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import numpy as np
import random

print("Version of Numpy: " , np.__version__)
# Basic numpy
python_List = [1,2,3]
print("Type of python List: " , type(python_List))
numpy_List = np.array(python_List)
print("Type of NumPy List: " , type(numpy_List))

python_Matrix_List = [[1,2,3],[4,5,6],[7,8,9]]
print("Python Matrix: " , python_Matrix_List)
numpy_Matrix_List = np.array(python_Matrix_List)
print("Numpy Matrix: ")
print(numpy_Matrix_List)
print("Numpy Matrix Shape: " , numpy_Matrix_List.shape)
print("Numpy Matrix value in in row 0 column 2: " , numpy_Matrix_List[0][2])
print("Numpy Matrix value in in row 0 column 2: " , numpy_Matrix_List[0,2])
print("Numpy Matrix value in in row 0 and 1 column 1 and 2: ")
print(numpy_Matrix_List[:2,1:])

for i in range(0, 10, 2):
    print("Python Range: " , i)

for i in np.arange(0, 10, 2):
    print("Numpy Range: " , i)

print("Zeros 1D Array: " , np.zeros(3))
print("Zeros 2D Array: ")
print(np.zeros((3,3)))

print("Ones 1D Array: " , np.ones(3))
print("Ones 2D Array: ")
print(np.ones((3,3)))

print("Line Space Between Array: " , np.linspace(0,10,3))
print("Length of Line Space Between Array: " , len(np.linspace(0,10,3)) )

print("Numpy Identity Square Matrix: ")
print(np.eye(3))
print("Python create a Float Random between 0.0 and 1.0: " , random.random())
print("Python Integer Random between specified range: " , random.randint(0, 10))
print("Python integer Even Randoms between specified range: " , random.randrange(0, 10, 2))
print("Python Random select from a List: " , random.choice(python_List))
print("Python Random Shuffle elements in a List: " + str(python_List) + " >> " ,
str(random.shuffle(python_List)).replace("None", "After Shuffle: ") + str( python_List))
print(str(random.seed(42)).replace("None", "Generating same sequence of random by seed :
"), random.random())
print("Numpy 1D create 2 Float Randoms between 0.0 and 1.0: " , np.random.rand(2))
print("Numpy create 2D Float Randoms between 0.0 and 1.0 in 2 rows and 3 columns: ")
print(np.random.rand(2,3))

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print("Numpy 1D create 2 Float Standard Random Distribution: " ,np.random.randn(2))

print("Numpy 1D create a Random Integers: " ,np.random.randint(10))
print("Numpy 2D create Random Integers between start and last with specified rows and
columns: ")
print(np.random.randint(0,51,(2,3)))
print("Numpy 1D create 5 Random Integers between 0 and 100: " ,np.random.randint(0,100,5))
print(str(np.random.seed(42)).replace("None", "Generating same sequence of random by seed
: "), np.random.rand(2))

array = np.arange(0,12)
print("Main Array: ")
print(array)
reshaped = array.reshape(3,4)
print("Reshaped Array: ")
print(reshaped)
print("Max in Array: ", array.max())
print("Min in Array: ", array.min())
print("Index of Max in Array: ", array.argmax())
print("Index of Min in Array: ", array.argmin())
print("Average in Array: ", array.mean())
print("Variance in Array: ", array.var())
print("Standard Deviation in Array: ", array.std())
print("Sum of values in Array: ", array.sum())
print("Sum of values in columns(across rows): ", reshaped.sum(axis=0))
print("Sum of values in rows(across columns): ", reshaped.sum(axis=1))

print("Data Type of Array: " , array.dtype)
print("Index 5 Value in Array : " , array[5])
print("Index 5 to 10 Values in Array : " , array[5:10])
print("Values before Index 10 in Array : " , array[:10])
print("Values after Index 10 in Array : " , array[10:])
print("All Values in Array : " , array[:])
array[0:5] = 0; print("Changing Values between Index 0 and 10 in Array : ",array)
print("Numpy array where value is greater than 12 as Boolean: ", array > 8)
print("Numpy array where value is greater than 12: ", array[array > 8])
print("Numpy array add 5 to each value: ", array + 5)
print("Numpy array minus 5 to each value: ", array - 5)
print("Numpy array add self to each value: ", array + array)
print("Numpy array minus self to each value: ", array - array)
print("Numpy array multiply self to each value: ", array * array)
print("Numpy array divide self to each value: (divided by zero error here)",array / array)
print("Numpy array sqrt: ", np.sqrt(array))
print("Numpy array sin: ", np.sin(array))
print("Numpy array log: ", np.log(array))

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