Introduction to Python

2023

Agenda

- Introduction: why Python?
- Python: 60 mins course
- Data: pandas
- Regression: scikit-learn
- Visualization: matplotlib

Section 1

Introduction: why Python?

Introduction: why Python?

- Why Python?

  https://www.python.org/

- Materials
  - Introductory: https://www.py4e.com/, https://python-course.eu/
  - Advanced: Fluent Python by Luciano Ramalho

- Programming environment
  - Anaconda

    https://www.anaconda.com/
  - conda

Section 2

Python: 60 minutes course

Python: 60 minutes course

Data Types and Operators

- Basic types: str, int, float, bool
- Containers: list, dict, set
- Arithmetic operators: +, -, *, /, **
- Logical operators: ==, !=, >, <, <=, >=

Control Flow

- if condition
- for loop

```
x = 1
y = 2.0
print(x+y, type(x), type(x+y))
```

✓ 0.5s

```
3.0 <class 'int'> <class 'float'>
```

```
z =str(x)+str(y)
print(z,type(z))
```

✓ 0.5s

```
12.0 <class 'str'>
```

```
b = (x==y)
print(b,type(b))
```

✓ 0.4s

```
False <class 'bool'>
```

```
first_list = [x,y,z]
if not b:
    for i in first_list:
        print(i)
```

✓ 0.7s

```
1
2.0
12.0
```

Python: 60 minutes course

Functions

- built-in functions
- methods
- def key word

Modules

- import statement
- Python standard library
- Externals modules: numpy

```
len(first_list)
```
✓ 0.4s
```
3
```

```
first_list.pop(-1)
```
✓ 0.2s
```
2.0
```

```
def sum_of_elements(x):
    s = 0
    for i in x:
        s +=i
    return s

sum_of_elements(first_list)
```
✓ 0.6s
```
3.0
```

```
import os
os.mkdir("test")
```
✓ 0.5s

```
import numpy as np
np.std(first_list)
```
✓ 2.7s
```
0.5
```

Python: 60 minutes course

Classes

- class key word
- __init__
- Object oriented programming

```
class Student:
    def __init__(self, name):
        self.name = name
        self.courses = []

    def __str__(self):
        return str(self.name)

    def sing_up(self, course):
        pass
```

✓ 0.8s

```
jd = Student("John Doe")
```

✓ 0.1s

```
print(jd)
```

✓ 0.1s

```
John Doe
```

```
class Complex:
    def __init__(self,x,y):
        self.x = x
        self.y = y
```

Section 3

Data: pandas

Data: pandas

https://pandas.pydata.org/

```
import pandas as pd
df_iris = pd.read_csv("iris.csv", index_col=0)
df_iris
```

✓ 0.8s

	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
1	5.1	3.5	1.4	0.2	setosa
2	4.9	3.0	1.4	0.2	setosa
3	4.7	3.2	1.3	0.2	setosa
4	4.6	3.1	1.5	0.2	setosa
5	5.0	3.6	1.4	0.2	setosa
...	...	...	...	...	...
146	6.7	3.0	5.2	2.3	virginica
147	6.3	2.5	5.0	1.9	virginica
148	6.5	3.0	5.2	2.0	virginica
149	6.2	3.4	5.4	2.3	virginica
150	5.9	3.0	5.1	1.8	virginica

150 rows × 5 columns

Section 4

Regression: scikit-learn

Regression: scikit-learn

https://scikit-learn.org/stable/

```
from sklearn.linear_model import LinearRegression
```

✓ 4.5s

```
X = df_iris[['Sepal.Length', 'Sepal.Width', 'Petal.Length']]
y = df_iris['Petal.Width']

reg = LinearRegression()
reg.fit(X,y)
```

✓ 0.6s

```
LinearRegression()
```

```
print("predict: " +str(reg.predict([X.loc[1,:]])[0]), "actual: " + str(y[1]))
```

✓ 0.5s

```
predict: 0.21625189892792285 actual: 0.2
```

```
y_preds = reg.predict(X)
1 - np.sum((y_preds-y)**2)/np.sum((y- np.mean(y))**2)
```

✓ 0.1s

```
0.9378502736046809
```

Section 5

Visualization: matplotlib

Visualization: matplotlib

https://matplotlib.org/

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

✓ 3.7s

```
species_list = df_iris.Species.unique()
sepal_lengths = [np.mean(df_iris[df_iris.Species == species]['Sepal.Length']) for  species in species_list]
sepal_width = [np.mean(df_iris[df_iris.Species == species]['Sepal.Width']) for  species in species_list]
petal_lengths = [np.mean(df_iris[df_iris.Species == species]['Petal.Length']) for  species in species_list]
petal_width = [np.mean(df_iris[df_iris.Species == species]['Petal.Width']) for  species in species_list]
```

✓ 0.6s

```
plt.figure()
plt.subplot(121)
plt.bar(species_list, sepal_width)
plt.ylabel('Mean sepal width')
plt.subplot(122)
plt.bar(species_list, sepal_lengths)
plt.ylabel('Mean sepal lengths')
plt.show
```

✓ 0.5s

```
<function matplotlib.pyplot.show>
```