Introduction to Programming with Python

Day 4

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Course Overview

1. Introduction
2. Lists, Tuples, Dicts
3. Conditional and Looping Statements
4. Errors and Error Handlers
5. Functional Programming
6. External Libraries, Numpy, Matplotlib
7. Advanced Plotting, Scipy,
8. Working with Files (CSV, Excel, Text)
9. GUI creation with Tkinter
10. Useful Utilities and Way Forward!

External Libraries

External Libraries

- Python by default is a versatile language. Being an opensource, many people have extended the functionality of python
- All this various Libraries are collected and listed in the pypi website
- www.pypi.org
- By the time of this writing, pypi has close to 3 million Libraries (and growing!)
- Most of the libraries are specific to a task only
- Most popular libraries are
  - numpy, scipy for math functions
  - matplotlib for plotting
  - pandas for datascience
  - tensorflow for machine learning
  - django, flask for web development

Installing Libraries

- external Libraries needs to be installed with a package manager
- by default python comes with a package manager called pip
- pip can be used to install, remove and upgrade the packages
- to install a package with pip, open terminal and type this

```
python -m pip install libraryName
```

example

```
python -m pip install numpy
```

Numpy

Introduction to Numpy Library

- numpy stands for Numerical Python. This has useful function for linear algebra, fourier transform, and matrices.
- numpy was created in 2005 by Travis Oliphant
- numpy is way more faster and convenient than list and default python array
- numpy is primarily written in c,c++ and then wrapped around python
- numpy has its own datatype called ndarray which offers many functionalities
- for more information about numpy https://numpy.org/
- if you know matlab, you can see https://numpy.org/doc/stable/user/numpy-for-matlab-users.html for how you can switch efficiently

Numpy functions and Operations

- Numpy library is huge with hundreds of operations and functions.
- It will be impossible to cover all of them in one class
- For basic array creation and conversion, please refer 1_numpy_basics file
- For element wise operations in numpy array, refer to 3_numpy_functions file
- for linear algebra and array operations, refer to 4_numpy_operations file

Matplotlib

Introduction to Matplotlib

- matplotlib is the most popular data visualization library in the python
- matplotlib was originally written by John D. Hunter in 2003 and it can work well along with numpy and other Libraries
- matplotlib come with a oop based plotting module called pyplot which offers various plot types by default
- matplotlib along with scipy and numpy is considered as opensource equivalent of Matlab
- matplotlib also has modules for animations, annotations and many other customization
- Comparable plotting libraries are seaborn, plotly, ggplot (For R people), altair etc

Line plots using pyplot

- To draw a simple line plot we can use the plot command

```
import matplotlib.pyplot as plt
X=[10,5,14,3,8,6]
plt.plot(X)
plt.show()
```

- For more examples and customization, please refer the 5_pyplot_basic file

Scatter plots using pyplot

- To draw a simple scatter plot we can use the plot command

```
import matplotlib.pyplot as plt
X=[10,5,14,3,8,6]
Y=[1,2,3,4,5,6]
plt.scatter(X,Y)
plt.show()
```

- For more examples and customization, please refer the 6_pyplot_scatter file

Bar chart using pyplot

- To draw a simple line plot we can use the plot command

```
import matplotlib.pyplot as plt
subjects=["English","French","Maths","Physics","Chemistry"]
marks=[80,96,75,83,88]
plt.bar(subjects,marks)
plt.show()
```

- For more examples and customization, please refer the 7_pyplot_bar file

print(“Thank You!”)