

Machine Learning

Assignment-3

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Question:1

1. Numpy: a. Using NumPy create random vector of size 15 having only Integers in the range 1-20.

1. Reshape the array to 3 by 5

2. Print array shape.

3. Replace the max in each row by 0

Solution:

```
In [ ]: Name:Deepthi Gudibanda  
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```

```
In [3]: import numpy as np
```

```
In [7]: #Question 1  
#a.1,2,3  
vec = np.random.randint(1, 21, size=15)# Create a random vector of size 15 with integers in the  
print("Original array:",vec)  
arr = vec.reshape(3, 5)# Reshape the vector into a 3x5 array  
print("Array :", arr)  
print("Array shape:", arr.shape)# Print the shape of the array  
arr[np.arange(arr.shape[0]), arr.argmax(axis=1)] = 0# Replace the maximum value in each row wit  
print("Modified array:\n", arr)# Print the modified array
```

```
Original array: [10  7 12 18  6  9 17  9 15  2 11 14 20  5  7]  
Array : [[10  7 12 18  6]  
 [ 9 17  9 15  2]  
 [11 14 20  5  7]]  
Array shape: (3, 5)  
Modified array:  
[[10  7 12  0  6]  
 [ 9  0  9 15  2]  
 [11 14  0  5  7]]
```

In this problem, I have created a random vector using rand function with integer range 1-20 and size 15. Then reshape the array using reshape function and print the shape using shape of the array then using the argmax and shape replaced the max value with 0.

Create a 2-dimensional array of size 4 x 3 (composed of 4-byte integer elements), also print the shape, type and data type of the array.

Solution:

```
In [3]: #1.b
import numpy as np

arr = np.zeros((4, 3), dtype=np.int32)# creates 2 dimensional array
print("Shape:", arr.shape)#returns the shape of the array.
print("Type:", type(arr))#returns the type of the array
print("Data type:", arr.dtype)#returns the data type of the elements in the array

Shape: (4, 3)
Type: <class 'numpy.ndarray'>
Data type: int32
```

In this problem I have created a 2-dimensional array with 4-byte integer elements. I have printed the shape of array using shape function and type using the type of function then using the data type function printed the data type.

b. Write a program to compute the eigenvalues and right eigenvectors of a given square array given below: $\begin{bmatrix} 3 & -2 \\ 1 & 0 \end{bmatrix}$

Solution:

```
In [9]: import numpy as np

arr = np.array([[3, -2], [1, 0]])
eigenvalues, eigenvectors = np.linalg.eig(arr)
print("Eigenvalues:", eigenvalues)#The eigenvalues are printed as a 1-dimensional array.
print("Eigenvectors:\n", eigenvectors)#The eigenvectors are printed as a 2-dimensional array

Eigenvalues: [2. 1.]
Eigenvectors:
[[0.89442719 0.70710678]
 [0.4472136  0.70710678]]
```

In this program, I have defined a square array then computed the eigenvalues and eigenvectors using the `np.linalg.eig(arr)`. then printed the eigenvalues as 1 dimensional array and right eigenvectors as 2-dimensional array.

c. Compute the sum of the diagonal element of a given array. $\begin{bmatrix} 0 & 1 & 2 \\ 3 & 4 & 5 \end{bmatrix}$

Solution:

```
In [10]: #1.c
import numpy as np

arr = np.array([[0, 1, 2], [3, 4, 5]])# creates given array
sum_diag = np.trace(arr)#computes the trace of the array
print("Array:\n", arr)
print("Sum of diagonal elements:", sum_diag)#sum of diagonal elements are printed

Array:
[[0 1 2]
 [3 4 5]]
Sum of diagonal elements: 4
```

In this program, I have defined the array using array function then computed the diagonal elements using diagonal sum and trace(arr) then printed the sum of diagonal using print() function.

d. Write a NumPy program to create a new shape to an array without changing its data. Reshape 3x2: [[1 2] [3 4] [5 6]] Reshape 2x3: [[1 2 3] [4 5 6]]

```
In [2]: #1.d
import numpy as np

arr = np.array([[1, 2], [3, 4], [5, 6]])#creates original array
reshape_1 = np.reshape(arr, (3, 2))#reshapes original array to 3*2
reshape_2 = np.reshape(arr, (2, 3))#reshapes the original array to 2*3
print("Original array:\n", arr)
print("Reshaped to 3x2:\n", reshape_1)
print("Reshaped to 2x3:\n", reshape_2)

Original array:
[[1 2]
 [3 4]
 [5 6]]
Reshaped to 3x2:
[[1 2]
 [3 4]
 [5 6]]
Reshaped to 2x3:
[[1 2 3]
 [4 5 6]]
```

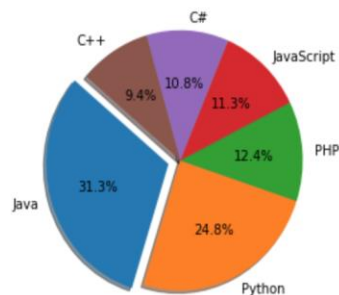
Solution:

In this program, I have defined the array using array function and reshaped it to 3*2 using reshape() function then printed the reshaped and again Reshaped array using reshape() and printed the new reshape.

2. Matplotlib 1. Write a Python programming to create a below chart of the popularity of programming Languages. 2. Sample data: Programming languages: Java, Python, PHP, JavaScript, C#, C++ Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

Solution:

```
In [1]: #Q2
import matplotlib.pyplot as plt
languages = 'Java', 'Python', 'PHP', 'JavaScript', 'C#', 'C++'
popularity = [22.2, 17.6, 8.8, 8, 7.7, 6.7]
colors = ["#1f77b4", "#ff7f0e", "#2ca02c", "#d62728", "#9467bd", "#8c564b"]
explode = (0.1, 0, 0, 0, 0, 0)
plt.pie(popularity, explode=explode, labels=languages, colors=colors,
        autopct='%1.1f%%', shadow=True, startangle=140)
plt.axis('equal')
plt.show()
```



In []:

In this problem, I have first defined the programming languages and their popularity as lists using Python. I have used the plt.pie() method from Matplotlib to create a pie chart. I then used the plt.axis() method to set the chart and I used the plt.show() method to display the chart.

GitHub Link: <https://github.com/Deepthi-gudibanda/MachineLearning>