

Introduction to Python & Colab

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

Dr. Mohamed ASSELLAOU



Agenda & Session Overview

Python Basics

Variables, data types, operators

Collections

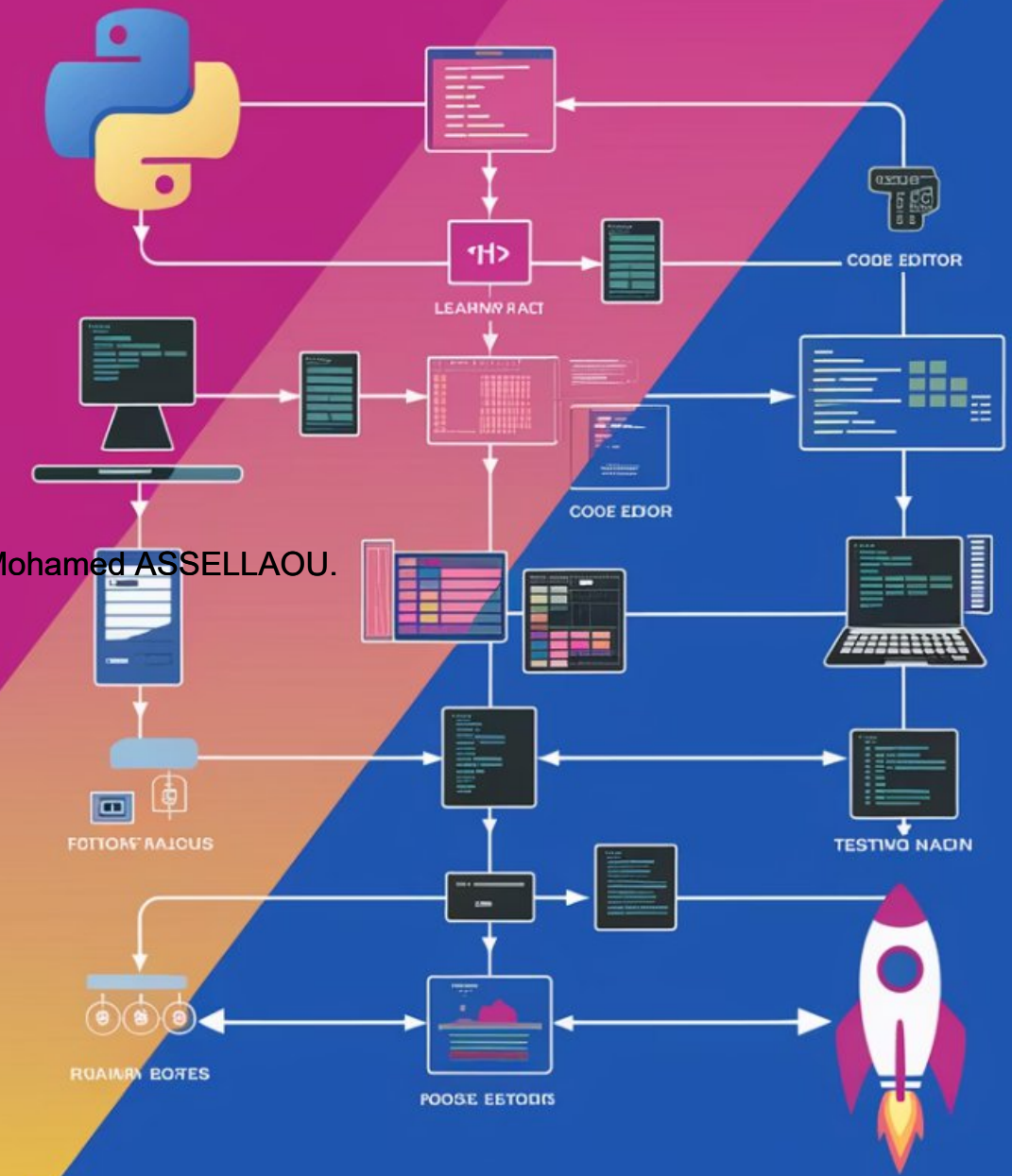
Lists, dictionaries, tuples, sets

Libraries

NumPy, Pandas, Matplotlib

Google Colab

Interface, features, collaboration



Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

Introduction to Python

High-level language

Simple syntax, easy to read

Interpreted

No compilation needed

Versatile

AI, data science, automation

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.



The Impact of Python in Real-World Applications



Data Analysis

Uncovering insights



Web Development

Building dynamic sites



Automation

Streamlining workflows



Machine Learning

Powering AI innovations

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

How to use Python ?

- Install python: <https://www.python.org/downloads>
- Create a file with the **.py** extension
- Open a terminal and run **python filename.py**

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

- Or we can simply use Google Colab



Getting Started with Google Colab



Cloud-based notebook



Free access

No installation or costs

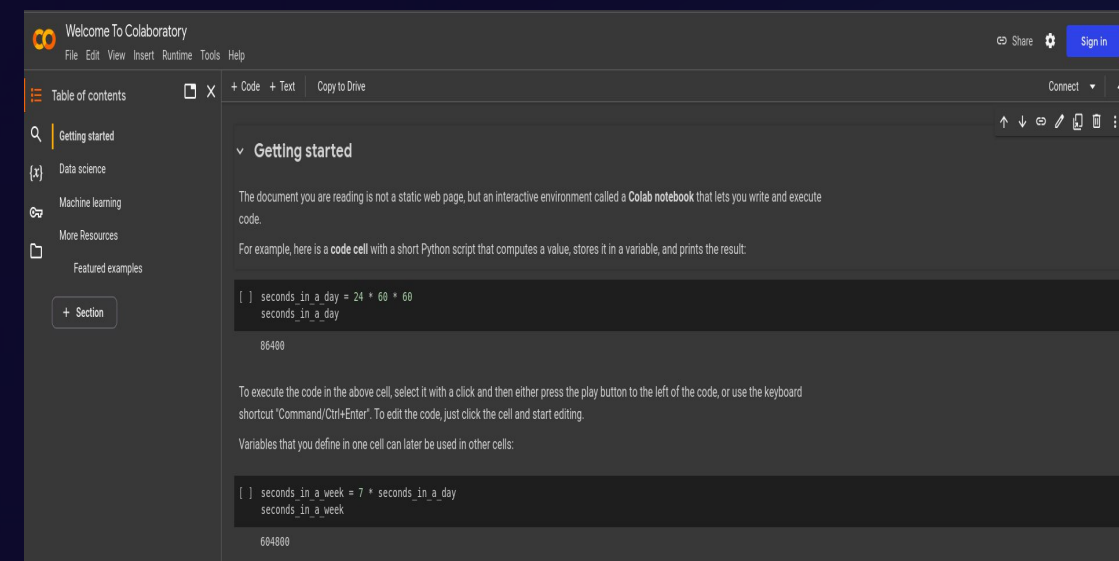
Code Python in your browser



Collaboration

Share and work together

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.



Python Basics – Variables and Data Types

Variables

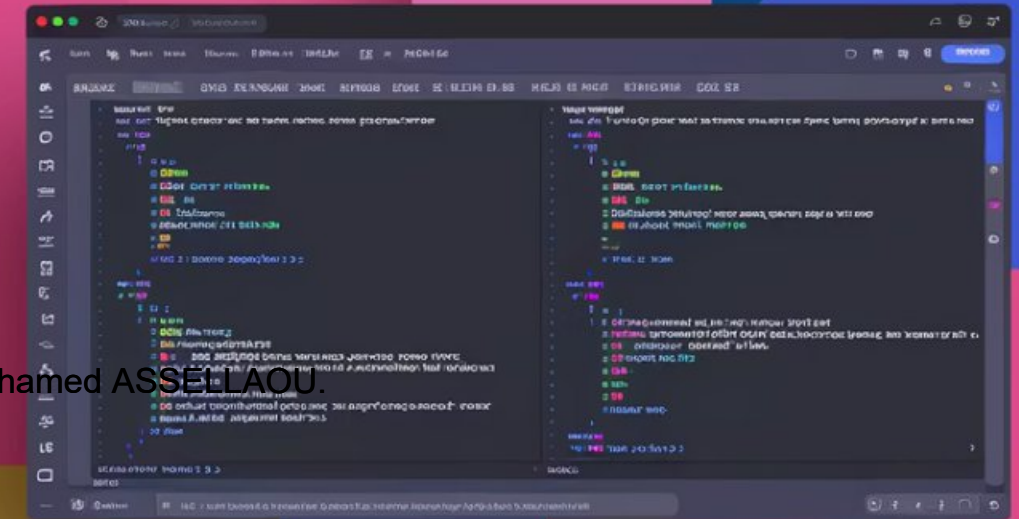
Name = value

Use lowercase_with_underscores

Data Types

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELAOU.

- Integers: whole numbers
- Floats: decimal numbers
- Strings: text data
- Booleans: True/False



Basic Python Syntax – Operators and Expressions



Working with Strings and Numbers

String Operations

- Concatenation: "Hello" + "World"
- Slicing: text[0:5]
- Formatting: f"Name: {name}"

Number Operations

- Type conversion: int(), float()
- Math operations: +, -, *, /
- Rounding: round()

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

Introducing Lists – The First Collection



Create lists

```
my_list = [1, 2, 3, "hello"]
```



Access elements

```
my_list[0] # Returns 1
```



Modify lists

```
my_list.append(4) # Adds item
```

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

Hands-on: List Operations in Code

```
# Sample list
```

```
fruits = ["apple", "banana", "cherry"]
```

```
# Add an item
```

```
fruits.append("orange")
```

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

```
# Remove an item
```

```
fruits.pop(1) # Removes banana
```

```
# Print the list
```

```
print(fruits) # ["apple", "cherry", "orange"]
```

Dictionaries – Key-Value Pairs

Creation

```
person = {"name": "Alice", "age": 25}
```

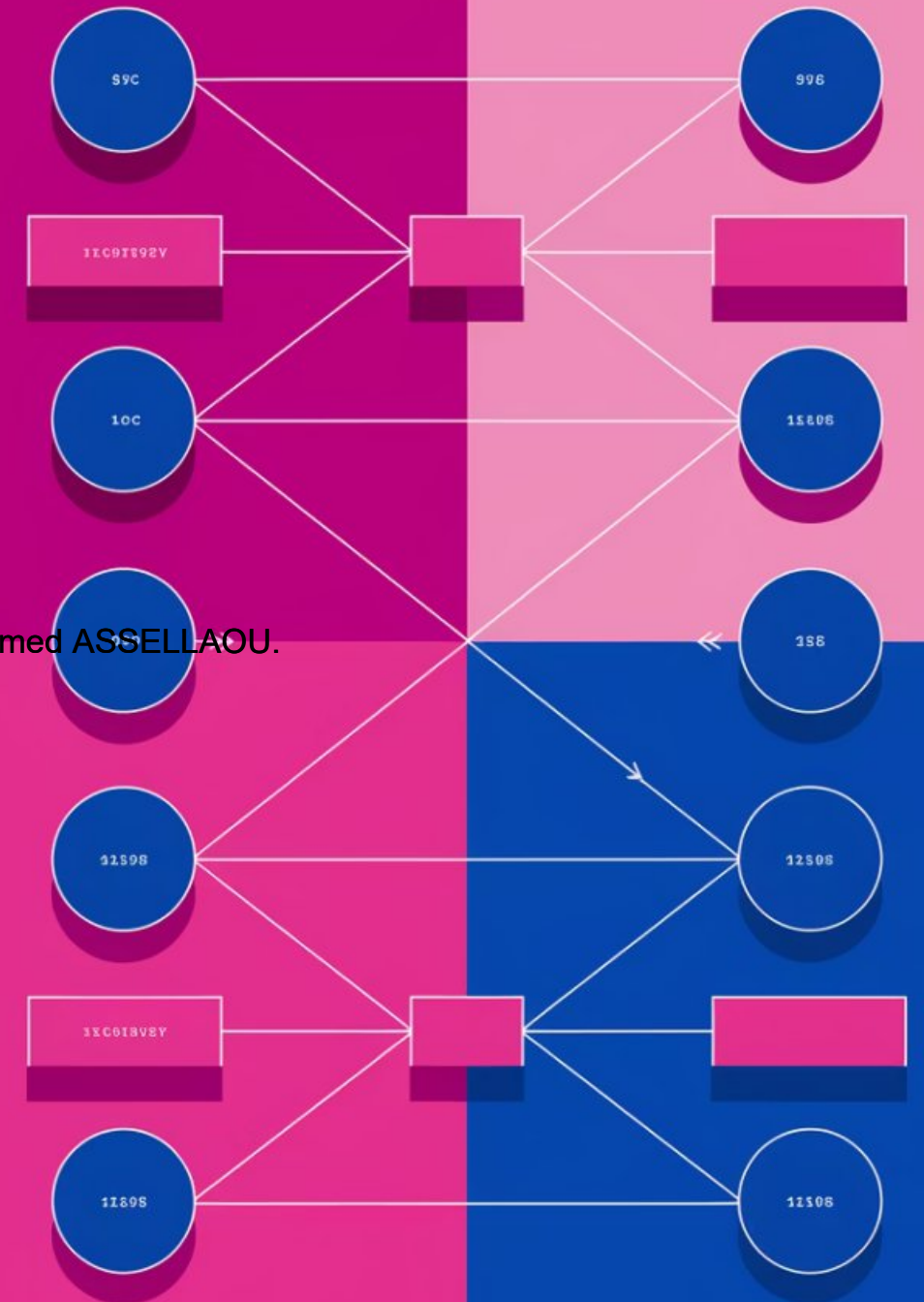
Access

```
person["name"] # Returns "Alice"
```

Update

```
person["age"] = 26 # Changes age value
```

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.



Interactive Example: Using Dictionaries

```
# Create a contacts dictionary
```

```
contacts = {"Mohamed": "0661123456", "Imane": "0663000001"}
```

```
# Access a value
```

```
print(contacts["Mohamed"]) # Prints: 0661123456
```

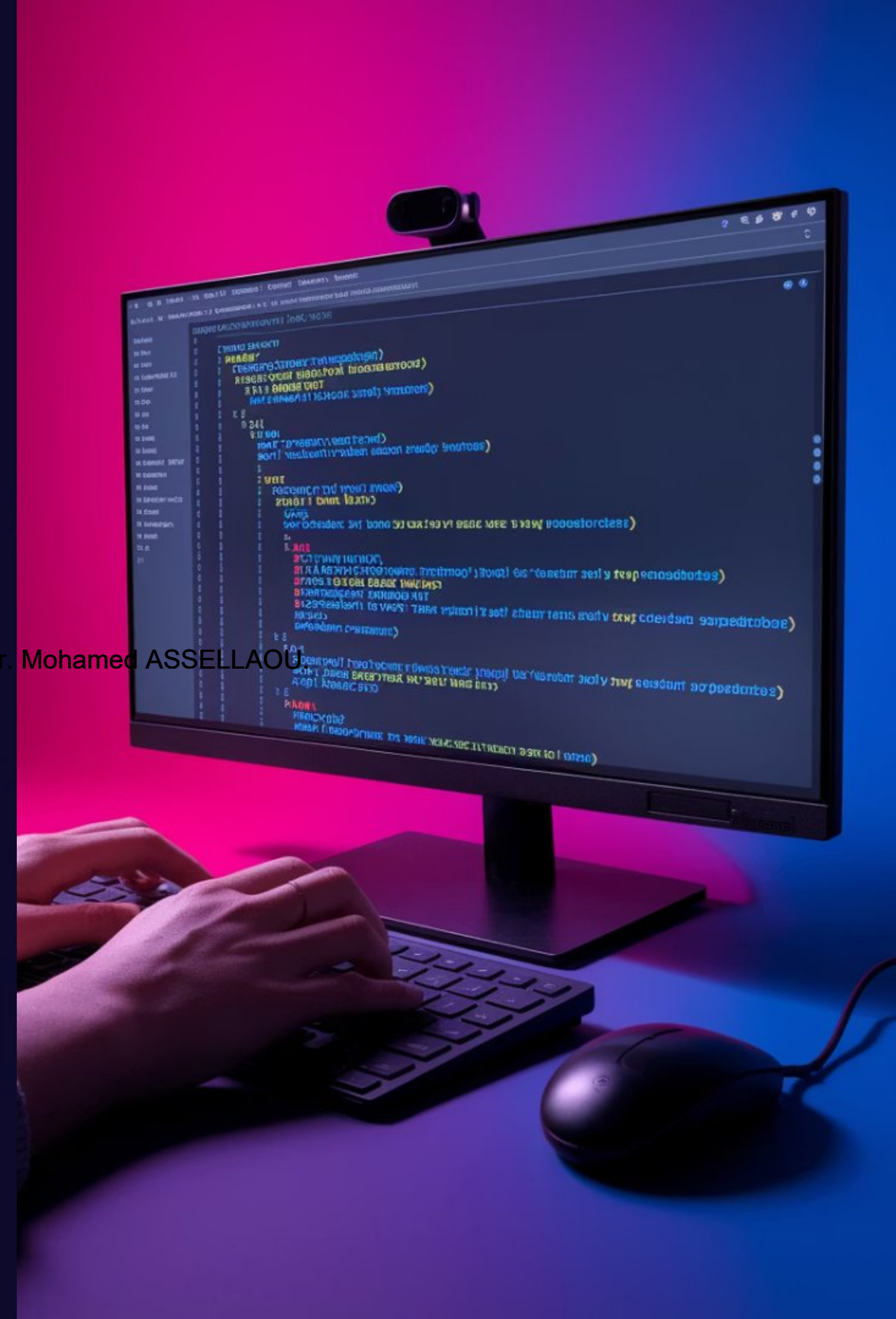
```
# Add a new contact
```

```
contacts["Charlie"] = "0662000002"
```

```
# Print all contacts
```

```
print(contacts)
```

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOUI



Other Python Collections – Tuples and Sets

Tuples

Immutable sequences

```
coordinates = (10, 20)
```

Sets

Unique elements only

```
unique_numbers = {1, 2, 3}
```

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.



Interactive Coding: Tuples and Sets

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

```
# Create a tuple
```

```
colors = ("red", "green", "blue")
```

```
print(colors[0]) # Prints: red
```

```
# Create a list with duplicates
```

```
numbers = [1, 2, 2, 3, 3, 3]
```

```
# Convert to set to remove duplicates
```

```
unique_numbers = set(numbers)
```

```
print(unique_numbers) # Prints: {1, 2, 3}
```


Control Flow – Conditionals

if statement

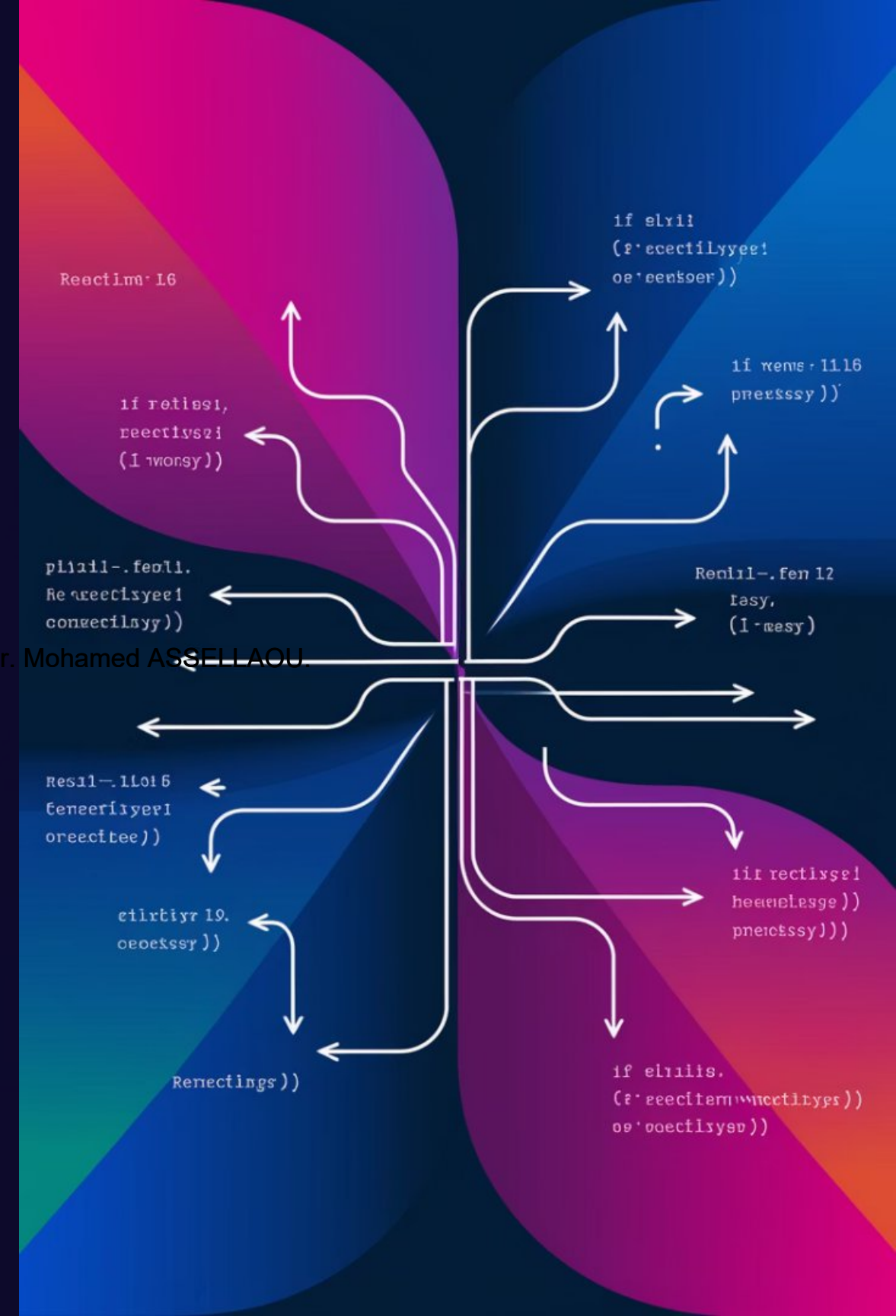
Execute code if condition is True

elif statement

Check another condition if first is False

else statement

Execute if all conditions are False



Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU

Control Flow – Loops

For Loop

Iterate over a sequence

```
for item in list:  
    print(item)
```

While Loop

Execute while condition is True

```
while count > 0:  
    count -= 1
```

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

Practical Exercise: Using Loops

Challenge: Print all even numbers in a list

```
numbers = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
```

Your code here:

```
for num in numbers:
```

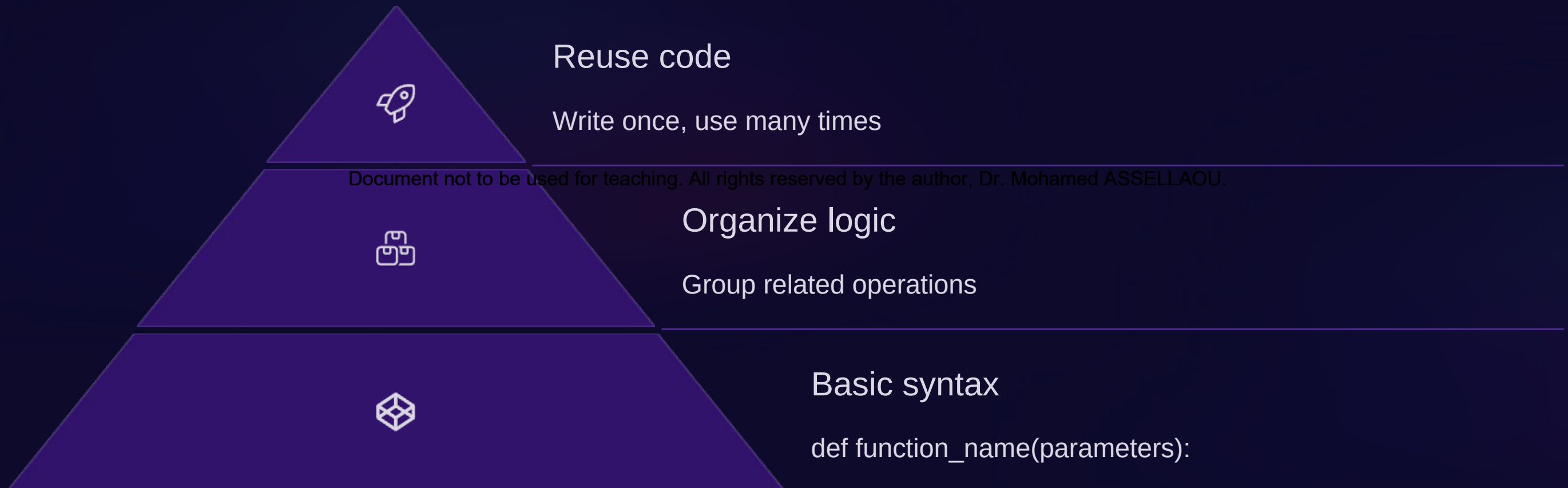
```
    if num % 2 == 0:
```

```
        print(num)
```

Output: 2, 4, 6, 8, 10

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

Defining Functions in Python



Hands-on: Write Your Own Function

```
# Define a greeting function
def greet(name):
    return f"Hello, {name}! Welcome to Python."

# Call the function
message = greet("Karim")
print(message)

# Output: Hello, Karim! Welcome to Python.
```

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

Recap of Python Fundamentals



Introduction to Python Libraries

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.



Extend capabilities

Add functionality without writing
from scratch



Import mechanism

```
import library_name
```



Community-driven

Thousands of specialized libraries

Spotlight on NumPy

Numerical Computing

Fast array operations

Multi-dimensional Arrays

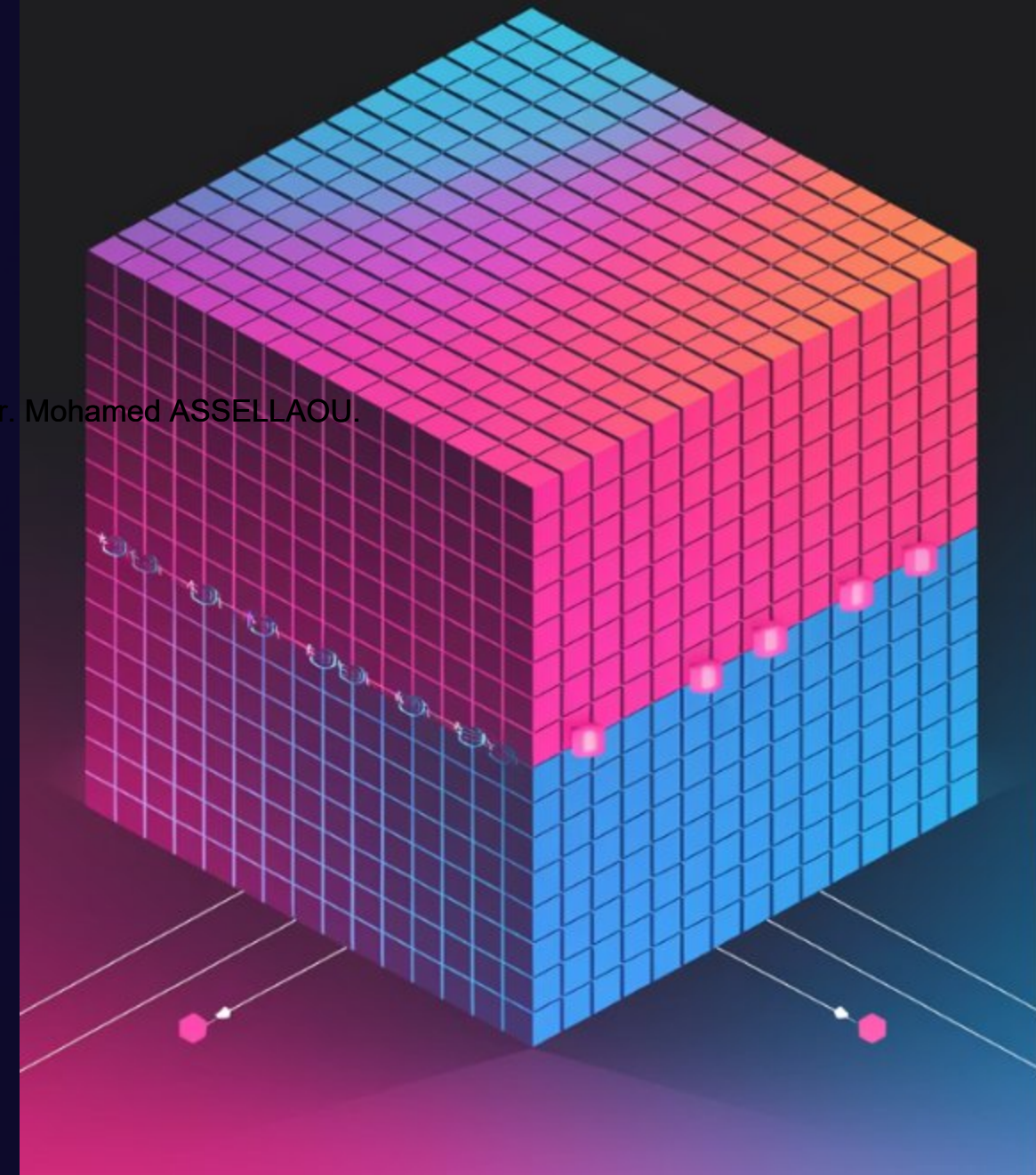
Efficient data structures

Mathematical Functions

Linear algebra, statistics

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

NUMPY ARRAY OPERATIONS



Spotlight on Pandas

Data Manipulation

- DataFrames: tabular data
- Series: 1D labeled arrays
- Powerful data cleaning tools

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

```
import pandas as pd  
  
df = pd.DataFrame({"A": [1, 2, 3]})  
print(df)
```

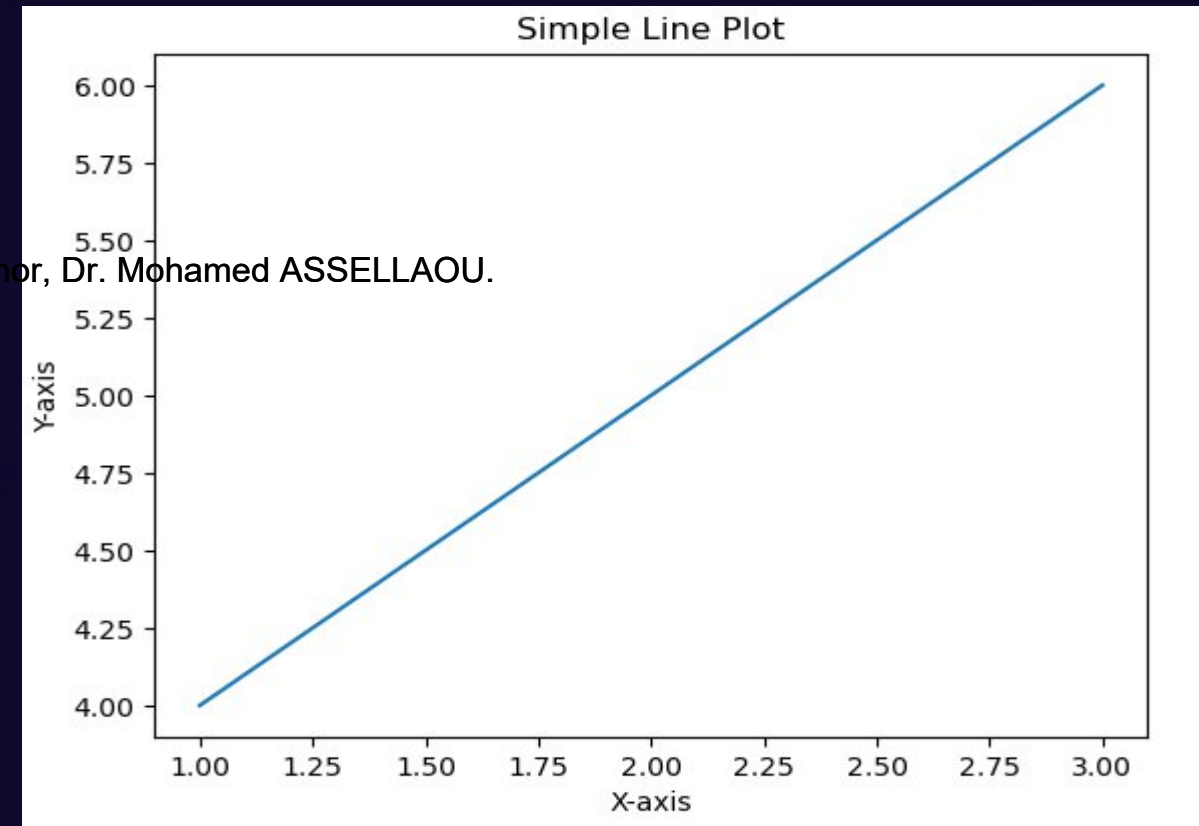
Data Visualization with Matplotlib

```
import matplotlib.pyplot as plt
```

```
# Create simple line plot
```

```
plt.plot([1, 2, 3], [4, 5, 6])  
plt.title("Simple Line Plot")  
plt.xlabel("X-axis")  
plt.ylabel("Y-axis")  
plt.show()
```

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.



Getting Started with Google Colab in Detail

Navigate to Colab

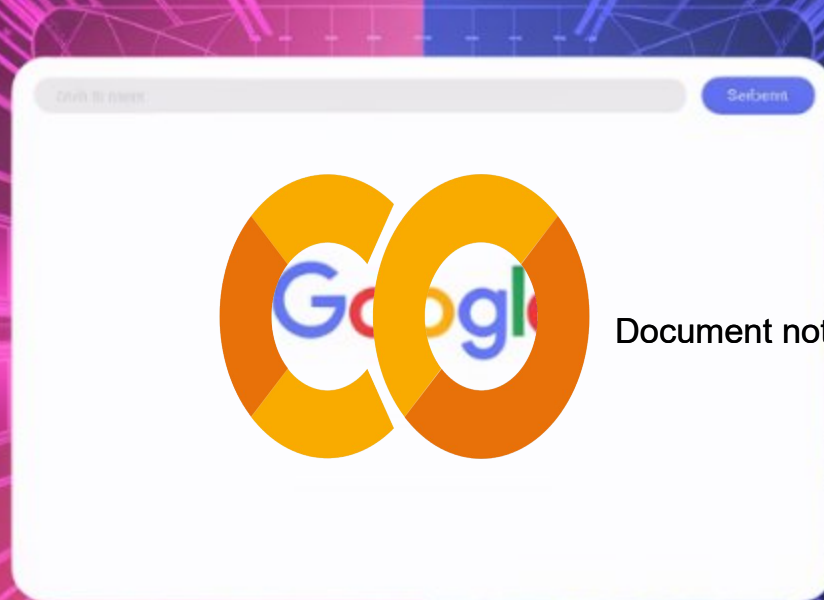
Visit colab.research.google.com

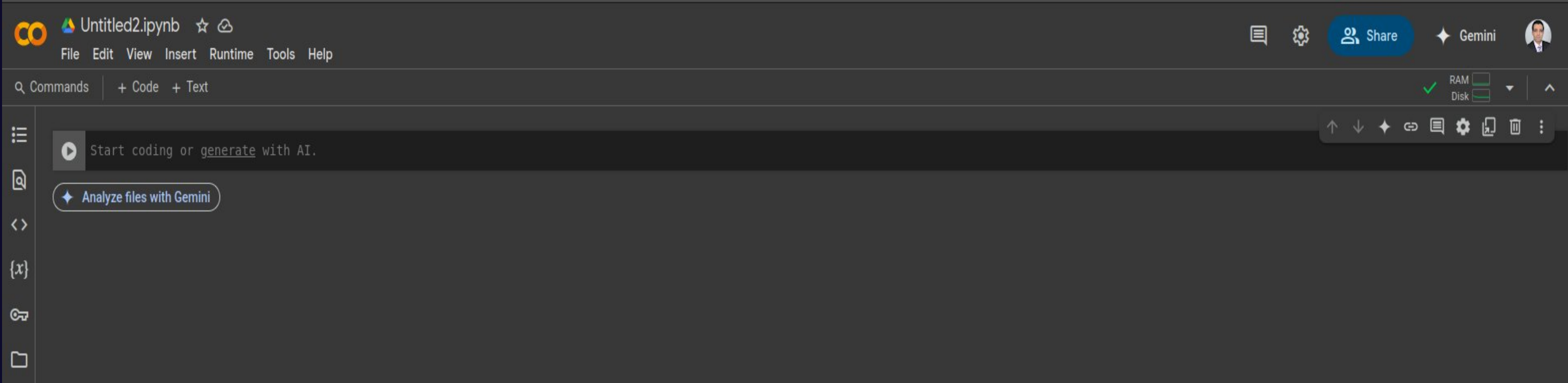
Sign in

Use Google account credentials

Create notebook

Click "New notebook" button





Navigating the Colab Interface

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

Menu Bar

File, Edit, View options

Code Cell

Write and execute Python

Sidebar

Files, snippets, settings

Creating and Editing Code Cells

Add Cell

Click + button or use Ctrl+M B

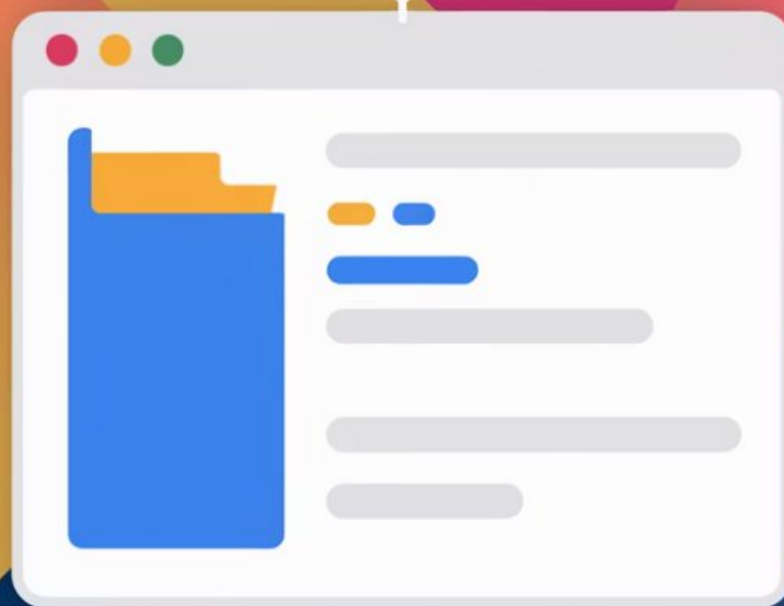
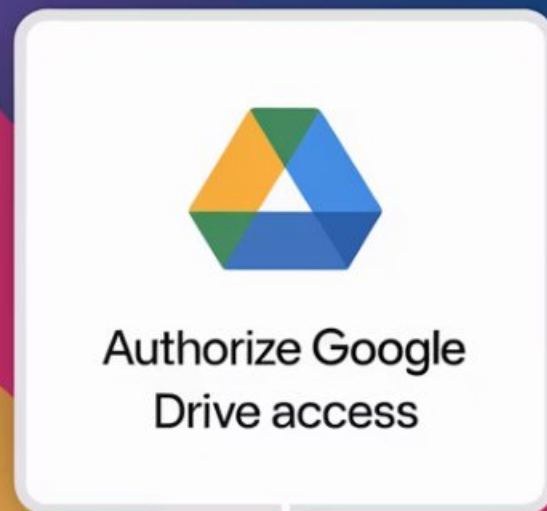
Run Cell

Press Shift+Enter or click play button

Edit Cell

Click in cell to modify code

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.



Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

Importing Code and Using Colab Resources

```
# Mount Google Drive  
from google.colab import drive  
drive.mount('/content/drive')
```

```
# List files in your Drive  
!ls "/content/drive/My Drive"
```

```
# Upload a local file  
from google.colab import files  
uploaded = files.upload()
```

Sharing and Collaborating in Colab

Share Button

Top-right corner of notebook

- View only
- Comment only
- Edit access

Collaboration Benefits

- Real-time editing
- Comments and feedback
- Version history
- Share results easily

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

Practical Exercise: Your First Colab Notebook

Create notebook

Click "New Notebook"

Add code cell

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

Run cell

Press Shift+Enter

Save notebook

Ctrl+S or File > Save

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.



Using External Libraries in Colab

```
# Install a library using pip  
!pip install seaborn
```

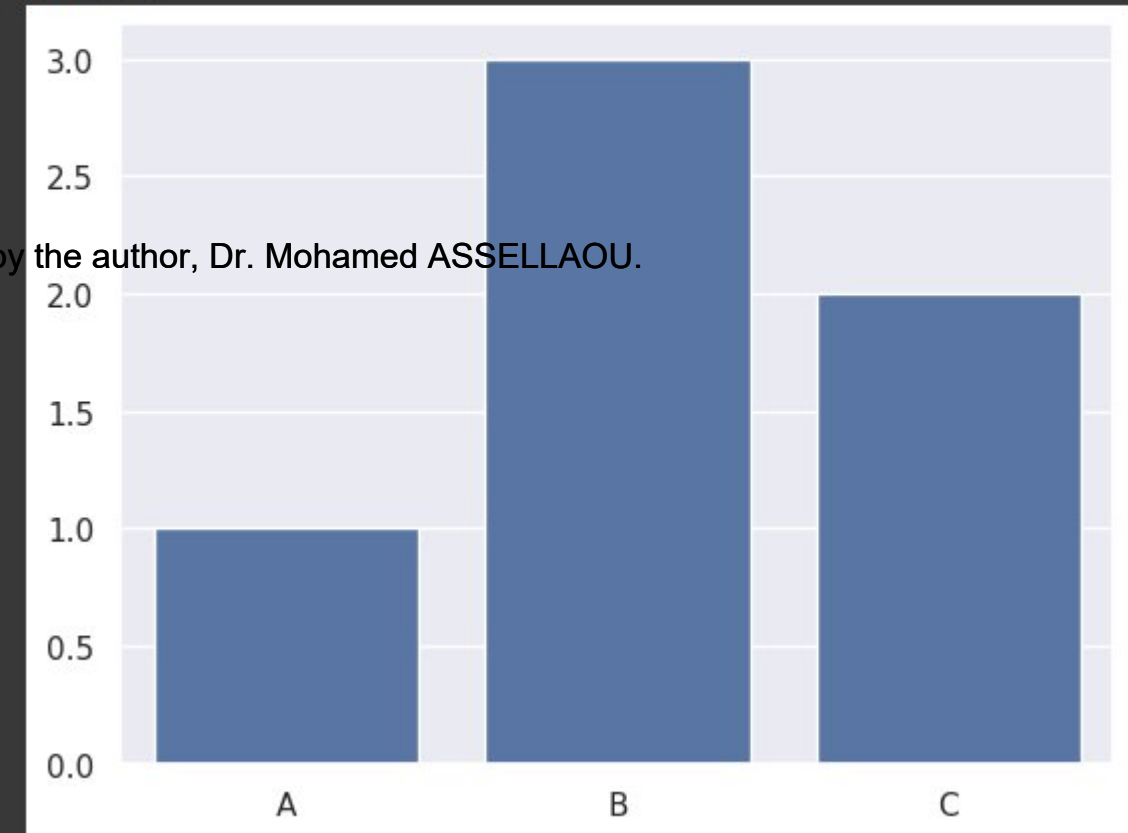
```
# Import the library  
import seaborn as sns
```

```
# Use the library  
sns.set_theme()  
sns.barplot(x=["A", "B", "C"], y=[1, 3, 2])
```

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

```
import seaborn as sns  
# Use the library  
sns.set_theme()  
sns.barplot(x=["A", "B", "C"], y=[1, 3, 2])
```

<Axes: >





Hands-on: Building a Mini Data Project



Create data

Build sample dataset with Pandas



Analyze

Filter and transform with NumPy



Visualize

Plot results with Matplotlib

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

Debugging and Troubleshooting in Colab

Common Errors

- `SyntaxError`: Invalid syntax
- `NameError`: Name not defined
- `ImportError`: No module found

Debugging Tips

- Read error messages carefully
- Use `print()` statements
- Check indentation
- Google the error message

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.

GPU Selection

AM



Hardware Accelerator



Advanced Colab Features

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.



GPU/TPU Acceleration



GitHub Integration



Terminal Access

Best Practices & Tips for Effective Coding in Colab



Use markdown cells

Document your code clearly



Add comments

Explain complex logic



Organize logically

Group related code together



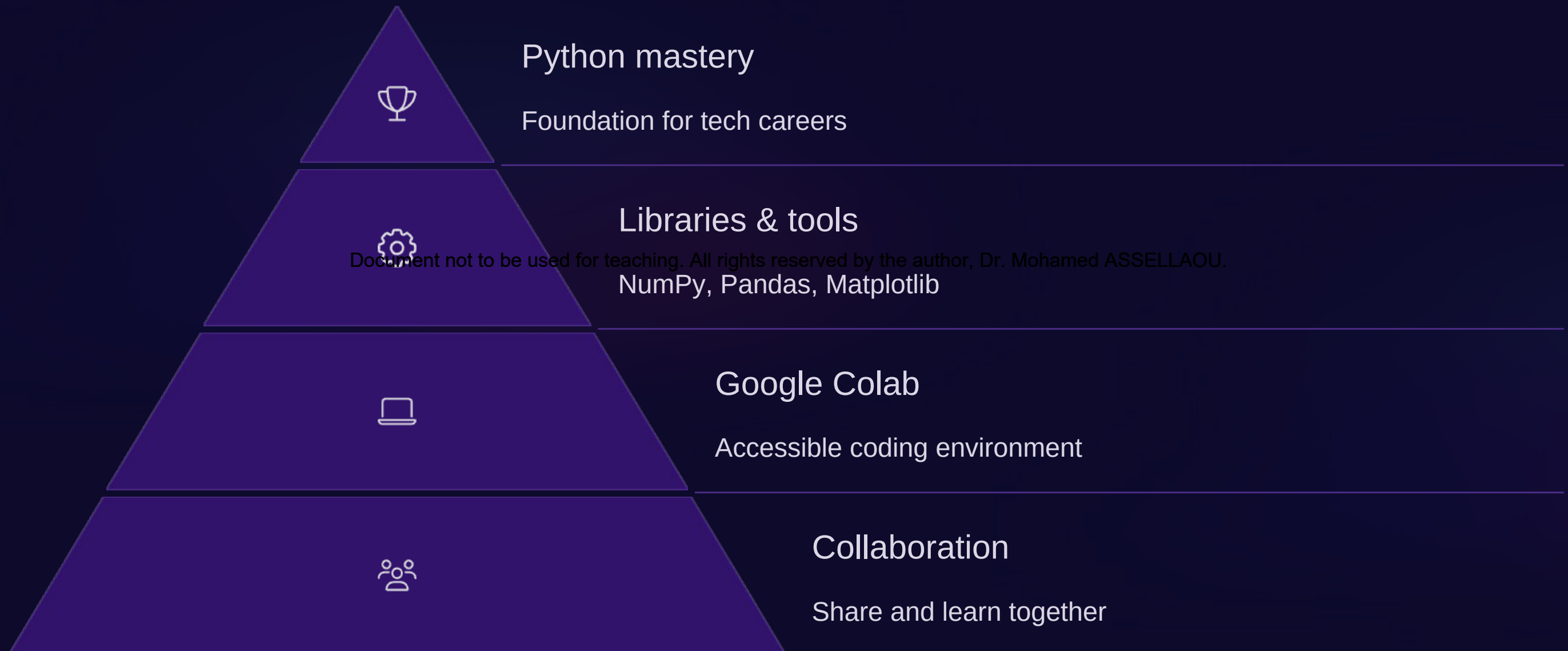
Save regularly

Prevent losing your work

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELI AOU.



Recap and Key Takeaways



Thank You

Document not to be used for teaching. All rights reserved by the author, Dr. Mohamed ASSELLAOU.
mohamed.assellaou@um6p.ma

[linkedin.com/in/mohamed-assellaou](https://www.linkedin.com/in/mohamed-assellaou)

