Complete NUMPY DOCUMENTATION

1. Array Creation Functions

In [3]:

```
import numpy as np
```

In [5]:

```
# Create an array from a list
a = np.array([1, 2, 3])
print("Array a:", a)
```

```
Array a: [1 2 3]
```

In [7]:

```
# Create an array with evenly spaced values
b = np.arange(0, 10, 2)  # Values from 0 to 10 with step 2
print("Array b:", b)
```

```
Array b: [0 2 4 6 8]
```

In [9]:

```
# Create an array with linearly spaced values
c = np.linspace(0, 1, 5)  # 5 values evenly spaced between 0 and 1
print("Array c:", c)
```

```
Array c: [0.   0.25 0.5  0.75 1.  ]
```

In [11]:

```
# Create an array filled with zeros
d = np.zeros((2, 3))  # 2x3 array of zeros
print("Array d:\n", d)
```

```
Array d:
 [[0. 0. 0.]
 [0. 0. 0.]]
```

In [21]:

```
# Create an array filled with ones
e=np.ones((2,3)) # 2x3 array of Ones
print("Array e: \n",e)
```

```
Array e: 
 [[1. 1. 1.]
 [1. 1. 1.]]
```

In [23]:

```
# Create an identity matrix
f = np.eye(4)  # 4x4 identity matrix
print("Identity matrix f:\n", f)
```

```
Identity matrix f:
 [[1. 0. 0. 0.]
 [0. 1. 0. 0.]
 [0. 0. 1. 0.]
 [0. 0. 0. 1.]]
```

2. Array Manipulation Functions

In [34]:

```
# Reshape an array
a1 = np.array([1, 2, 3])
```

```
print(" Original array:",a1)
reshaped = np.reshape(a1, (3, 1))  # Reshape to 1x3
print("Reshaped array:\n", reshaped)
```

```
 Original array: [1 2 3]
Reshaped array:
 [[1]
 [2]
 [3]]
```

In [38]:

```
# Flatten an array
f1 = np.array([[1, 2], [3, 4]])
print(" Original array:\n",f1)
flattened = np.ravel(f1)  # Flatten to 1D array
print("Flattened array:", flattened)
```

```
 Original array:
 [[1 2]
 [3 4]]
Flattened array: [1 2 3 4]
```

In [40]:

```
# Transpose an array
e1 = np.array([[1, 2], [3, 4]])
print(" Original array:\n",e1)
transposed = np.transpose(e1)  # Transpose the array
print("Transposed array:\n", transposed)
```

```
 Original array:
 [[1 2]
 [3 4]]
Transposed array:
 [[1 3]
 [2 4]]
```

In [44]:

```
# Stack arrays vertically
a2 = np.array([1, 2])
print("Array 1:",a2)
b2 = np.array([3, 4])
print("Array 2:",b2)
stacked = np.vstack([a2, b2])  # Stack a and b vertically
print("Stacked arrays:\n", stacked)
```

```
Array 1: [1 2]
Array 2: [3 4]
Stacked arrays:
 [[1 2]
 [3 4]]
```

3. Mathematical Functions

In [49]:

```
# Add two arrays
g = np.array([1, 2, 3, 4])
print("Array 1:",g)
h= np.array([9,8,7,6])
print("Array 2:",h)
added = np.add(g, h)  # Add 2 to each element
print("Added 2 Arrays:", added)
```

```
Array 1: [1 2 3 4]
Array 2: [9 8 7 6]
Added 2 Arrays: [10 10 10 10]
```

In [51]:
```
# Square each element
print("Array :",g)
squared = np.power(g, 2)  # Square each element
print("Squared array:", squared)
```

```
Array : [1 2 3 4]
Squared array: [ 1  4  9 16]
```

In [53]:
```
# Square root of each element
print("Array :",g)
sqrt_val = np.sqrt(g)  # Square root of each element
print("Square root of Array:", sqrt_val)
```

```
Array : [1 2 3 4]
Square root of Array: [1.         1.41421356 1.73205081 2.        ]
```

In [55]:
```
print(a1)
print(g)
```

```
[1 2 3]
[1 2 3 4]
```

In [57]:
```
# Dot product of two arrays
a2 = np.array([1, 2, 3])
print("Array 1:",a2)
print("Array 2:",g)
dot_product = np.dot(a2, g)  # Dot product of a and g
print("Dot product of Array 1 and Array 2:", dot_product)
```

```
Array 1: [1 2 3]
Array 2: [1 2 3 4]
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Cell In[57], line 5
      3 print("Array 1:",a2)
      4 print("Array 2:",g)
----> 5 dot_product = np.dot(a2, g)  # Dot product of a and g
      6 print("Dot product of Array 1 and Array 2:", dot_product)

ValueError: shapes (3,) and (4,) not aligned: 3 (dim 0) != 4 (dim 0)
```

In [59]:
```
print("Array 1:",a1)
print("Array 2:",a)
dot_product = np.dot(a1, a)  # Dot product of a and g
print("Dot product of Array 1 and Array 2:", dot_product)
```

```
Array 1: [1 2 3]
Array 2: [1 2 3]
Dot product of Array 1 and Array 2: 14
```

4. Statistical Functions

In [64]:
```
s = np.array([1, 2, 3, 4])
print("Array :",s)
```

```
mean = np.mean(s)
print("Mean of Array:", mean)
```

```
Array : [1 2 3 4]
Mean of Array: 2.5
```

In [66]:

```
# Standard deviation of an array
print("Array :",s)
std_dev = np.std(s)
print("Standard deviation of Array:", std_dev)
```

```
Array : [1 2 3 4]
Standard deviation of Array: 1.118033988749895
```

In [68]:

```
# Minimum element of an array
print("Array :",s)
minimum = np.min(s)
print("Min of Array:", minimum)
```

```
Array : [1 2 3 4]
Min of Array: 1
```

In [70]:

```
# Maximum element of an array
print("Array :",s)
maximum = np.max(s)
print("Max of Array:", maximum)
```

```
Array : [1 2 3 4]
Max of Array: 4
```

5. Linear Algebra Functions

In [77]:

```
# Create a matrix
matrix = np.array([[1, 2], [3, 4]])
print(matrix)
```

```
[[1 2]
 [3 4]]
```

In [75]:

```
# Determinant of a matrix
determinant = np.linalg.det(matrix)
print("Determinant of matrix:", determinant)
```

```
Determinant of matrix: -2.0000000000000004
```

In [79]:

```
# Inverse of a matrix
inverse = np.linalg.inv(matrix)
print("Inverse of matrix:\n", inverse)
```

```
Inverse of matrix:
 [[-2.   1. ]
 [ 1.5 -0.5]]
```

6. Random Sampling Functions

In [86]:

```
# Generate random values between 0 and 1
random_vals = np.random.rand(3)  # Array of 3 random values between 0 and 1
print("Random values:", random_vals)
```

```
Random values: [0.54488318 0.4236548  0.64589411]
```

In [91]:

```
# Set seed for reproducibility
np.random.seed(0)

# Generate random values between 0 and 1
random_vals = np.random.rand(3)  # Array of 3 random values between 0 and 1
print("Random values:", random_vals)
```

```
Random values: [0.5488135  0.71518937 0.60276338]
```

In [106…

```
# Generate random integers
rand_ints = np.random.randint(0, 10, size=5)  # Random integers between 0 and 10
print("Random integers:", rand_ints)
```

```
Random integers: [0 9 8 9 4]
```

In [104…

```
# Set seed for reproducibility
np.random.seed(1000)

# Generate random integers
rand_ints = np.random.randint(0, 10, size=5)  # Random integers between 0 and 10
print("Random integers:", rand_ints)
```

```
Random integers: [3 7 7 0 1]
```

7. Boolean & Logical Functions

In [119…

```
# Check if all elements are True
# all
logical_test = np.array([True, False, True])
all_true = np.all(logical_test)  # Check if all are True
print("All elements True:", all_true)
```

```
All elements True: False
```

In [123…

```
# Check if all elements are True
logical_test1 = np.array([True, True, True])
all_true = np.all(logical_test1)  # Check if all are True
print("All elements True:", all_true)
```

```
All elements True: True
```

In [125…

```
# Check if any elements are True
# any
any_true = np.any(logical_test)  # Check if any are True
print("Any elements True:", any_true)
```

```
Any elements True: True
```

8. Set Operations

In [128…

```
# Intersection of two arrays
set_a = np.array([1, 2, 3, 4])
set_b = np.array([3, 4, 5, 6])
intersection = np.intersect1d(set_a, set_b)
print("Intersection of a and b:", intersection)
```

```
Intersection of a and b: [3 4]
```

In [130…

```
# Union of two arrays
union = np.union1d(set_a, set_b)
print("Union of a and b:", union)
```

```
Union of a and b: [1 2 3 4 5 6]
```

9. Array Attribute Functions

In [133…

```
# Array attributes
a = np.array([1, 2, 3])
shape = a.shape  # Shape of the array
size = a.size    # Number of elements
dimensions = a.ndim  # Number of dimensions
dtype = a.dtype   # Data type of the array

print("Shape of a:", shape)
print("Size of a:", size)
print("Number of dimensions of a:", dimensions)
print("Data type of a:", dtype)
```

```
Shape of a: (3,)
Size of a: 3
Number of dimensions of a: 1
Data type of a: int32
```

In [169…

```
# Array attributes
a = np.array(([1], [2],[3]))
shape = a.shape  # Shape of the array
size = a.size    # Number of elements
dimensions = a.ndim  # Number of dimensions
dtype = a.dtype   # Data type of the array

print("Shape of a:", shape)
print("Size of a:", size)
print("Number of dimensions of a:", dimensions)
print("Data type of a:", dtype)
```

```
Shape of a: (3, 1)
Size of a: 3
Number of dimensions of a: 2
Data type of a: int32
```

10. Other Functions

In [176…

```
# Create a copy of an array
a = np.array([1, 2, 3,4])
copied_array = np.copy(a)  # Create a copy of array a
print("Copied array:", copied_array)
```

```
Copied array: [1 2 3 4]
```

In [178…

```
# Size in bytes of an array
array_size_in_bytes = a.nbytes  # Size in bytes
print("Size of a in bytes:", array_size_in_bytes)
```

```
Size of a in bytes: 16
```

In [180…

```
# Check if two arrays share memory
shared = np.shares_memory(a, copied_array)  # Check if arrays share memory
print("Do a and copied_array share memory?", shared)
```

```
Do a and copied_array share memory? False
```