A My Path MN and BDPATCF Collaboration

Intro to Python

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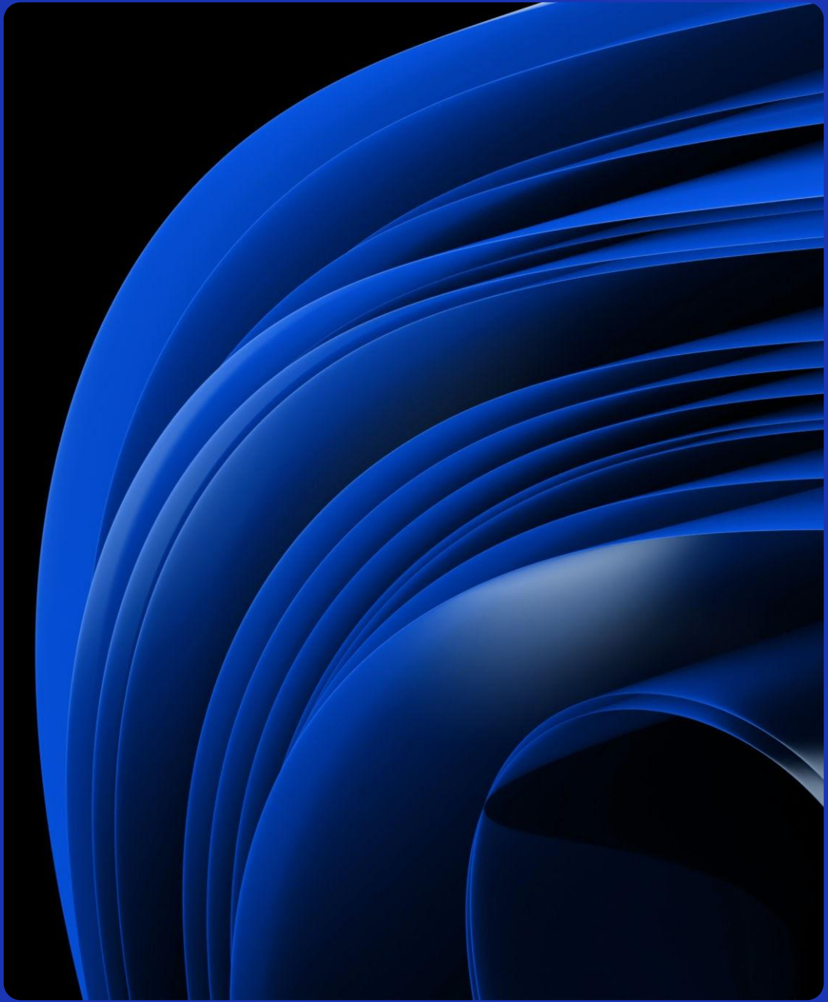


Review

Variables

- *Variables* are like labeled jars where we store information.
- They help us keep track of values like names, numbers, or anything else in our programs.

Integers & Floats

- *Integers* are whole numbers (like 3, -7) and *floats* are decimal numbers (like 4.5, -0.1).
- We use them to do math in Python.

Review

Booleans

- 🔹 *Booleans* are either `True` or `False`.
- 🔹 They help our programs make decisions by answering yes/no questions.

Strings

- 🔹 *Strings* are text – like words, sentences, or even emojis!
- 🔹 They're written with quotes like `"Hello"` or `'Python 🐍'`.

Review

Lists

- 🔹 *Lists* are like boxes that can hold many items – numbers, words, or even other lists.
- 🔹 They let us group things together in one place.

Dictionaries

- 🔹 *Dictionaries* store data in pairs, like a word and its meaning.
- 🔹 You look things up by using keys (like names or labels).

Review

Basic if

- 🔹 *If statements* let us make choices in our programs.
- 🔹 We can say, “If something is true, then do this.”

if → elif

- 🔹 *Elif* means “else if.”
- 🔹 It lets us check more than one condition in a row to decide what to do.

Review

if → elif → else

- *Else* is what happens when none of the previous conditions were true.
- This makes our programs more complete by covering every possibility.

for

- *For loops* let us repeat things a set number of times.
- They're great for going through lists and doing something with each item.

Review

while

- *While loops* keep going **as long as** something is true.
- We use them when we don’t know how many times we need to repeat something.

Review: Python Error: *SyntaxError*

Error Name	Description	Example	Common Causes	Suggested Fixes
SyntaxError	Occurs when code violates Python's syntax rules, like missing colons or parentheses.	`if x = 5: print(x)` (missing == for comparison)	Typos, missing punctuation, incorrect indentation.	Check error messages for line and caret location.

python:

```python
if True
      print("Hello")
```

Terminal Output:

```
 File "<stdin>", line 1
    if True
          ^
  SyntaxError: expected ':'
```

python:

```python
  print("Hello"
```

Terminal Output:

```
   File "<stdin>", line 1

      print("Hello"

            ^

  SyntaxError: '(' was never closed
```

python:

```python
if x = 5:
      print("x is 5")
```

Terminal Output:

```
 File "<stdin>", line 1
    if x = 5:
        ^
  SyntaxError: invalid syntax
```

Review:Python Error: *IndentationError*

Error Name	Description	Example	Common Causes	Suggested Fixes
IndentationError	Raised when indentation is inconsistent, critical for Python's block structure.	`if True: print("Hello") else print("World")` (missing indent after `if`).	Mixing tabs and spaces, incorrect nesting.	Use formatters like Black, ensure consistent 4-space indentation.

```python
def say_hello():
print("Hello")
```

Terminal Output:

```
File "script.py", line 2

    print("Hello")
    ^
IndentationError: expected an indented
block after function definition on line 1
```

```python
print("Start")
        print("Why am I here?")
```

Terminal Output:

```
File "script.py", line 2
    print("Why am I here?")
    ^
IndentationError: unexpected indent
```

Review: Python Error: *NameError*

Error Name	Description	Example	Common Causes	Suggested Fixes
NameError	Raised when an undefined variable or function is used.	`print(x)` where `x` is not defined.	Typos, variable not initialized, scope issues.	Define variables before use, check spelling, use linters for early detection.

```python
print(x)
```

Terminal Output:

```
File "script.py", line 1, in <module>
    print(x)
NameError: name 'x' is not defined
```

```python
number = 42
print(nubmer)
```

Terminal Output:

```
File "script.py", line 2, in <module>
print(nubmer) NameError: name 'nubmer' is
not defined
```

Review:
Python Error: *UnboundedLocalError*

Error Name	Description	Example	Common Causes	Suggested Fixes
UnboundLocalError	Occurs when a local variable is referenced before assignment, a NameError subtype.	`def func(): print(x); x = 5` (using `x` before assignment).	Scope confusion, modifying globals without declaration.	Assign values before use, use `global` for globals if needed.

```python
def increment():
    print(x)  # Trying to use x before
    assigning x = 5 increment()
```

```python
def process_list():
    for i in range(3):
        total += i  # total isn't initialized
    print(total)
process_list()
```

Terminal Output:

```
File "script.py", line 2, in increment
  print(x)
UnboundLocalError: cannot access local variable
'x' where it is not associated with a value
```

Terminal Output:

```
File "script.py", line 3, in process_list
  total += i
UnboundLocalError: cannot access local variable 'total' where it
is not associated with a value
```

Review: Python Error: *TypeError*

Error Name	Description	Example	Common Causes	Suggested Fixes
TypeError	Raised when an operation is applied to an inappropriate type.	`"hello" + 5` (trying to add string and integer).	Incorrect type usage, mismatched function arguments.	Ensure correct types, use type conversion, check documentation.

```
num = 5
text = "hello"
result = num + text
```

```
number = 123
print(number[0])  # Integers don't support indexing
```

Terminal Output:

```
File "script.py", line 3, in <module> result =
num + text TypeError: unsupported operand
type(s) for +: 'int' and 'str'
```

Terminal Output:

```
File "script.py", line 2, in <module>
print(number[0]) TypeError: 'int' object is not
subscriptable
```

Review: Python Error: ValueError

Error Name	Description	Example	Common Causes	Suggested Fixes
ValueError	Occurs when a function gets correct type but invalid value.	`int("abc")` (trying to convert non-numeric string to int).	Passing invalid values, user input errors.	Validate inputs, use try-except for handling, check function docs.

```
text = "hello"
number = int(text)  # Can’t convert "hello" to int
```

Terminal Output:

```
File "script.py", line 2, in <module>
   number = int(text)
ValueError: invalid literal for int() with base 10: 'hello'
```

```
a, b = [1]  # Only one value, but expecting two
```

Terminal Output:

```
File "script.py", line 1, in <module>
   a, b = [1]
ValueError: not enough values to unpack (expected 2, got 1)
```

Review: Python Error: KeyError

Error Name	Description	Example	Common Causes	Suggested Fixes
KeyError	Raised when accessing a non-existent key in a dictionary.	`my_dict["missing"]` where "missing" isn't a key.	Typo in key name, key not added to dictionary.	Use `dict.get()` with default value, verify keys before access.

```
my_dict = {"name": "Alice", "age": 25}
print(my_dict["gender"])  # "gender" isn’t a key
```

```
data = {"color": "blue"}
print(data["colour"])  # Typo: "colour" vs. "color"
```

Terminal Output:

```
File "script.py", line 2, in <module>
   print(my_dict["gender"])
KeyError: 'gender'
```

Terminal Output:

```
File "script.py", line 2, in <module> print(data["colour"])
KeyError: 'colour'
```

Review: Python Error: IndexError

Error Name	Description	Example	Common Causes	Suggested Fixes
IndexError	Raised when accessing an index outside sequence range.	`my_list[10]` where `my_list` has length 5.	Index out of range, off-by-one errors.	Use `len()` to check range, ensure index within bounds.

```python
my_list = [10, 20, 30]
print(my_list[3])  # Only indices 0, 1, 2 exist
```

Terminal Output:
File "script.py", line 2, in <module>
print(my_list[3]) IndexError: list index out of range

```python
empty_list = []
print(empty_list[0])  # No items to index
```

Terminal Output:
File "script.py", line 2, in <module>
print(empty_list[0]) IndexError: list index out of range

Review: Python Error: AttributeError

Error Name	Description	Example	Common Causes	Suggested Fixes
AttributeError	Occurs when accessing a non-existent attribute or method.	`my_list.lower()` (lists don't have `lower()`).	Typo in attribute name, method not available.	Verify attribute/method with `dir(object)`, use static analysis tools like Mypy.

```
number = 42 number.append(10)  # Integers don’t have append
```

```
text = "hello" print(text.lenght)  # Typo: should be "length"
```

Terminal Output:

```
File "script.py", line 2, in <module>
    number.append(10)
AttributeError: 'int' object has no attribute 'append'
```

Terminal Output:

```
File "script.py", line 2, in <module>
        print(text.lenght)
AttributeError: 'str' object has no attribute 'lenght'
```

Review: Python Error: ImportError

Error Name	Description	Example	Common Causes	Suggested Fixes
ImportError	Raised when a module cannot be imported, including ModuleNotFoundError in Python 3.	`import non_existent_module` (module not installed).	Module not installed, typo in name, path issues.	Check installation with `pip`, verify module name, ensure `__init__.py` for packages.

```python
import maht  # Typo: should be "math"
```

Terminal Output:

```
File "script.py", line 1, in <module>
    import maht
ImportError: No module named 'maht'
```

```python
from random import shuffle, randomize  # "randomize" isn’t in random
```

Terminal Output:

```
File "script.py", line 1, in <module>
    from random import shuffle, randomize
ImportError: cannot import name 'randomize' from 'random'
(/usr/lib/python3.10/random.py)
```

Review: What If There is No Error But it Just Doesn’t Work? Debugging!

When in doubt, use print statements in between. 👍

```
total = 0
for i in range(5):

    total += i
print(f"Final is: {i}")

#prints
    Final is: 5
```

```
total = 5
for i in range(5):
    print(f"Loop iteration: {i}")
    total += i
print(f"Final is: {i}")

#prints
    Loop iteration: 0
    Loop iteration: 1
    Loop iteration: 2
    Loop iteration: 3
    Loop iteration: 4
    Final is: 5
```

Review: Pseudocode

-Not required but it's good practice and has benifits
-Written in pure comments if in a program file or HOWEVER is clear to you
-For clarity
-Planning things out
-Maybe you don’t know how to program it yet but you know how conceptually it will work

Review: Functions

A block of code that can be reused over and over again.

```
def greet():

        print("Hello!")


greet()
```

```
greet(name):

        print("Hello", name)


greet("James")
```

```
def greet_user(name, hour):
    if hour < 12:
        time_of_day = "morning"
    elif hour < 18:
        time_of_day = "afternoon"
    else:
        time_of_day = "evening"

    print(f"Good {time_of_day}, {name}!")


greet_user("Ava", 9)      # → Good morning, Ava!
greet_user("Liam", 15)    # → Good afternoon, Liam!
```

Review:Referencing Functions

You can **reuse functions from another Python file** by importing them, like this:

```
from my_file import my_function
```

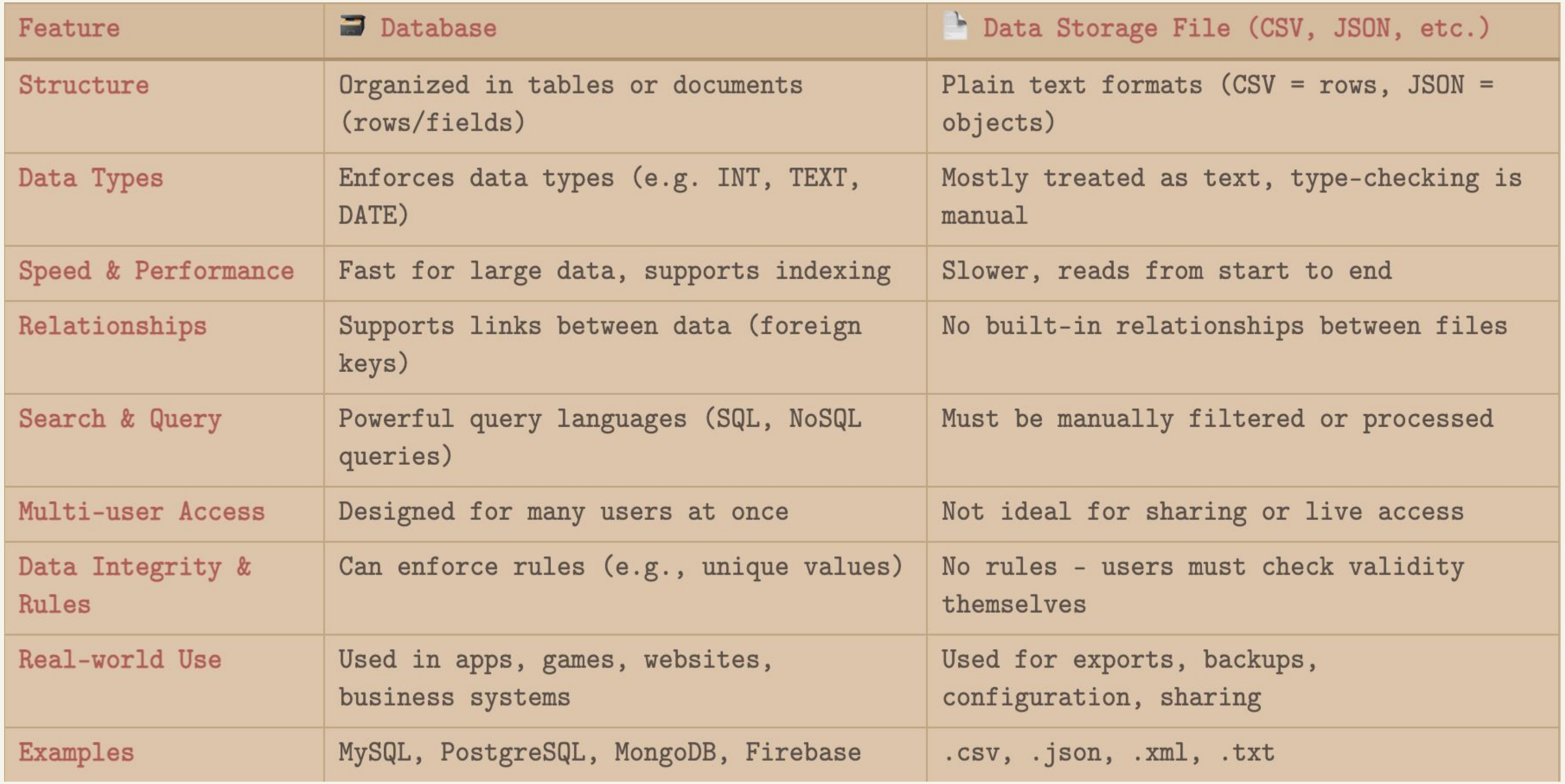
It's just like referencing a function **someone else wrote** — which is exactly what happens when you import a **library** like math, csv, or random.

You're using **pre-written code** to save time and avoid writing everything yourself!

Review: File Types & File Extensions

Scripting	.py, .ps1, .sh
Simple Data Storage	.csv and .json
Audio	.mp3 and .mp4
Word Doc	.doc and .docx
Database	.db
Querying a Database	.sql
Markup	.html, .md

Review:Databases vs Data Storage



Feature	🗃️ Database	📄 Data Storage File (CSV, JSON, etc.)
Structure	Organized in tables or documents (rows/fields)	Plain text formats (CSV = rows, JSON = objects)
Data Types	Enforces data types (e.g. INT, TEXT, DATE)	Mostly treated as text, type-checking is manual
Speed & Performance	Fast for large data, supports indexing	Slower, reads from start to end
Relationships	Supports links between data (foreign keys)	No built-in relationships between files
Search & Query	Powerful query languages (SQL, NoSQL queries)	Must be manually filtered or processed
Multi-user Access	Designed for many users at once	Not ideal for sharing or live access
Data Integrity & Rules	Can enforce rules (e.g., unique values)	No rules - users must check validity themselves
Real-world Use	Used in apps, games, websites, business systems	Used for exports, backups, configuration, sharing
Examples	MySQL, PostgreSQL, MongoDB, Firebase	.csv, .json, .xml, .txt

Review: What Is a Database?

Key Features of a Database:

- **Stores lots of data** (names, links, numbers, etc.)
- **Keeps it organized** (tables, rows, columns)
- **Makes it easy to search and filter**
- **Can be used by apps, websites, and games**

Real-world Examples:

- Instagram uses databases to store user posts, comments, and likes.
- A video game stores player stats and scores in a database.
- Schools use databases to keep track of students and grades.

Review: DaaS | Database as a Service

Feature	Firebase	AWS (RDS / DynamoDB)	Supabase	Azure (SQL / Cosmos DB)
🔧 Type	NoSQL (Firestore / Realtime DB)	SQL (RDS) + NoSQL (DynamoDB)	SQL (PostgreSQL)	SQL (Azure SQL) + NoSQL (Cosmos DB)
🧱 Structure	Documents & Collections (JSON)	Tables (SQL) or Key-Value	Tables (SQL, PostgreSQL)	Tables (SQL) or Documents/Graphs (NoSQL)
🚀 Best For	Real-time apps, mobile & chat	Scalable enterprise apps	Web apps, startups, full-stack dev	Enterprise apps, global-scale systems
🌍 APIs Automatically Generated?	✅ Firestore SDK / REST	❌ Manual setup	✅ REST + GraphQL auto-generated	❌ Manual setup via SDKs or Logic Apps
💻 Self-hosting Option	❌ No	✅ Yes (some DB engines)	✅ Yes (open-source version available)	❌ No (fully managed by Azure)
💰 Free Tier	✅ Generous	✅ Limited (depends on service)	✅ Generous	✅ Limited (Azure Free Tier available)
🎯 Developer Experience	Beginner-friendly, Google tools	More setup-heavy, powerful	Developer-first, open-source vibe	Strong IDE integration (Visual Studio), enterprise tools

What is Web Scraping?

🌐 Definition:

- Web Scraping is **automatically gathering information from websites** using code.

🎯 Simple Analogy:

- "Imagine copying and pasting information, but **faster, automatic, and smarter!**"

Ethical and Legal Rules ⚖️

- ✅ **Always respect** website rules (`robots.txt` file).
- ✅ **Only scrape publicly available information** (e.g., Wikipedia, NASA, public APIs).
- ❌ **Never scrape** sensitive personal data, copyrighted materials, or private content.

Tools for Today’s Lesson 🛠️

requests

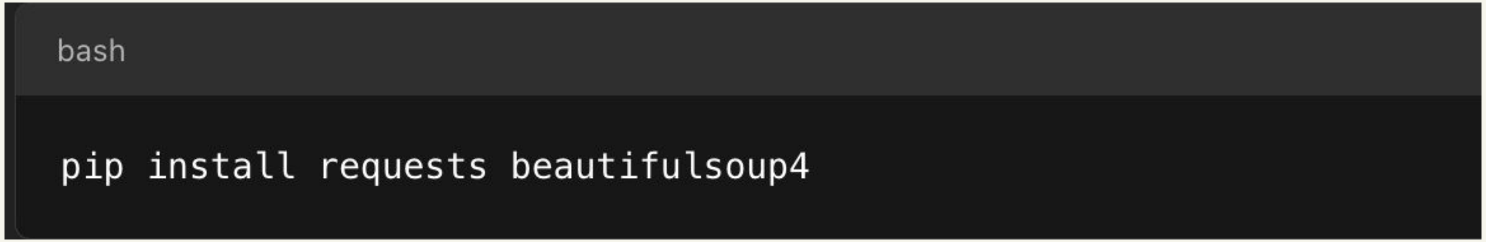
- **Downloads webpages** directly into your Python program.

BeautifulSoup

- **Extracts and organizes** exactly the parts of the webpage you want.

Installing the Tools (Quick Demo)

Run this command in your Terminal or Command Prompt:



bash

```bash
pip install requests beautifulsoup4
```

In-Class Project 1 (Fully Completed):

Title: "Scrape and Save Simple Wikipedia Information" (Plug-and-Play)

Steps:

- Fetch a Wikipedia page about "Python (programming language)."
- Use BeautifulSoup to grab the text from the page.
- Save text into a `.txt` file.
- Convert it into `.csv`.
- Delete the original `.txt` file.

In-Class Project 2 (Partially Completed - Simple Fix):

Title: "Scraping Current Weather Info" (Weather website)

Hint/comment: “Uncomment the lines and run. If errors appear, use ChatGPT or Stack Overflow to troubleshoot.”

In-Class Project 3 (Intermediate Difficulty):

Title: "Extracting Audio or Video Links"

Scrape links to freely available video/audio files (e.g., a podcast homepage)

You will:

- Uncomment selection code

- Write loop to print or save these links to a file.

Class Discussion & Troubleshooting Practice (10 mins):

- Encourage students to use AI to debug problems.
- Demonstrate asking a simple question to ChatGPT, example:
    - "My BeautifulSoup select isn't working, what did I do wrong?"

Take-Home Project (Low Barrier, Higher Autonomy):

Title: "Create Your Own Web Scraper!"

Choose one:

- Scrape headlines from a favorite free news/blogging site.
- Scrape free stock price info from a financial site.
- Scrape open, free podcast episodes.