UNIKASSEL
VERSITÄT

Getting Started with Python: Syntax, Functions, and Classes

Shahab A. Shojaeezadeh
shahab2710@gmail.com
github.com/shahab271069

November 04, 2024

Agenda

- Importing Packages
- Using ‘os‘
- Using ‘glob‘
- Using ‘numpy‘
- Using ‘scipy‘
- Using ‘matplotlib‘
- Using ‘pandas‘
- Summary and Questions

Importing Packages

- Use the `import` statement
- Example:

Import Example

```
import os
import pandas as pd
import glob
import matplotlib.pyplot as plt
import numpy as np
from scipy import stats
```

Using ‘os‘ Package

- Interact with the operating system
- Example: Listing files in a directory

List Files

```
import os
files = os.listdir(".")
print(files)
```

Using ‘os‘ - Check File Existence

- Check if a file exists
- Example:

Check File

```
if os.path.exists("file.txt"):
print("File exists")
```

Using ‘os‘ - Create a Directory

- Create a new directory
- Example:

Create Directory

```
os.mkdir("new_folder")
print("Directory created")
```

Using ‘os‘ - Remove a File

- Delete a file
- Example:

Remove File

```
os.remove("file.txt")
print("File removed")
```

Using ‘os‘ - Get Current Working Directory

- Get the current working directory
- Example:

Current Directory

```
cwd = os.getcwd()
print(cwd)
```

Using ‘glob‘ Package

- Find all the pathnames matching a specified pattern
- Example: List all .txt files

Glob Example

```
import glob
files = glob.glob("*.txt")
print(files)
```

Using ‘glob‘ - Recursively Finding Files

- Search for files in subdirectories
- Example:

Recursive Search

```
files = glob.glob("**/*.txt", recursive=True)
print(files)
```

Using ‘numpy‘ Package

- Fundamental package for numerical computing
- Example: Creating an array

Create Array

```
import numpy as np
arr = np.array([1, 2, 3])
print(arr)
```

Using ‘numpy‘ - Array Operations

- Perform operations on arrays
- Example: Element-wise addition

Array Addition

```
arr1 = np.array([1, 2, 3])
arr2 = np.array([4, 5, 6])
result = arr1 + arr2
print(result)
```

Using ‘numpy‘ - Statistical Functions

- Perform statistical calculations
- Example: Mean and Standard Deviation

Statistics

```
mean = np.mean(arr)
std_dev = np.std(arr)
print(mean, std_dev)
```

Using ‘numpy‘ - Reshape Array

- Change the shape of an array
- Example:

Reshape Array

```
reshaped = arr.reshape(3, 1)
print(reshaped)
```

Using ‘scipy‘ Package

- Library for scientific computing
- Example: Statistical tests

Statistical Tests

```
from scipy import stats
t_statistic, p_value = stats.ttest_ind(sample1,
sample2)
print(t_statistic, p_value)
```

Using ‘scipy‘ - Optimization

- Solve optimization problems
- Example:

Optimization Example

```
from scipy.optimize import minimize
result = minimize(fun, x0)
print(result)
```

Using ‘scipy‘ - Interpolation

- Perform interpolation on data
- Example:

Interpolation

```
from scipy.interpolate import interp1d
f = interp1d(x, y)
new_y = f(new_x)
```

Using ‘matplotlib‘ Package

- Create static, animated, and interactive visualizations
- Example: Simple Line Plot

Line Plot

```
import matplotlib.pyplot as plt
plt.plot([1, 2, 3], [4, 5, 6])
plt.show()
```

Using ‘matplotlib‘ - Scatter Plot

- Create scatter plots
- Example:

Scatter Plot

```
plt.scatter(x, y)
plt.title("Scatter Plot")
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.show()
```

Using ‘matplotlib‘ - Bar Plot

- Create bar charts
- Example:

Bar Plot

```
plt.bar(["A", "B", "C"], [1, 2, 3])
plt.title("Bar Plot")
plt.show()
```

Using ‘matplotlib‘ - Histogram

- Create histograms
- Example:

Histogram

```
plt.hist(data)
plt.title("Histogram")
plt.show()
```

Using ‘pandas‘ Package

- Data manipulation and analysis
- Example: Reading a CSV file

Read CSV

```
import pandas as pd
data = pd.read_csv("data.csv")
print(data.head())
```

Using ‘pandas‘ - DataFrame Operations

- Perform operations on DataFrames
- Example: Filtering Data

Filter DataFrame

```
filtered = data[data["column"] > 10]
print(filtered)
```

Using ‘pandas‘ - Group By

- Group data by a specific column
- Example:

Group By

```
grouped = data.groupby("column").mean()
print(grouped)
```

Using ‘pandas‘ - Merging DataFrames

- Combine multiple DataFrames
- Example:

Merging DataFrames

```
merged = pd.merge(df1, df2, on="key")
print(merged)
```

Using ‘pandas‘ - Saving DataFrame

- Save DataFrame to CSV
- Example:

Save DataFrame

```
data.to_csv("output.csv", index=False)
```

Summary

- Covered essential Python packages
- Demonstrated code examples for each package
- Discussed practical applications

Questions?

Thank you for your attention!
Any questions?