NUMPY (nemerical python)

In [1]:
```
import numpy as np
```

In [2]:
```
np.__version__
```

Out[2]:
```
'2.1.3'
```

In [3]:
```
 mylist=[0,1,2,3,4,5]
mylist
```

Out[3]:
```
[0, 1, 2, 3, 4, 5]
```

In [4]:
```
type(mylist)
```

Out[4]:
```
list
```

In [86]:
```
arr=np.array(mylist)
```

In [6]:
```
array=[0,1,2,3,4,5]
```

In [87]:
```
arr
```

Out[87]:
```
array([0, 1, 2, 3, 4, 5])
```

In [88]:
```
type(arr)
```

Out[88]:
```
numpy.ndarray
```

In [89]:
```
np.arange(10)
```

Out[89]:
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

In [90]:
```
np.arange(20)
```

Out[90]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
       17, 18, 19])
```

In [91]:
```
np.arange(5.0)
```

Out[91]:
```
array([0., 1., 2., 3., 4.])
```

In [92]:
```
np.arange(10,20)
```

Out[92]:
```
array([10, 11, 12, 13, 14, 15, 16, 17, 18, 19])
```

In [93]:
```
np.arange(0,5)
```

Out[93]:
```
array([0, 1, 2, 3, 4])
```

In [94]:
```
np.arange(0,10)
```

Out[94]:
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

In [95]:
```
np.arange(20,10)
```

Out[95]:
```
array([], dtype=int64)
```

In [96]:
```
np.arange(-20,10)
```

Out[96]:
```
array([-20, -19, -18, -17, -16, -15, -14, -13, -12, -11, -10,  -9,  -8,
        -7,  -6,  -5,  -4,  -3,  -2,  -1,   0,   1,   2,   3,   4,   5,
         6,   7,   8,   9])
```

In [97]:
```
np.arange(-10,10)
```

Out[97]:
```
array([-10,  -9,  -8,  -7,  -6,  -5,  -4,  -3,  -2,  -1,   0,   1,   2,
         3,   4,   5,   6,   7,   8,   9])
```

In [98]:
```
np.arange(-30,10)
```

Out[98]:
```
array([-30, -29, -28, -27, -26, -25, -24, -23, -22, -21, -20, -19, -18,
       -17, -16, -15, -14, -13, -12, -11, -10,  -9,  -8,  -7,  -6,  -5,
        -4,  -3,  -2,  -1,   0,   1,   2,   3,   4,   5,   6,   7,   8,
         9])
```

In [99]:
```
np.arange(40,10)
```

Out[99]:
```
array([], dtype=int64)
```

In [100…
```
ar=np.arange(-30,10)
ar
```

Out[100…
```
array([-30, -29, -28, -27, -26, -25, -24, -23, -22, -21, -20, -19, -18,
       -17, -16, -15, -14, -13, -12, -11, -10,  -9,  -8,  -7,  -6,  -5,
        -4,  -3,  -2,  -1,   0,   1,   2,   3,   4,   5,   6,   7,   8,
         9])
```

In [101…
```
np.arange()
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[101], line 1
----> 1 np.arange()

TypeError: arange() requires stop to be specified.
```

need 1 argument

In [102…
```
np.arange(20)
```

Out[102…
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
       17, 18, 19])
```

In [103…
```
np.arange(10, 30, 5)
```

Out[103…
```
array([10, 15, 20, 25])
```

In [104…
```
np.arange(5,50,10)
```

Out[104… array([5, 15, 25, 35, 45])

In [105…
```
np.arange(2,50,3)
```

Out[105… array([2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47])

In [106…
```
np.arange(2,30,4,6)
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[106], line 1
----> 1 np.arange(2,30,4,6)

TypeError: Cannot interpret '6' as a data type
```

max 3 arguments it will take

In [107…
```
np.zeros(3)#prameter tunning( by default it will take float values)
```

Out[107… array([0., 0., 0.])

In [108…
```
np.zeros(10)
```

Out[108… array([0., 0., 0., 0., 0., 0., 0., 0., 0., 0.])

In [109…
```
np.zeros(5)
```

Out[109… array([0., 0., 0., 0., 0.])

In [110…
```
np.zeros(4)
```

Out[110… array([0., 0., 0., 0.])

In [111…
```
np.zeros(3,dtype=int)#hyper parameter we can chage float to int
```

Out[111… array([0, 0, 0])

In [112…
```
np.zeros(5,dtype=int)
```

Out[112… array([0, 0, 0, 0, 0])

In [113…
```
np.zeros(10,dtype=int)
```

Out[113… array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0])

In [114…
```
np.zeros(8,dtype=int)
```

Out[114… array([0, 0, 0, 0, 0, 0, 0, 0])

In [115…
```
zero=np.zeros([2,2])
print(zero)
print('###')
print(type(zero))
```

```
[[0. 0.]
 [0. 0.]]
###
<class 'numpy.ndarray'>
```

In [116…
```
np.zeros((2,3))
```

Out[116…
```
array([[0., 0., 0.],
       [0., 0., 0.]])
```

In [117…
```
np.zeros((5,10))
```

Out[117…
```
array([[0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.]])
```

In [118…
```
np.zeros((10,20))
```

Out[118…
```
array([[0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
        0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
        0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
        0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
        0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
        0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
        0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
        0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
        0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
        0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
        0., 0., 0., 0.]])
```

In [119…
```
np.zeros((3,4),dtype=int)
```

Out[119…
```
array([[0, 0, 0, 0],
       [0, 0, 0, 0],
       [0, 0, 0, 0]])
```

In [120…
```
np.zeros((5,10),dtype=int)
```

Out[120…
```
array([[0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
       [0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
       [0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
       [0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
       [0, 0, 0, 0, 0, 0, 0, 0, 0, 0]])
```

In [121…
```
np.zeros((10,10))
```

Out[121…
```
array([[0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0., 0., 0., 0., 0.]])
```

In [122…
```
np.ones((3,4))
```

Out[122…
```
array([[1., 1., 1., 1.],
       [1., 1., 1., 1.],
       [1., 1., 1., 1.]])
```

In [123…
```
np.ones(10)
```

Out[123…
```
array([1., 1., 1., 1., 1., 1., 1., 1., 1., 1.])
```

In [124…
```
np.ones(5)
```

Out[124…
```
array([1., 1., 1., 1., 1.])
```

In [125…
```
np.ones((10,5))
```

Out[125…
```
array([[1., 1., 1., 1., 1.],
       [1., 1., 1., 1., 1.],
       [1., 1., 1., 1., 1.],
       [1., 1., 1., 1., 1.],
       [1., 1., 1., 1., 1.],
       [1., 1., 1., 1., 1.],
       [1., 1., 1., 1., 1.],
       [1., 1., 1., 1., 1.],
       [1., 1., 1., 1., 1.],
       [1., 1., 1., 1., 1.]])
```

In [126…
```
np.ones((5,10),dtype=int)
```

Out[126…
```
array([[1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1, 1, 1, 1, 1, 1]])
```

In [127…
```
np.ones((3,4),dtype=int)
```

Out[127…
```
array([[1, 1, 1, 1],
       [1, 1, 1, 1],
       [1, 1, 1, 1]])
```

In [128…
```
np.twos((3,4))
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
Cell In[128], line 1
----> 1 np.twos((3,4))

File ~\anaconda3\Lib\site-packages\numpy\__init__.py:414, in __getattr__(attr)
    411     import numpy.char as char
    412     return char.chararray
--> 414 raise AttributeError("module {!r} has no attribute "
    415                       "{!r}".format(__name__, attr))

AttributeError: module 'numpy' has no attribute 'twos'
```

only zero and one are the functions of numpy

In [129…
```
rand(3,4)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[129], line 1
----> 1 rand(3,4)

NameError: name 'rand' is not defined
```

In [130…
```
random.rand(3,4)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[130], line 1
----> 1 random.rand(3,4)

NameError: name 'random' is not defined
```

In [131…
```
np.random.rand(3)
```

Out[131…
```
array([0.95197316, 0.76594982, 0.30952905])
```

In [132…
```
np.random.rand(5)
```

Out[132…
```
array([0.11091058, 0.85321357, 0.77286198, 0.54141289, 0.86068158])
```

In [133…
```
np.random.rand(3,4)
```

Out[133…
```
array([[0.90489185, 0.70341809, 0.43456407, 0.63844885],
       [0.41102932, 0.10209737, 0.63223832, 0.63122774],
       [0.13259611, 0.05661269, 0.21951081, 0.26683408]])
```

In [134…
```
np.random.rand(5,10)
```

Out[134…
```
array([[0.2814205 , 0.79272726, 0.36315904, 0.23442858, 0.88724399,
        0.75526029, 0.73504829, 0.27599263, 0.44529767, 0.88316742],
       [0.82972105, 0.75631153, 0.04082906, 0.01361399, 0.92250661,
        0.84818966, 0.06995892, 0.06709387, 0.20152424, 0.39873538],
       [0.38316433, 0.22077661, 0.91691394, 0.33451716, 0.71252825,
        0.22423658, 0.13129337, 0.04391609, 0.90525544, 0.55020494],
       [0.5311906 , 0.47639075, 0.02852723, 0.90581833, 0.95916803,
        0.90290289, 0.16280437, 0.44793228, 0.6592853 , 0.15575627],
       [0.75111296, 0.13251544, 0.2836758 , 0.40120058, 0.52622808,
        0.28712517, 0.75942254, 0.28191311, 0.85504726, 0.31039382]])
```

In [135…
```
np.random.randint(4,6)
```

Out[135…
```
4
```

In [136…
```
np.random.randint(5,10)
```

Out[136…
```
5
```

In [137…
```
np.random.randint(10,20)
```

Out[137…
```
18
```

In [138…
```
np.random.randint(5,20,10)
```

Out[138…
```
array([15,  5, 17, 14,  8, 16,  6, 18, 15,  8], dtype=int32)
```

In [139…
```
np.random.rand(2,10,2)
```

Out[139…
```
array([[[0.60336864, 0.4185426 ],
        [0.48384175, 0.91072213],
        [0.79412533, 0.12343876],
        [0.75082922, 0.89847786],
        [0.40622325, 0.27460271],
        [0.48820171, 0.08418797],
        [0.19578402, 0.76223251],
        [0.55063479, 0.16653297],
        [0.647875  , 0.42880218],
        [0.86798928, 0.67711034]],

       [[0.10911949, 0.18730543],
        [0.72828648, 0.76041863],
        [0.23752381, 0.36469835],
        [0.74803897, 0.82142379],
        [0.78040169, 0.80617124],
        [0.91235411, 0.73129102],
        [0.41705751, 0.48806926],
        [0.07985436, 0.98824273],
        [0.01480905, 0.34222456],
        [0.45790009, 0.2548007 ]]])
```

In [140…
```
np.random.randint(10,30,5)
```

Out[140…
```
array([16, 28, 17, 11, 29], dtype=int32)
```

In [141…
```
np.random.randint(-10,30,5)
```

Out[141…
```
array([22,  8, 14, 13, 25], dtype=int32)
```

In [142…
```
np.random.randint(-20,30,20)
```

Out[142…
```
array([ 20,   4, -18,  13,  29,  27, -18,   0,   8,  -8,   8,   2,  12,
         1,  -9,   6,   3,  -7,  16, -10], dtype=int32)
```

In [143…
```
np.random.randint(20,10)
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Cell In[143], line 1
----> 1 np.random.randint(20,10)

File numpy\\random\\mtrand.pyx:796, in numpy.random.mtrand.RandomState.randint()

File numpy\\random\\_bounded_integers.pyx:1425, in numpy.random._bounded_integer
s._rand_int32()

ValueError: low >= high
```

in argument first number always greater than second numer

In [144…
```
np.random. randint(2,3,5,6)
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[144], line 1
----> 1 np.random. randint(2,3,5,6)

File numpy\\random\\mtrand.pyx:777, in numpy.random.mtrand.RandomState.randint()

TypeError: Cannot interpret '6' as a data type
```

only 3 arguments allowed

In [145…
```
np.random.randint(4,10,(5,10))
```

Out[145…
```
array([[8, 4, 8, 7, 5, 9, 7, 8, 8, 5],
       [8, 9, 5, 9, 9, 4, 4, 6, 9, 7],
       [8, 4, 8, 5, 6, 9, 6, 8, 6, 7],
       [6, 8, 5, 5, 7, 8, 5, 5, 6, 4],
       [4, 8, 5, 4, 9, 7, 7, 9, 7, 6]], dtype=int32)
```

In [146…
```
np.random.randint(4,10,(2,3))
```

Out[146…
```
array([[5, 5, 9],
       [8, 5, 7]], dtype=int32)
```

In [147…
```
np.random.randint(4,9,(5,4))
```

Out[147…
```
array([[8, 6, 6, 6],
       [4, 8, 5, 6],
       [8, 7, 7, 8],
       [4, 8, 4, 8],
       [5, 8, 8, 4]], dtype=int32)
```

In [148…
```
arr
```

Out[148…
```
array([0, 1, 2, 3, 4, 5])
```

In [149…
```
np.arange(1,13)
```

Out[149…
```
array([ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12])
```

In [150…
```
np.arange(1,13).reshape(3,4)
```

Out[150…
```
array([[ 1,  2,  3,  4],
       [ 5,  6,  7,  8],
       [ 9, 10, 11, 12]])
```

In [151…
```
np.arange(1,21).reshape(5,4)
```

Out[151…
```
array([[ 1,  2,  3,  4],
       [ 5,  6,  7,  8],
       [ 9, 10, 11, 12],
       [13, 14, 15, 16],
       [17, 18, 19, 20]])
```

In [152…
```
np.arange(1,51).reshape(5,10)
```

Out[152…
```
array([[ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10],
       [11, 12, 13, 14, 15, 16, 17, 18, 19, 20],
       [21, 22, 23, 24, 25, 26, 27, 28, 29, 30],
       [31, 32, 33, 34, 35, 36, 37, 38, 39, 40],
       [41, 42, 43, 44, 45, 46, 47, 48, 49, 50]])
```

In [153…
```
np.arange(1,96).reshape(5,19)
```

Out[153…
```
array([[ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
        17, 18, 19],
       [20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35,
        36, 37, 38],
       [39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54,
        55, 56, 57],
       [58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73,
        74, 75, 76],
       [77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92,
        93, 94, 95]])
```

In [154…
```
np.arange(1,13).reshape(3,5)
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Cell In[154], line 1
----> 1 np.arange(1,13).reshape(3,5)

ValueError: cannot reshape array of size 12 into shape (3,5)
```

In [155…
```
np.arange(1,21).reshape(10,2)
```

Out[155…
```
array([[ 1,  2],
       [ 3,  4],
       [ 5,  6],
       [ 7,  8],
       [ 9, 10],
       [11, 12],
       [13, 14],
       [15, 16],
       [17, 18],
       [19, 20]])
```

In [156…
```
np.arange(1,71).reshape(14,5)
```

Out[156…
```
array([[ 1,  2,  3,  4,  5],
       [ 6,  7,  8,  9, 10],
       [11, 12, 13, 14, 15],
       [16, 17, 18, 19, 20],
       [21, 22, 23, 24, 25],
       [26, 27, 28, 29, 30],
       [31, 32, 33, 34, 35],
       [36, 37, 38, 39, 40],
       [41, 42, 43, 44, 45],
       [46, 47, 48, 49, 50],
       [51, 52, 53, 54, 55],
       [56, 57, 58, 59, 60],
       [61, 62, 63, 64, 65],
       [66, 67, 68, 69, 70]])
```

Slicing in matrix

In [157…
```
d=np.random .randint(1,10,(4,5))
```

In [158…
```
d
```

Out[158…
```
array([[4, 6, 1, 9, 1],
       [6, 4, 7, 2, 4],
       [6, 3, 6, 8, 3],
       [7, 3, 5, 7, 7]], dtype=int32)
```

In [159…
```
type(d)
```

Out[159…
```
numpy.ndarray
```

In [160…
```
d[:]
```

Out[160…
```
array([[4, 6, 1, 9, 1],
       [6, 4, 7, 2, 4],
       [6, 3, 6, 8, 3],
       [7, 3, 5, 7, 7]], dtype=int32)
```

In [161…
```
b=np.random .randint(1,10,(5,5))
```

In [162…
```
b
```

Out[162…
```
array([[7, 9, 3, 8, 4],
       [8, 4, 4, 9, 6],
       [5, 5, 7, 5, 1],
       [1, 6, 8, 8, 2],
       [5, 9, 5, 5, 9]], dtype=int32)
```

In [163…
```
b[:]
```

Out[163…
```
array([[7, 9, 3, 8, 4],
       [8, 4, 4, 9, 6],
       [5, 5, 7, 5, 1],
       [1, 6, 8, 8, 2],
       [5, 9, 5, 5, 9]], dtype=int32)
```

In [164…
```
b[0]
```

Out[164…
```
array([7, 9, 3, 8, 4], dtype=int32)
```

In [165…
```
b[3]
```

Out[165…
```
array([1, 6, 8, 8, 2], dtype=int32)
```

In [166…
```
b[-1]
```

Out[166…
```
array([5, 9, 5, 5, 9], dtype=int32)
```

In [169…
```
arr
```

Out[169…
```
array([0, 1, 2, 3, 4, 5])
```

In [172…
```
arr.max()
```

Out[172…
```
np.int64(5)
```

In [173…
```
arr.min()
```

Out[173…
```
np.int64(0)
```

In [174…
```
arr.median()
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
Cell In[174], line 1
----> 1 arr.median()

AttributeError: 'numpy.ndarray' object has no attribute 'median'
```

In [175…
```
arr.mean()
```

Out[175…
```
np.float64(2.5)
```

In [179…
```
from numpy import *
a=array([0,1,2,3,4,5])
median(a)
```

Out[179…
```
np.float64(2.5)
```

In [180…
```
from numpy import *
a=array([10,20,5,30])
median(a)
```

Out[180…
```
np.float64(15.0)
```

In [ ]: