OPEN SOURCE SOFTWARE LAB (15B17CI575)

Lab Assignment 4

Topic Coverage: Python-Numpy package

Basic commands of Numpy

1. Import the numpy package under the name np : import numpy as np
2. Create a vector with values ranging from 10 to 49.
   a. Z = np.arange(10,50)
3. Reverse a vector (first element becomes last
   a. Z = np.arange(50)
   b. Z = Z[::-1]
4. Create a 3x3 matrix with values ranging from 0 to 8.
   a. Z = np.arange(9).reshape(3,3)
5. Find indices of non-zero elements from [1,2,0,0,4,0]
   a. nz = np.nonzero([1,2,0,0,4,0])
6. Create a 3x3 identity matrix
   a. Z = np.eye(3)
7. Create a 3x3x3 array with random values
   a. Z = np.random.random((3,3,3))
8. Create a 10x10 array with random values and find the minimum and maximum values
   a. Z = np.random.random((10,10))
   b. Zmin, Zmax = Z.min(), Z.max()
   c. print(Zmin, Zmax)
9. Create a random vector of size 30 and find the mean value
   a. Z = np.random.random(30)
   b. m = Z.mean()
   c. print(m)
10. Create a 2d array with 1 on the border and 0 inside.
    a. Z = np.ones((10,10))
    b. Z[1:-1,1:-1] = 0
    c. print(Z)
11. How to add a border (filled with 0's) around an existing array?
    a. Z = np.ones((5,5))
    b. Z = np.pad(Z, pad_width=1, mode='constant', constant_values=0)
    c. print(Z)
12. Multiply a 5x3 matrix by a 3x2 matrix
    a. Z = np.dot(np.ones((5,3)), np.ones((3,2)))
    b. print(Z)
13. Given a 1D array, negate all elements which are between 3 and 8, in place.

a. Z = np.arange(11)
b. Z[(3 < Z) & (Z <= 8)] *= -1
c. print(Z)
14. How to find common values between two arrays?
    a. Z1 = np.random.randint(0,10,10)
    b. Z2 = np.random.randint(0,10,10)
    c. print(np.intersect1d(Z1,Z2))
15. How to get the dates of yesterday, today and tomorrow?
    a. yesterday = np.datetime64('today', 'D') - np.timedelta64(1,'D')
    b. today = np.datetime64('today', 'D')
    c. tomorrow = np.datetime64('today', 'D') +
    d. np.timedelta64(1, 'D')
16. How to get all the dates corresponding to the month of July 2016?
    a. Z = np.arange('2016-07', '2016-08', dtype='datetime64[D]')
    b. print(Z)
17. Consider two random array A and B, check if they are equal
    a. A = np.random.randint(0,2,5)
    b. B = np.random.randint(0,2,5)
    c. # Assuming identical shape of the arrays and a tolerance for the comparison of values
       equal = np.allclose(A,B)
    d. print(equal)
    e. # Checking both the shape and the element values, no tolerance
    f. (values have to be exactly equal)
    g. equal = np.array_equal(A,B)
    h. print(equal)
18. Create random vector of size 10 and replace the maximum value by 0.
    a. Z = np.random.random(10)
    b. Z[Z.argmax()] = 0

You can refer following link for more information:

Exercise Questions:

1. Using numpy, WAP that takes an input from the user in the form of a list and calculate the frequency of occurrence of each character/integer in that list (count the number of characters).

2. Take a binary input from user and segregate all 1's to left side and 0's to right side.
   Ex: Input : 1010011   Output : 111100

3. Write a Python program to remove the nth index character from a nonempty string.

4. Write a Python program to test whether each element of a 1-D array is also present in a second array.
   Expected Output:
   Array1: [0 10 20 40 60]
   Array2: [0, 40]
   Compare each element of array1 and array2
   [True False False True False]

5. Write a Python program to find the set exclusive-or of two arrays. Set exclusive-or will return the sorted, unique values that are in only one (not both) of the input arrays.
   Array1: [0 10 20 40 60 80]
   Array2: [10, 30, 40, 50, 70]
   Unique values that are in only one (not both) of the input arrays:
   [0 20 30 50 60 70 80]

 6. Take an input matrix from the user and find the rank, trace, determinant of the input matrix.