

1 NumPy Exercises

Now that we've learned about NumPy let's test your knowledge. We'll start off with a few simple tasks, and then you'll be asked some more complicated questions.

Import NumPy as np

```
[2]: import numpy as np
```

Create an array of 10 zeros

```
[3]: arr=np.zeros(10)
arr
```

```
[3]: array([0., 0., 0., 0., 0., 0., 0., 0., 0., 0.])
```

Create an array of 10 ones

```
[4]: np.ones(10)
```

```
[4]: array([1., 1., 1., 1., 1., 1., 1., 1., 1., 1.])
```

Create an array of 10 fives

```
[6]: np.ones(10)+4
```

```
[6]: array([5., 5., 5., 5., 5., 5., 5., 5., 5., 5.])
```

Create an array of the integers from 10 to 50

```
[9]: np.arange(10,51,1)
```

```
[9]: array([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])
```

Create an array of all the even integers from 10 to 50

```
[10]: np.arange(10,51,2)
```

```
[10]: array([10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42,
           44, 46, 48, 50])
```

Create a 3x3 matrix with values ranging from 0 to 8

```
[11]: np.array([[0,1,2],[3,4,5],[6,7,8]])
```

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

Create a 3x3 identity matrix

```
[12]: np.eye(3)
```

```
[12]: array([[1., 0., 0.],
           [0., 1., 0.],
           [0., 0., 1.]])
```

Use NumPy to generate a random number between 0 and 1

```
[14]: np.random.rand(1,1)
```

```
[14]: array([[0.78413792]])
```

Use NumPy to generate an array of 25 random numbers sampled from a standard normal distribution

```
[15]: np.random.normal(0, 1, 25)
```

```
[15]: array([ 0.75660477, -1.7026483 , -1.03298058, -0.07458034, -0.48139966,
           -1.78015943, -0.16408477,  1.56306501,  0.54801842, -0.54534486,
           1.22460256,  0.8580257 , -0.17954232, -0.931197 , -0.41248628,
           0.50219931, -1.00632924,  0.29186428,  0.1144067 , -0.24492607,
           -2.50774664,  2.33890478,  0.79207794,  0.72093211,  0.94225453])
```

Create the following matrix:

```
[4]: np.arange(0.01,1.01,0.01).reshape(10,10)
```

```
[4]: array([[0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09, 0.1 ],
           [0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, 0.2 ],
           [0.21, 0.22, 0.23, 0.24, 0.25, 0.26, 0.27, 0.28, 0.29, 0.3 ],
           [0.31, 0.32, 0.33, 0.34, 0.35, 0.36, 0.37, 0.38, 0.39, 0.4 ],
           [0.41, 0.42, 0.43, 0.44, 0.45, 0.46, 0.47, 0.48, 0.49, 0.5 ],
           [0.51, 0.52, 0.53, 0.54, 0.55, 0.56, 0.57, 0.58, 0.59, 0.6 ],
           [0.61, 0.62, 0.63, 0.64, 0.65, 0.66, 0.67, 0.68, 0.69, 0.7 ],
           [0.71, 0.72, 0.73, 0.74, 0.75, 0.76, 0.77, 0.78, 0.79, 0.8 ],
           [0.81, 0.82, 0.83, 0.84, 0.85, 0.86, 0.87, 0.88, 0.89, 0.9 ],
           [0.91, 0.92, 0.93, 0.94, 0.95, 0.96, 0.97, 0.98, 0.99, 1.0 ]])
```

```
[0.91, 0.92, 0.93, 0.94, 0.95, 0.96, 0.97, 0.98, 0.99, 1.  ]])
```

Create an array of 20 linearly spaced points between 0 and 1:

```
[18]: np.linspace(0,1,20)
```

```
[18]: array([0.          , 0.05263158, 0.10526316, 0.15789474, 0.21052632,
          0.26315789, 0.31578947, 0.36842105, 0.42105263, 0.47368421,
          0.52631579, 0.57894737, 0.63157895, 0.68421053, 0.73684211,
          0.78947368, 0.84210526, 0.89473684, 0.94736842, 1.          ])
```

1.1 Numpy Indexing and Selection

Now you will be given a few matrices, and be asked to replicate the resulting matrix outputs:

```
[19]: mat = np.arange(1,26).reshape(5,5)
      mat
```

```
[19]: 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]])
```

```
[0]: # WRITE CODE HERE THAT REPRODUCES THE OUTPUT OF THE CELL BELOW
      # BE CAREFUL NOT TO RUN THE CELL BELOW, OTHERWISE YOU WON'T
      # BE ABLE TO SEE THE OUTPUT ANY MORE
```

```
[20]: mat[2:,1:]
```

```
[20]: array([[12, 13, 14, 15],
          [17, 18, 19, 20],
          [22, 23, 24, 25]])
```

```
[0]: # WRITE CODE HERE THAT REPRODUCES THE OUTPUT OF THE CELL BELOW
      # BE CAREFUL NOT TO RUN THE CELL BELOW, OTHERWISE YOU WON'T
      # BE ABLE TO SEE THE OUTPUT ANY MORE
```

```
[21]: mat[3,4]
```

```
[21]: 20
```

```
[0]: # WRITE CODE HERE THAT REPRODUCES THE OUTPUT OF THE CELL BELOW
      # BE CAREFUL NOT TO RUN THE CELL BELOW, OTHERWISE YOU WON'T
      # BE ABLE TO SEE THE OUTPUT ANY MORE
```

```
[24]: mat[:3,1:2]
```

```
[24]: array([[ 2],
           [ 7],
           [12]])
```

```
[0]: # WRITE CODE HERE THAT REPRODUCES THE OUTPUT OF THE CELL BELOW
      # BE CAREFUL NOT TO RUN THE CELL BELOW, OTHERWISE YOU WON'T
      # BE ABLE TO SEE THE OUTPUT ANY MORE
```

```
[26]: mat[4]
```

```
[26]: array([21, 22, 23, 24, 25])
```

```
[0]: # WRITE CODE HERE THAT REPRODUCES THE OUTPUT OF THE CELL BELOW
      # BE CAREFUL NOT TO RUN THE CELL BELOW, OTHERWISE YOU WON'T
      # BE ABLE TO SEE THE OUTPUT ANY MORE
```

```
[27]: mat[3:]
```

```
[27]: array([[16, 17, 18, 19, 20],
           [21, 22, 23, 24, 25]])
```

1.1.1 Now do the following

Get the sum of all the values in mat

```
[29]: sum(sum(mat))
```

```
[29]: 325
```

Get the standard deviation of the values in mat

```
[30]: np.std(mat)
```

```
[30]: 7.211102550927978
```

Get the sum of all the columns in mat

```
[31]: sum(mat)
```

```
[31]: array([55, 60, 65, 70, 75])
```