**ML ASSIGNMENT – 3**

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**GitHub Link:**

**Video Repository:**

**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

**Text

Description automatically generated**

**Description of code:**

a)Firstly, here the np.random.randint() function is used to create an array of random integers between 1 and 20, inclusive, of size 15. Print the random vector.

1) reshape() method is used to convert this 1D array into a 3x5 array. Finally, we print the reshaped 3x5 array.

2) The shape attribute of the 3x5 array returns a tuple (3, 5) which represents the dimensions of the array. The first value of the tuple is the number of rows, and the second value is the number of columns in the array.

3) Here, the argmax() method is used to get the indices of the maximum value in each row of the 3x5 array along the axis=1 direction. Then, the put() method is used to replace these maximum values with 0 in the original array. Finally, we print the updated 3x5 array with the maximum values replaced by 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.

**Graphical user interface, text, application, email

Description automatically generated**

**Description of code:**

In this code, np.array() creates a 2-dimensional array with 4 rows and 3 columns, and the dtype is parameter which is used to specify that the elements of the array should be 4-byte integers (np.int32). The print() statements then output information about the array, including its shape, type, and data type.

**b)** Write a program to compute the eigenvalues and right eigenvectors of a given square array given below: [[ 3 -2]

[ 1 0]]

Graphical user interface, text, application

Description automatically generated

**Description of code:**

The eigenvalues variable contains the eigenvalues of the array, and the eigenvectors variable contains the corresponding eigenvectors. I used a method called np.linalg.eig() which returns the outputs eigenvalues and the right eigenvectors respectively. The eigenvalues are printed as a 1-dimensional array, and the eigenvectors are printed as a 2-dimensional array with each column representing an eigenvector.

**C)** Compute the sum of the diagonal element of a given array. [[0 1 2]

[3 4 5]]

Graphical user interface, application

Description automatically generated

**Description of code:**

Here, first import the NumPy library and create a 2D array ‘arr’ with the given values. We then use the trace function of NumPy to compute the sum of the diagonal elements of the array. The trace function returns the sum of the diagonal elements of a matrix. Finally, we print the diagonal sum, which is 4 in this case.

**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]]

Graphical user interface, text, application

Description automatically generated

**Description of code:**

In this program, we first import the NumPy library and create the array using the NumPy array() function. Then, we use the reshape() function to create a new array with the same data but a different shape. Finally, we print both the 3x2 and 2x3 arrays to verify that the data is the same, but the shape has changed.

**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

Graphical user interface, text, application, email

Description automatically generated

**Description of code:**

For this question I have imported pyplot as plt from matplotlib and for exploding the section in plot, I have used a explode statement and given it as argument in the plt.plot method I have set labels as languages and used autopct for displaying the percentage inside the graph %.1f%% displays one digit after the decimal.