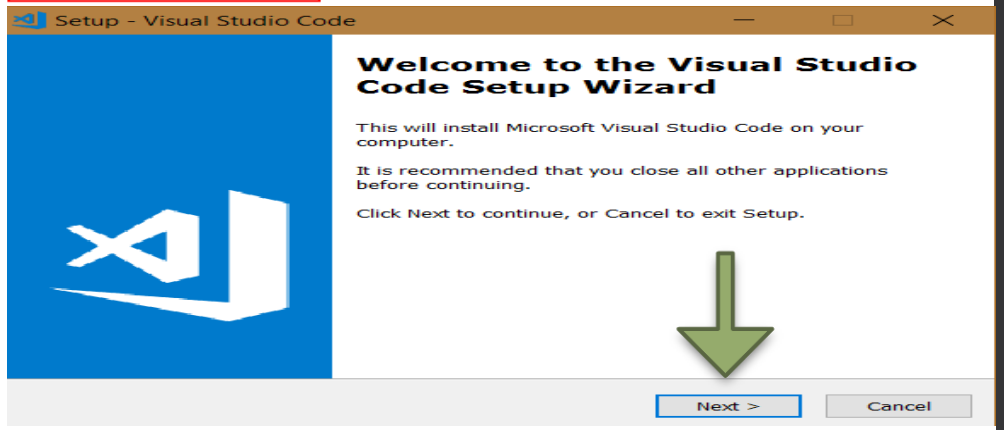
- Download and install VS Code from the official website.

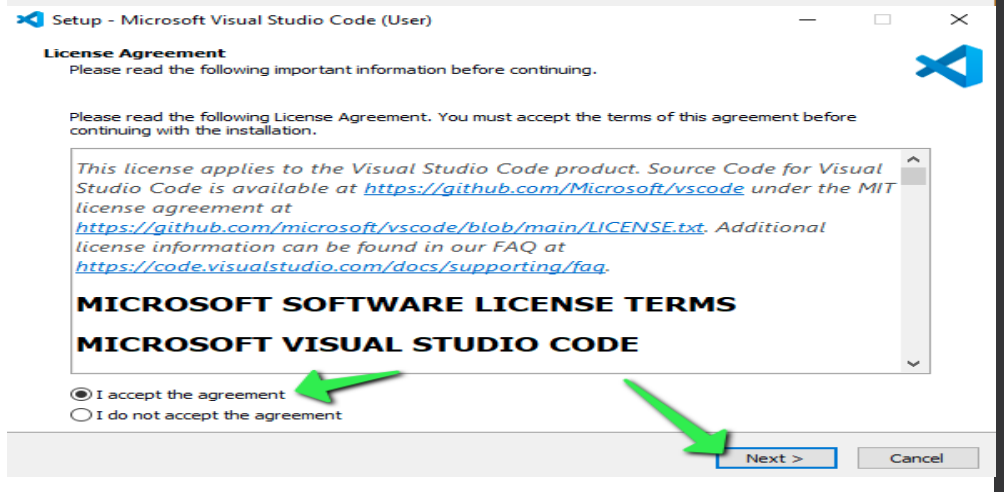


Install Jupyter Extension in VS Code

- Open VS Code.
- Go to the Extensions tab (left sidebar) and search for Jupyter.
- Click Install to add the Jupyter extension.







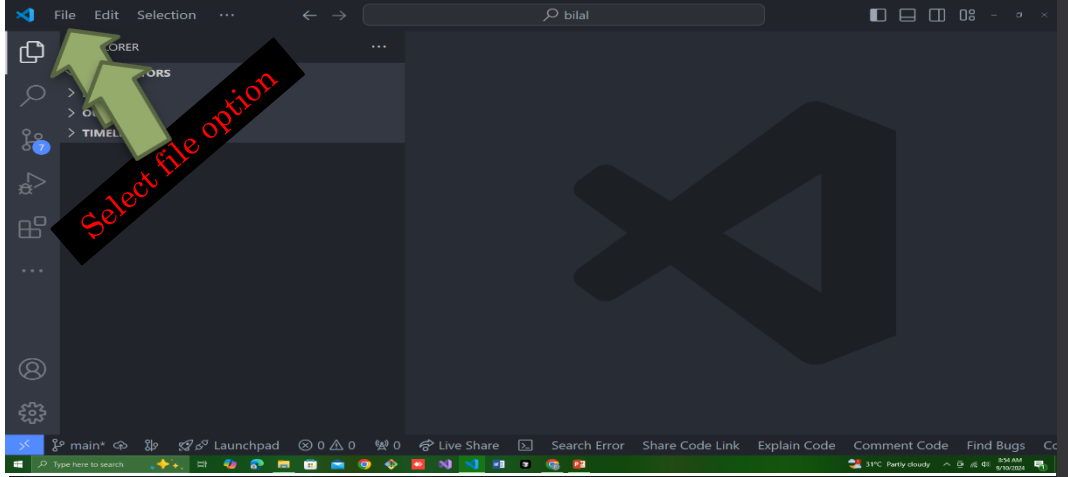
Working with Files, Folders, Kernel, and Terminal in VS Code

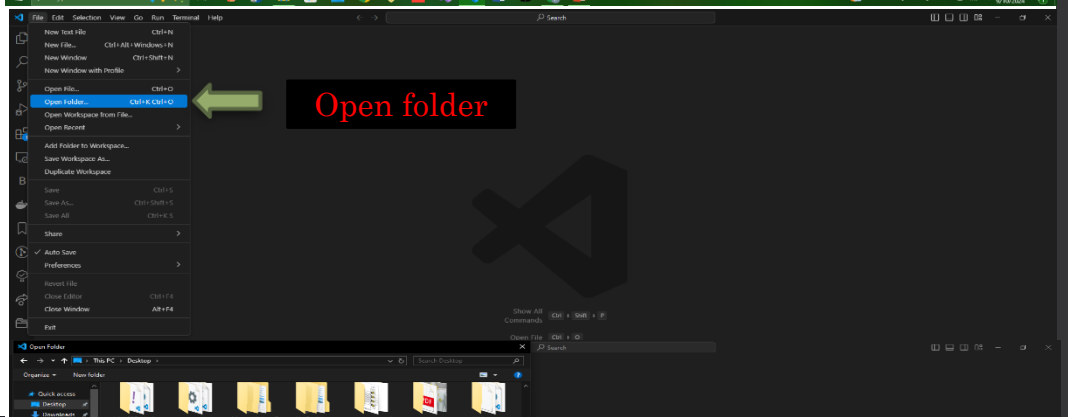
Select a File or Folder in VS Code

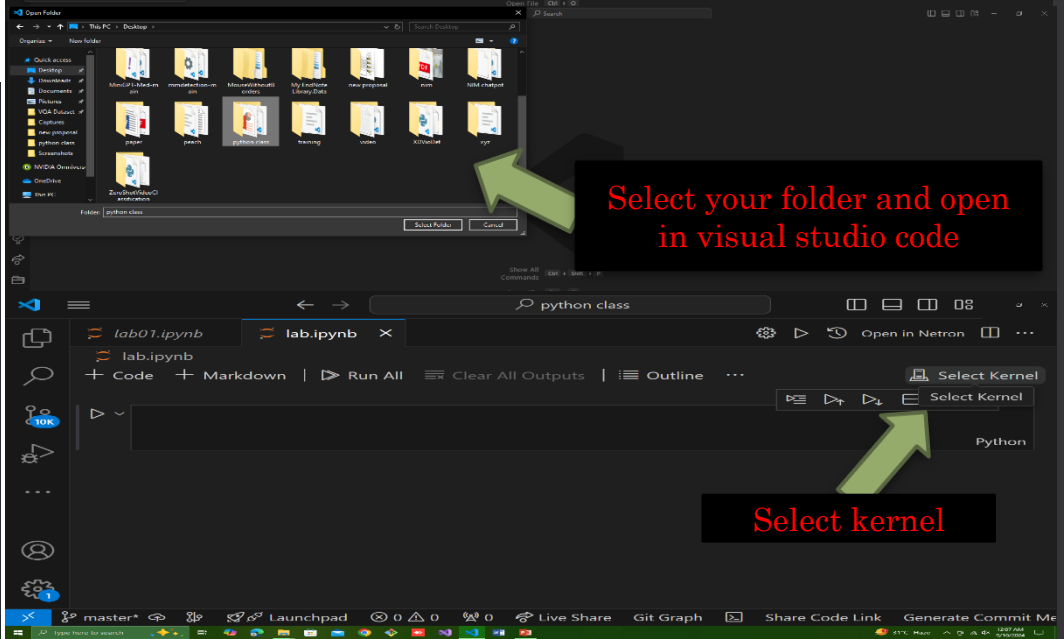
- Open VS Code.
- Click on File in the top menu.
- Select Open Folder to choose your project directory.
- Alternatively, click the Explorer icon on the left sidebar and select a file.

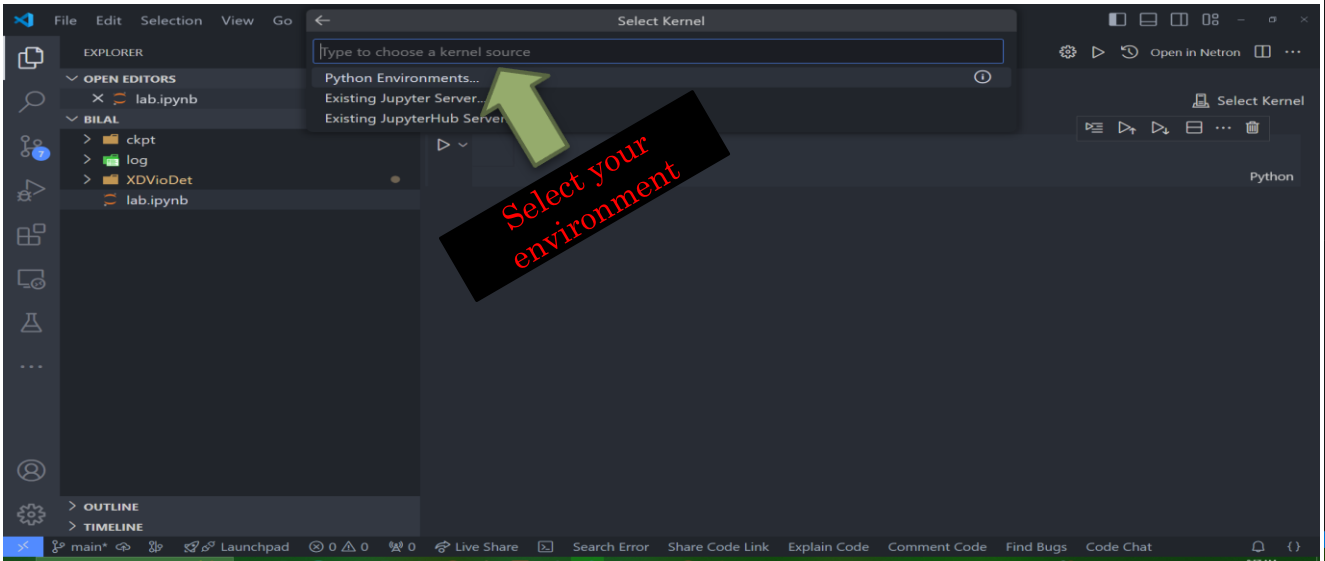
Select Jupyter Kernel

- After opening a Jupyter Notebook file (.ipynb):
- Click on the kernel name (top-right of the notebook editor).
- Choose the Python environment or kernel you want to use for running the notebook.





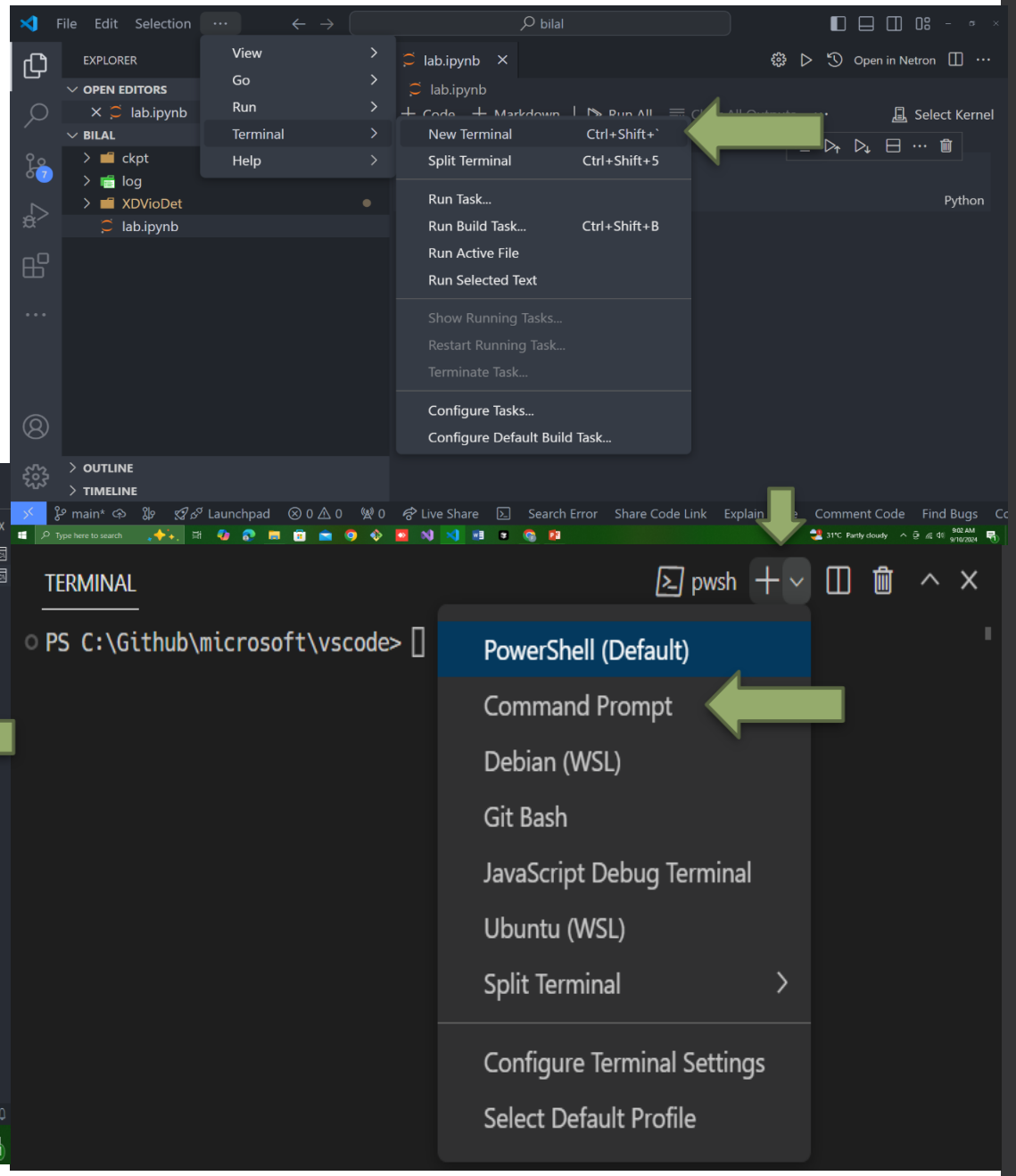


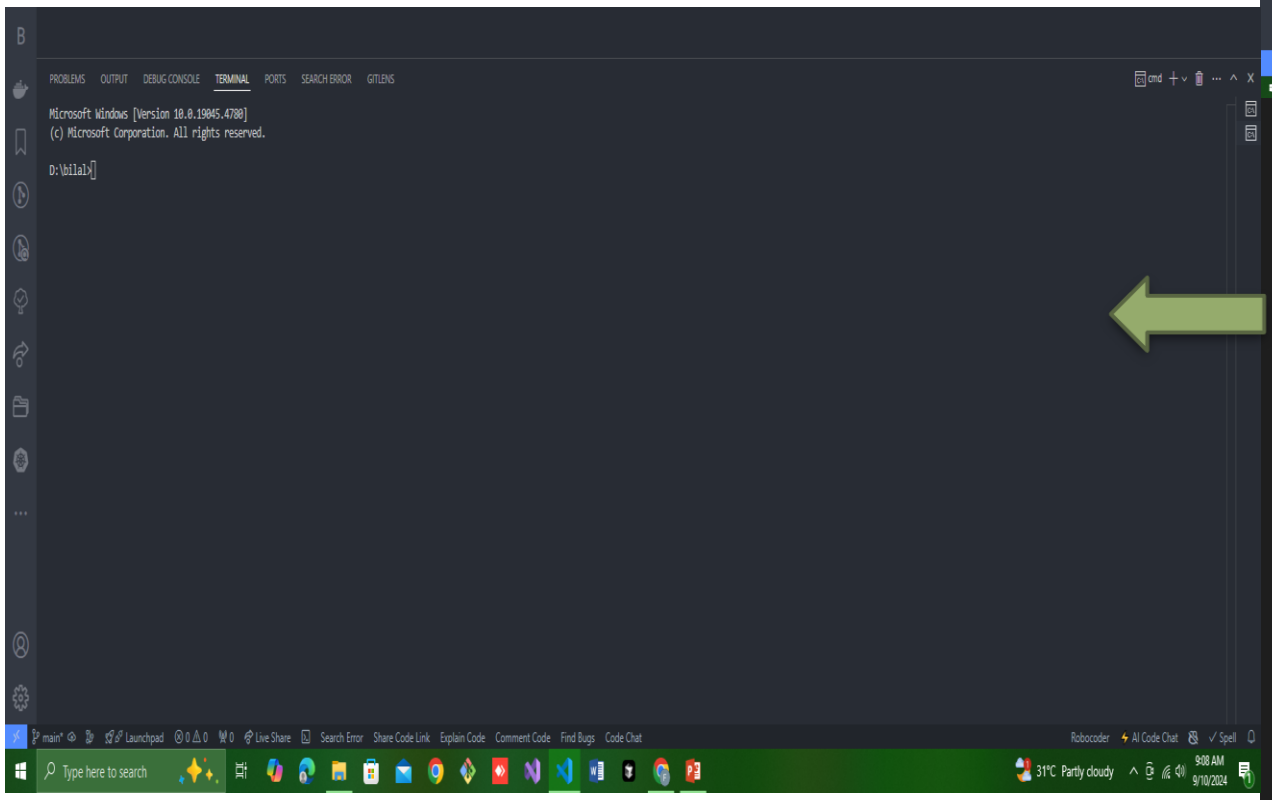


Working with Files, Folders, Kernel, and Terminal in VS Code

Open Terminal

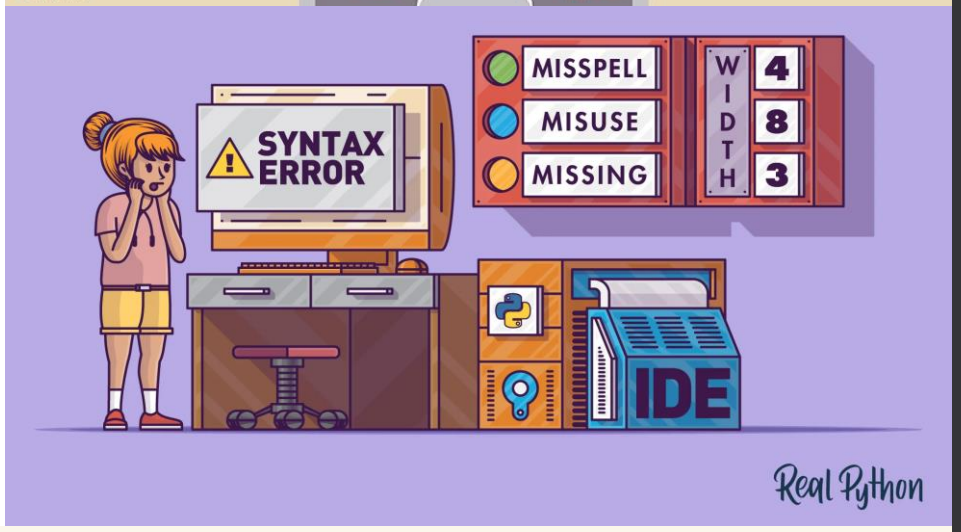
- In VS Code, press **Ctrl + Shift** to open the integrated terminal.
- Alternatively, go to **View > Terminal** from the top menu to open a new terminal session.

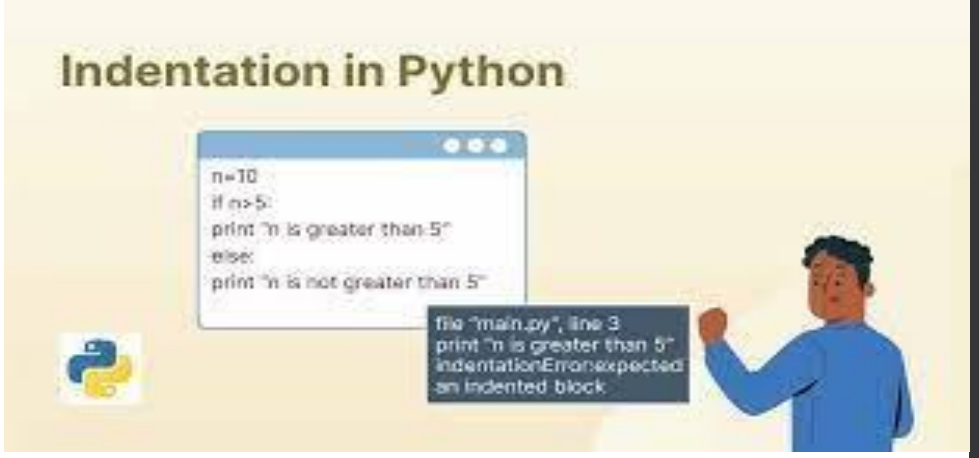




Basic Python Syntax

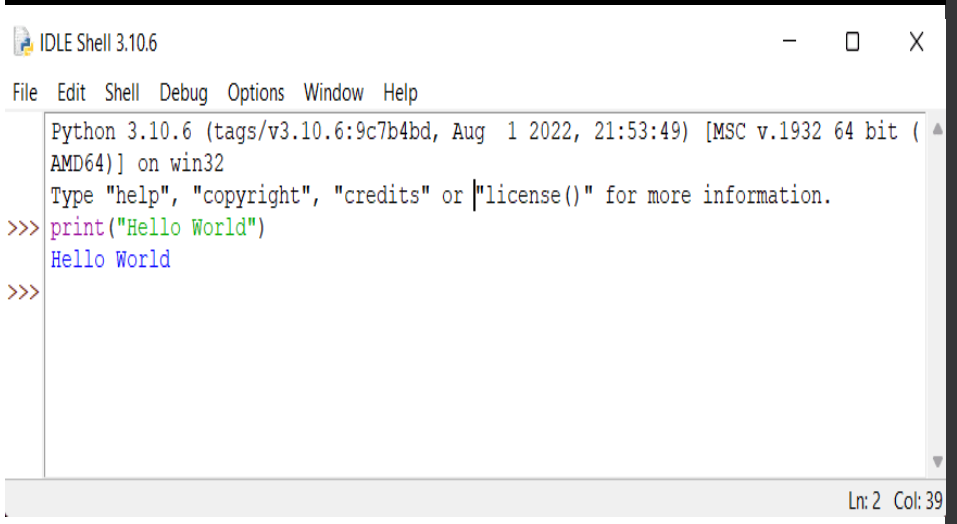
- **Python Syntax Overview:**
  - Python code is executed line by line (interpreted language).
  - No need for explicit declaration of variables.
  - Indentation is crucial in Python (used for defining blocks of code).
  - Case-sensitive language (e.g., Variable and variable are different).
- **Basic Syntax Elements**:
  - **Variables**: Names assigned to values (e.g., **x = 10**).
  - **Operators**: Symbols for performing operations (e.g., +, -, *, /).
  - **Comments**: Notes in the code for clarification (use **# for single-line**).
  - **Functions**: Defined blocks of reusable code (e.g., **def my_function():**).





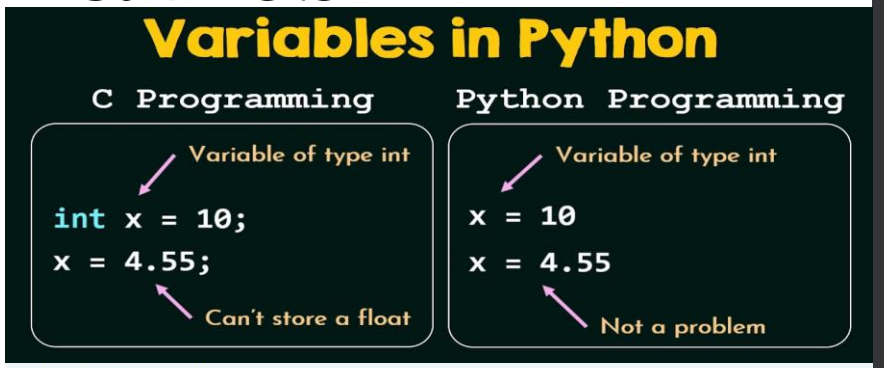
Writing Your First Python Program

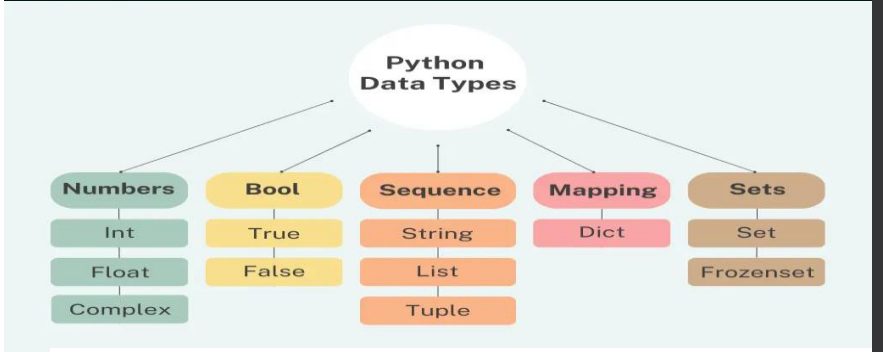
- "**Hello, World**!" Example:
- Explanation of the **print()** function.
- Writing and executing your first Python program.
- Understanding Python Syntax:
- Code structure in Python.
- Code Cells vs. Markdown Cells in Jupyter Notebook:
- Difference between code and markdown cells.
- Adding notes and explanations in markdown.

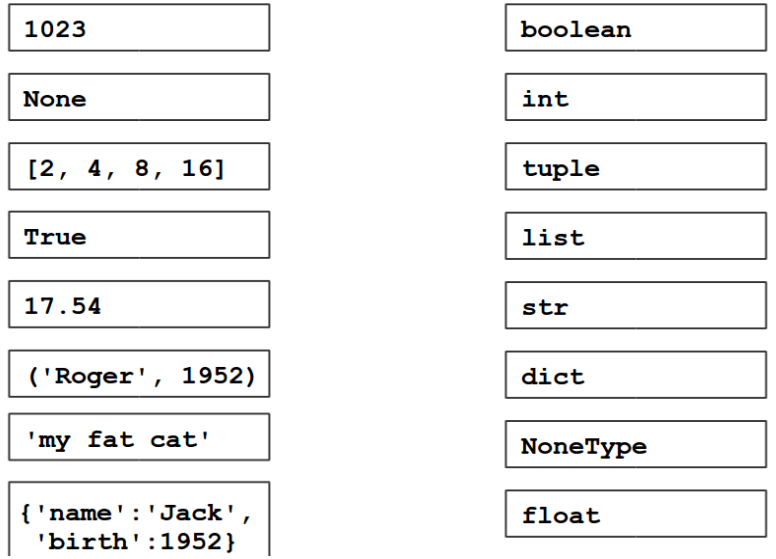


Python Data Types and Variables

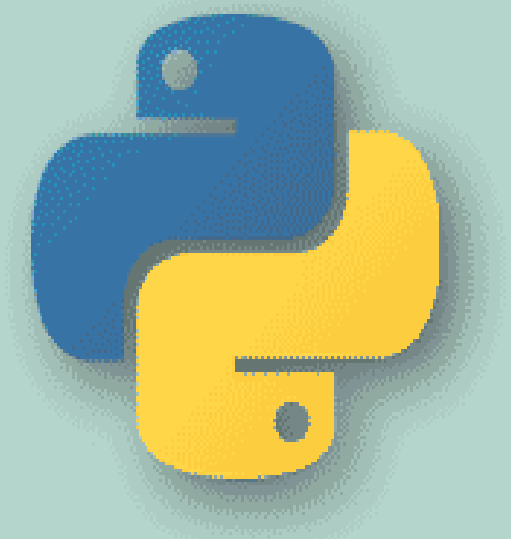
- **Variables**
  - Variables are used to store data values.
  - No need to declare the type; Python determines it automatically.
    - x = 10 # Integer
    - name = "Alice" #
- **Common Data Types**
  - **int**: Whole numbers (e.g., 5, 100)
  - **float**: Decimal numbers (e.g., 3.14, 0.99)
  - **str**: Text or string (e.g., "Hello", "Python")
  - **bool**: True or False values (e.g., True, False)
  - **list**: Ordered, mutable collection (e.g., [1, 2, 3])
  - **tuple**: Ordered, immutable collection (e.g., (1, 2, 3))
  - **dict**: Key-value pairs (e.g., {"key": "value"})

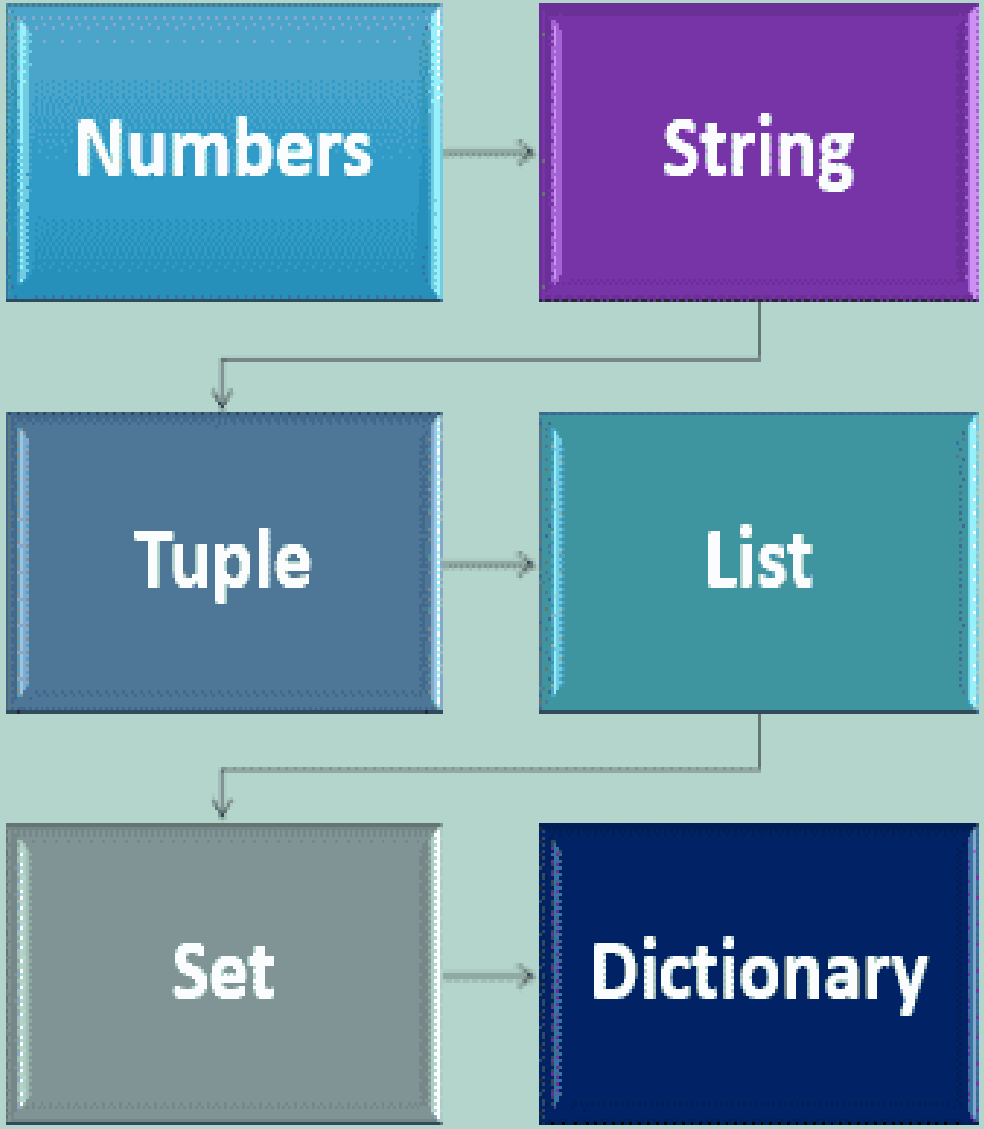






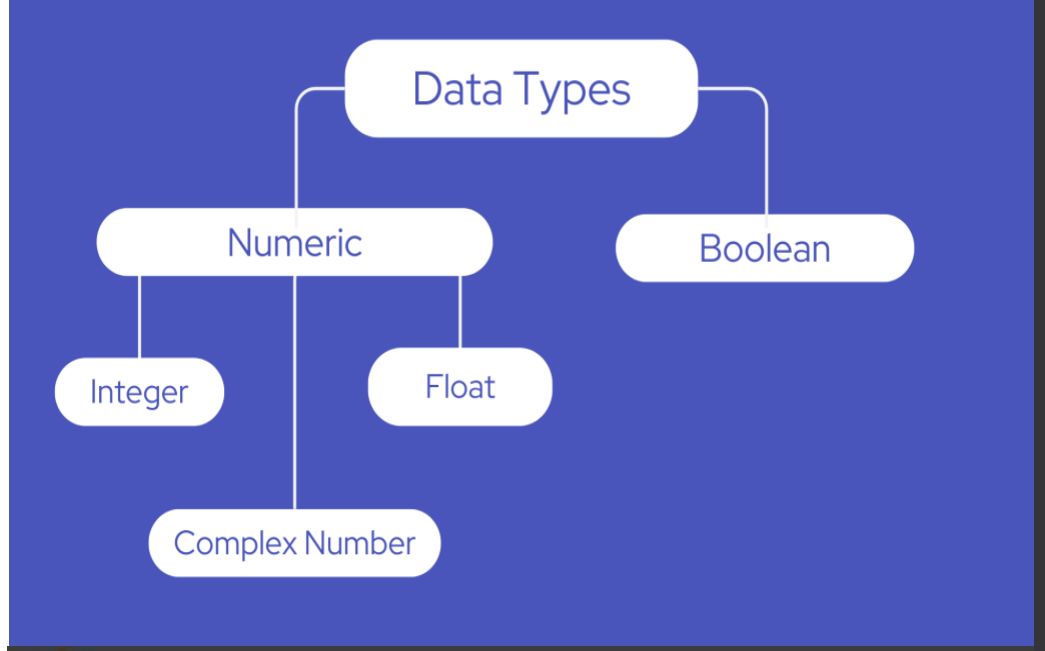
Python
Data Types

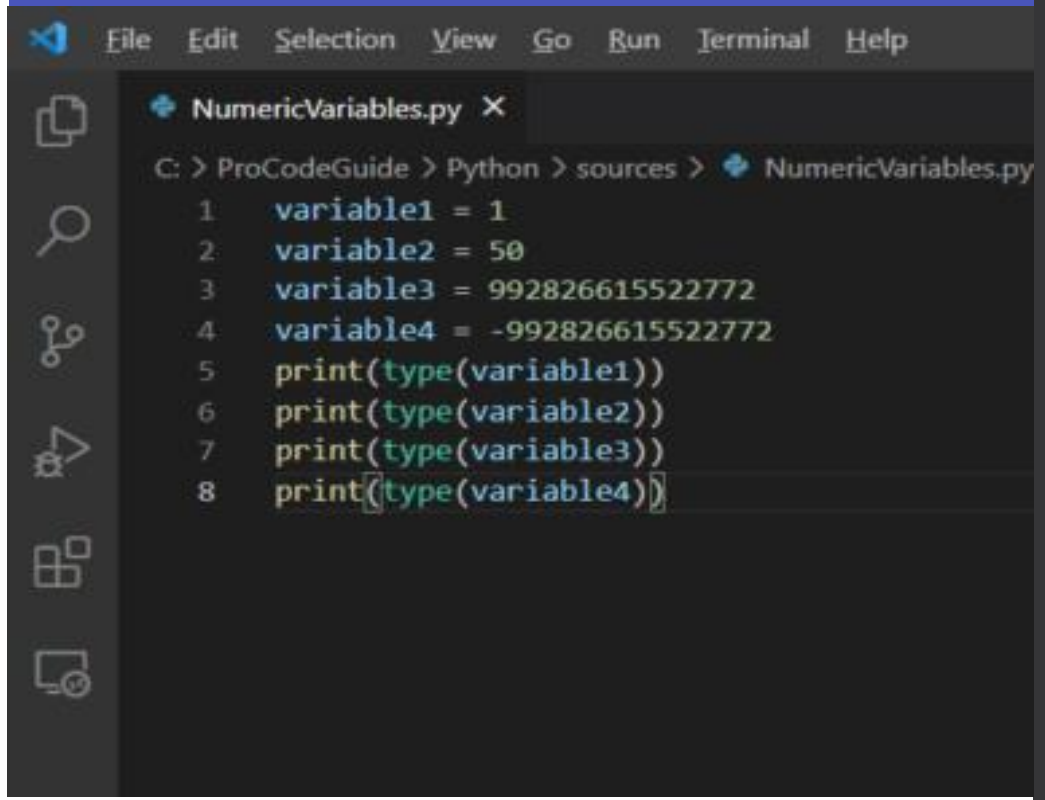




Integer (int)

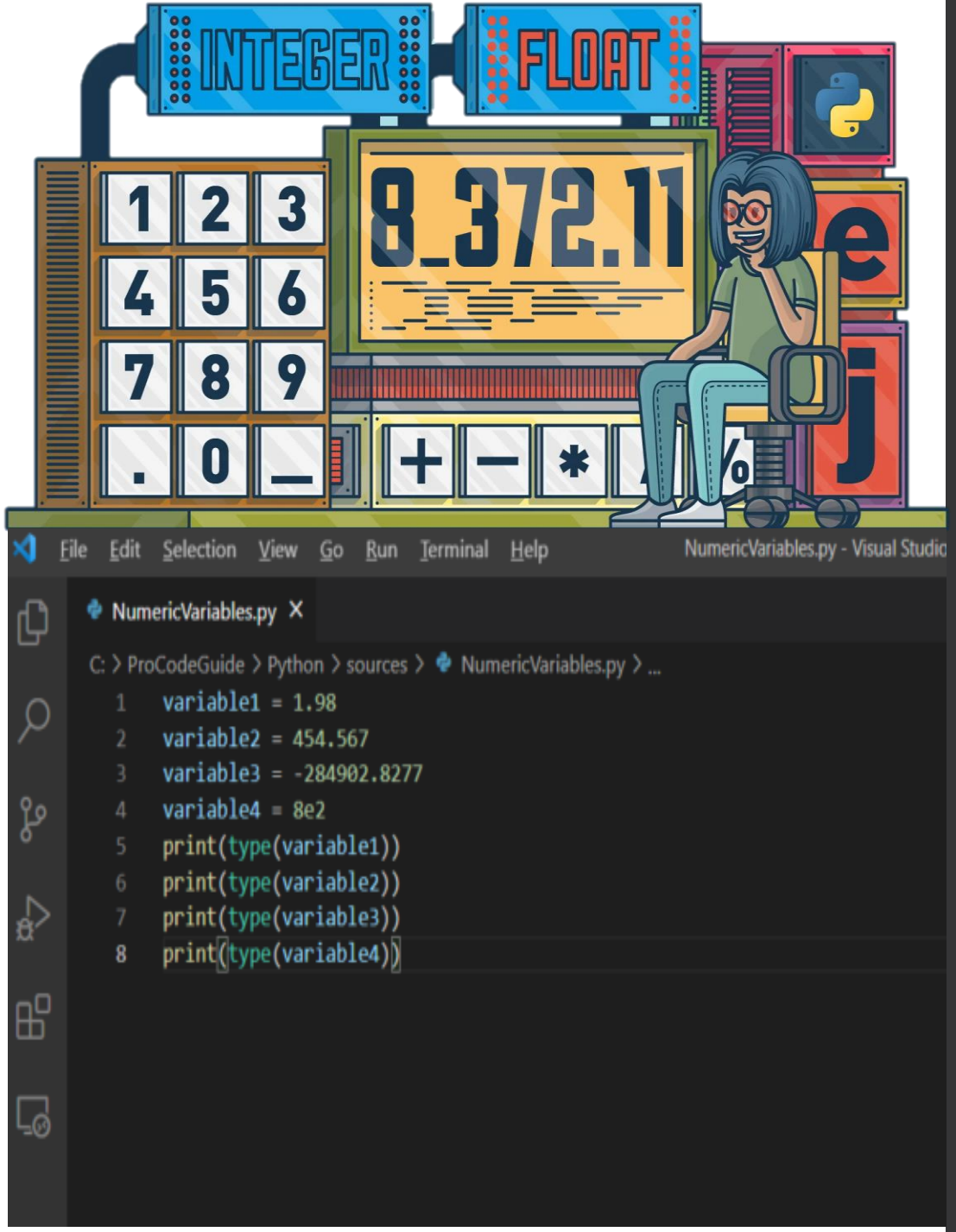
- Integers are whole numbers, either positive, negative, or zero.
- Used for counting, indexing, and arithmetic operations
- Cannot have decimal or fractional parts
- Commonly used in loops, indexing arrays, and mathematical computations
- Examples of integers: -10, 0, 15





Float (float)

- Floats are numbers with decimal points, representing fractional values.
- Useful for precise calculations (e.g., financial transactions, measurements)
- Can represent large or small numbers using scientific notation (e.g., 1.23e4)
- Can be positive or negative
- Floats take up more memory than integers because of the decimal precision
- **Example**:
  - price = 19.99 Represents the price of an item



String (str)

- Strings are sequences of characters used to store and manipulate text.
- Can contain letters, numbers, symbols, and spaces
- Enclosed in either single (') or double (") quotes
- Strings are immutable: once created, their content cannot be changed
- Commonly used for names, messages, filenames, etc.
- Supports various operations like concatenation (+), slicing ([]), and formatting (f-strings)
- Example:
  - greeting = "Hello, world!" # A basic greeting message

strings.py

```
Student1 = "George"
Student2 = "George"
Student3 = "Geordie"

print(id(Student1)) # 2873542725936
print(id(Student2)) # 2873542725936
print(id(Student3)) # 8653454375582
```

```
# Defining strings
var1 = "Hello "
var2 = "Geek"

# + Operator is used to combine strings
var3 = var1 + var2
print(var3)

# outpuut: Hello Geek
```

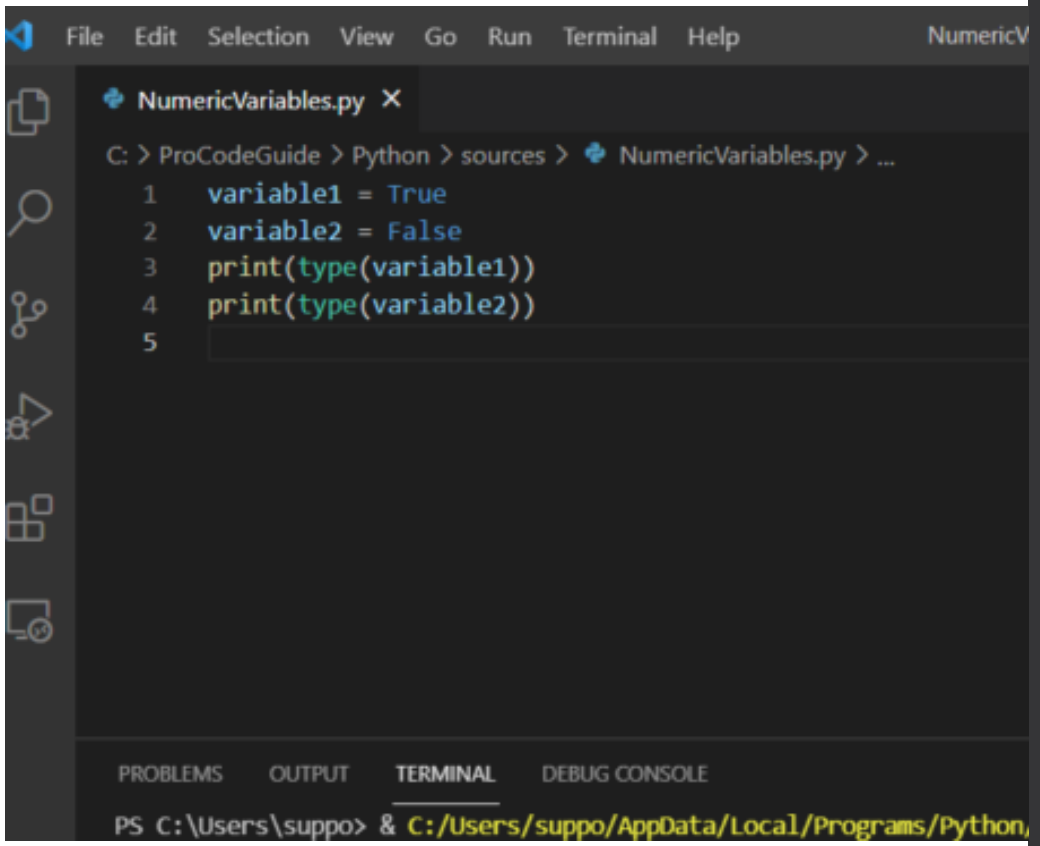
```
year = 2022

print(f'Hello {year}')
print(f'Hello {year=}')
print(f'Hello {year:0<4}')
print(f'Hello {year:.1f}')
print(f'Hello {year:,}')
```

Boolean (bool)

- Booleans represent one of two possible values: True or False.
- Used in conditional statements (e.g., if, while) t control program flow
- Result of logical operations (e.g., 5 > 3 is True)
- Can be converted from other data types: bool(0) is False, bool(1) is True
- Often used to represent states, such as on/off, open/closed
- Example:
  - is_logged_in = True # Indicates if a user is logged in

Working with boolean data type in python



List (list)

- Lists are ordered collections of items that can store different data types.
- **Mutable**: You can add, remove, or modify elements in a list
- Lists are indexed, starting from 0
- Supports various operations such as appending (.append()), removing (.remove()), and sorting (.sort())
- Can store different data types: integers, strings, even other lists
- Commonly used to store sequences of items like names, numbers, or objects
- Example:
  - fruits = ["apple", "banana", "cherry"] # A list of fruits

script.py

```
row_1 = ['Facebook', 0.0, 'USD', 2974676, 3.5]
          0          1     2        3       4
                  Index numbers

print(row_1[0])
print(row_1[1])
print(row_1[2])
print(row_1[3])
print(row_1[4])
```

Output

```
Facebook
0.0
USD
2974676
3.5
```

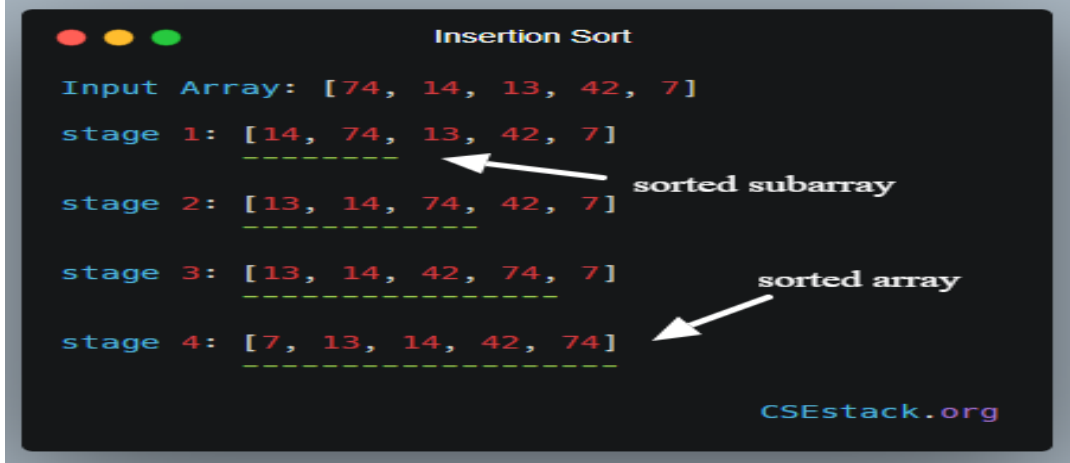
script.py

```
row_1 = ['Facebook', 0.0, 'USD', 2974676, 3.5]

print(row_1[-1])
print(row_1[4])
```

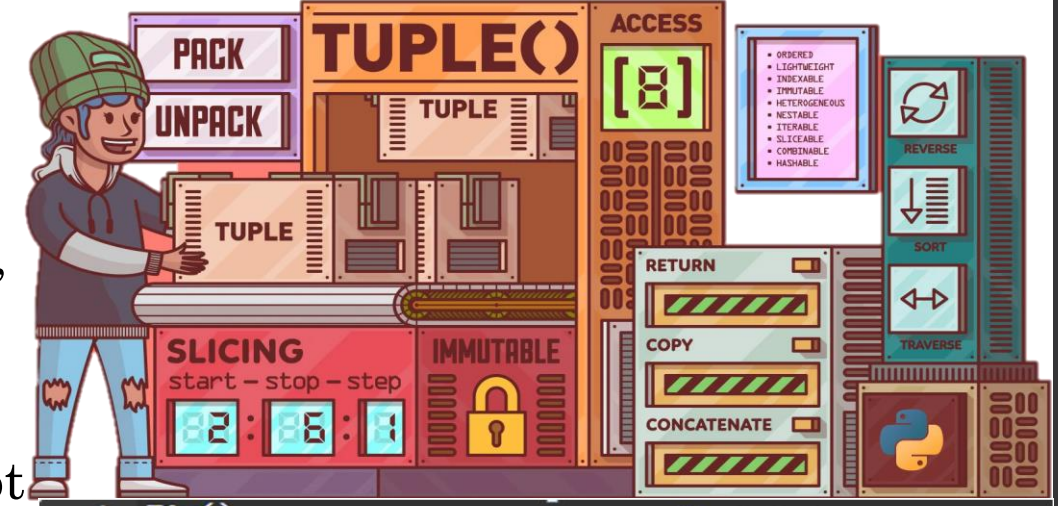
Output

```
3.5
3.5
```



Tuple (tuple)

- Tuples are ordered, immutable collections of items, meaning their values cannot be changed once assigned.
- Tuples are useful for fixed data sets that should not be altered
- Like lists, tuples are indexed starting from 0
- Can contain mixed data types, including integers, floats, strings, or other tuples
- Tuples can be unpacked into separate variables: x, y = (10, 20)
- Commonly used for storing related pieces of data, like coordinates or color values
- Example:
  - coordinates = (34.0522, -118.2437) # Latitude and longitude of a location




```
1  T1=()                                          // tuple display construct
2
3  T2= tuple()                                    // Empty Tuple
4
5  T3= (1)                                        // Single Element
6  T4= 3,                                            Tuple
7  T5= (4,)
8
9  T6= (1,2,3,4,5,6,7,8,9,10)                     // Long Tuple
10                                                // Nested Tuple
11 T7= (11,12,(13,14))
12
13 T8= tuple('hello')                             // Tuple from existing
14                                                   sequence
15 L= ['a','b','c','d','e']
16 T9= tuple(L)
17
18 T10= tuple(input('Enter tuple Elements:'))
19                                                // Taking input from Keyboard
```

```
my_tuple = ("dog", 4.5, True, 7, "apple")
print(my_tuple)
# ('dog', 4.5, True, 7, 'apple')

my_second_tuple = tuple(["dog", 4.5, True, 7, "apple"])
print(my_second_tuple)
# ('dog', 4.5, True, 7, 'apple')
```

Dictionary (dict)

- Dictionaries store data in key-value pairs, allowing fast lookups by unique keys.
- Keys must be unique and immutable (e.g., strings, numbers, tuples)
- Values can be of any data type and can be changed (mutable)
- Commonly used for structured data like user profiles, settings, or JSON data
- Supports operations like adding new key-value pairs (dict['key'] = value) and removing keys (del dict['key'])
- Keys are accessed quickly compared to lists due to the dictionary's hashing mechanism
- Example:
  - student = {"name": "Alice", "age": 22} # A dictionary representing a student