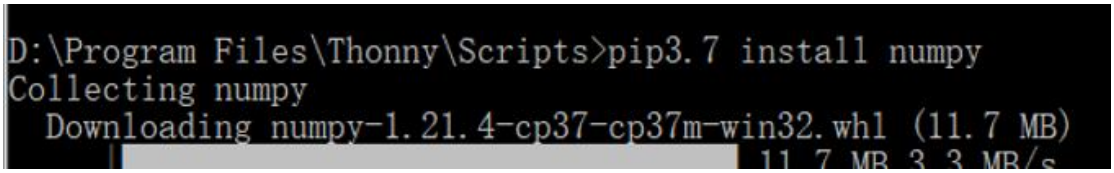
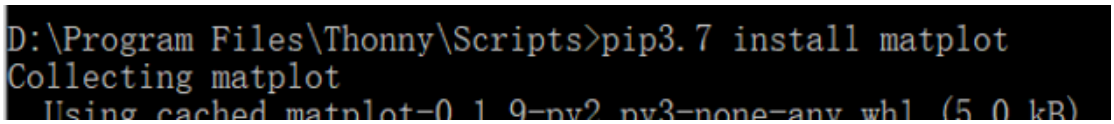
Practice exercises: Week 10 (Data analytics in Python) : NumPy and Matplotlib

1. Install numpy and matplotlib for Thonny

Pip install numpy



Pip install matplotlib



or Tools menu → manage packages—search for numpy/matplotlib for instlllation at Thonny code editor

2. Try the code given below to get how numpy array works:

```
import numpy as np
#The numpy.array() function can take a list or list of lists as input.
#When we input a list, we get a one-dimensional array as a result
vector=np.array([5,10,15,20])
#when we input a list of lists, we get a matrix as a result:
matrix=np.array([[5,10,15],[20,25,30],[35,40,45]])
print(vector)
print(matrix)
```

Expected results will be:

```
>>> %Run prac2.py
[ 5 10 15 20]
[[ 5 10 15]
 [20 25 30]
 [35 40 45]]
```

```
#(2)
#We can use numpy.shape property to figure out how many elements
#are in the array
print(vector.shape)
#For matrices, the shape property contains a tuple with 2 elements.
print (matrix.shape)
```

The result will be

```
(4,)
(3, 3)
```

3.

```
 5 10 15 20
20 25 30 35
35 40 45 50
```

Define a matrix as given below by using numpy array and your code should output

(i) Display the second row of the array

(ii) Display the second column of the array

(iii) Display the number of rows and columns that the array contains

Answer:

```
1 import numpy  as np
2 matrix=np.array([[5,10,15,20],[20,25,30,35],[35,40,45,50]])
3 print(matrix[1,:]) #output the data in line 2
4 print(matrix[:,1]) #output the data in column a
5 print(matrix.shape) #output the numbers of lines and columns.
```

import numpy as np
matrix=np.array([[5,10,15,20],[20,25,30,35],[35,40,45,50]])
print(matrix[1,:]) #output the data in line 2
print(matrix[:,1]) #output the data in column a
print(matrix.shape) #output the numbers of lines and columns.

4. Iris Data Set: This database widely used for pattern recognition literature. The data set include 5 columns:

i. sepal length in cm

ii. sepal width in cm

iii. petal length in cm

iv. petal width in cm

v. class:

-- Iris Setosa

-- Iris Versicolour

-- Iris Virginica

Here is an example for how to read data from it with numpy and plot scatter and line charts with matplotlib. You could run it and view the results.

```
import numpy as np
import matplotlib.pyplot as plt
irisdata=np.loadtxt('iris.txt',delimiter=',',dtype=str)
print(irisdata)
irisArray=irisdata[:,:4] # select the first 4 columns of data
irisArray = irisArray.astype(float) # turn string to float
print(irisArray)
rownum=np.shape(irisArray)[0] #number of rows
#colnum=np.shape(irisArray)[1] #number of cloumns
plt.plot(np.linspace(0,rownum,num=rownum),irisArray[:,0],'b')
plt.ylabel("sepal length in cm")
plt.show()

plt.plot(np.linspace(0,rownum,num=rownum),irisArray[:,1],'b')
plt.ylabel("sepal width in cm")
plt.show()

plt.scatter(np.linspace(0,rownum,num=rownum),irisArray[:,2],marker='o')
plt.ylabel("petal length in cm")
plt.show()

plt.scatter(np.linspace(0,rownum,num=rownum),irisArray[:,3],marker='o')
plt.ylabel("petal width in cm")
plt.show()
```