Python For Data Science Cheat Sheet
NumPy Basics

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NumPy

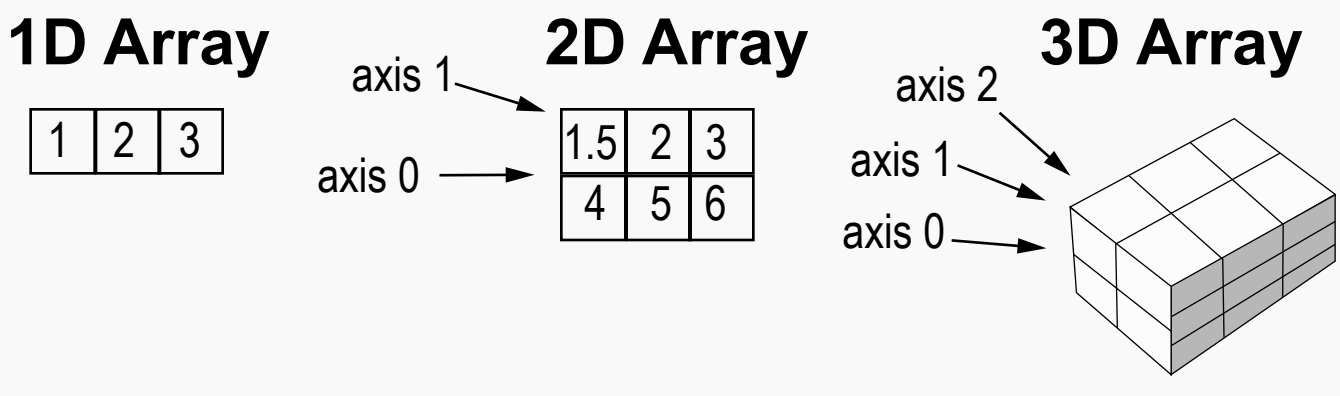
The NumPy liabrary is the core library for scientific computing in Python. It provides a high - performance multi-dimensional array object, and tools for working with these arrays.

Use the following import convention:

```
>>>Import numpy as np
```

NumPy

NumPy Arrays



Creating Arrays

```
>>> a = np.array([1,2,3])
>>> b = np.array([(1.5,2,3) , (4,5,6)] , dtype = float)
>>> c = np.array([[(1.5,2,3) , (4,5,6) ] , [ (3,2,1),
    (4,5,6)]],dtype = float)
```

Initial Placeholders

```
>>> np.zeros((3,4))
>>> np.ones((2,3,1)dtype=np.int16)
>>> d = np.arange(10,25,5)

>>> np.linspace(0,2,9)

>>> e = np.full((2,2),7)
>>> f = np.eye(2)
>>> np.random.random ((2,2))
>>> np.empty((3,2))
```

Create an array of zeros
Create an array of ones
Create an array of evenly spaced values (step value)
Create an array of evenly spaced values 9number of samples)
Create a constant array
Create a 2x2 identity matrix
Create an array with random values
Create an empty array

I/O

Saving and loading on Disk

```
>>> np.save('my_array' , a)
>>> np.savez('array.npz', a, b)
>>> np.load('my_array.npy')
```

Saving and loading Text Files

```
>>> np.loadtxt("myfile.txt")
>>> np.genfromtxt("my_file.csv", delimeter=',')
>>> np.savetxt("myarray.txt", a, delimiter=" ")
```

Data Types

```
>>> np.int64
>>> np.float 32
>>> np.complex
>>> np.bool
>>> np.object
>>> np.string_
>>> np.unicode_
```

Signed 64-bit integer types
standard double-prcisior floating point
Complex numbers represented by 128 floats
Boclean type storing TRUE and FALSE values
Fixed-length string type
Fixed-length unicode type

Inspecting Your Array

```
>>> a.shape
>>> len(a)
>>> b.ndim
>>> e.size
>>> b.dtype
>>> b.dtype.name
>>> b.astype(int)
```

Array dimensions
Length of array
Number of array dimensions
Number of array elements
Data type of array elements
Name of data type
Convert an array to a different type

Asking for Help

```
>>> np.info(np.ndarray.dtype)
```

Array Mathematics

Array Mathematics

```
>>> g = a-b
    array ([[-0.5, 0., 0. ],
            [-3., -3., -3. ]])
>>> np.subtract(a,b)
>>> b+a
    array([[ 2.5, 4., 6. ],
           [ 5., 7., 9. ]])
>>> np.add(b,a)
>>> a/b
    array([[ 0.6666667, 1. , 1. ],
           [ 0.25     , 0.4, 0.5]])
>>> np.divide(a,b)
>>> a*b
    array([[ 1.5, 4., 9.],
           [ 4. ,10, 18.]])
>>> np.multiply(a,b)
>>> np.exp(b)
>>> np.sqrt(b)
>>> np.sin(a)
>>> np.cos(b)
>>> np.log(a)
>>> e.dot(f)
    array([[ 7., 7.],
           [ 7., 7.]])
```

Subtraction
Subtraction
Addition
Addition
Division
Division
Multiplication
Multiplication
Exponentiation
Square root
Print sines of an array
Element-wise cosine
Element-wise natural logarithm
Dot product

Comparison

```
>>> a == b
    array([[False,True,True],
           [False,False,False]], dtype=bool)
>>> a < 2
    array([True,False,False], dtype=bool)
>>> np.array_equal(a, b)
```

Element-wise comparison
Element-wise comparison
Array-wise comparison

Aggregate Functions

```
>>> a.sum()
>>> a.min()
>>> b.max(axis=0)
>>> b.cumsum(axis=1)
>>> a.mean()
>>> b.median()
>>> a.corrcoef()
>>> np.std(b)
```

Array-wise sum
Array-wise minimum value
Maximum value of an array row
Cumulative sum of the elements
Mean
Median
Correlation coefficient
Standard deviation

Copying Arrays

```
>>> h = a.view()
>>> np.copy(a)
>>> h = a.copy()
```

Create a view of the array with the same data
Create a copy of the array
Create a deep copy of the array

Sorting Arrays

```
>>> a.sort()
>>> c.sort(axis=0)
```

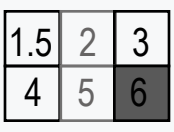
Sort an array
Sort the elements of an array's axis

Subsetting , Slicing , Indexing

Subsetting


```
>>> a[2]
  3
```

Select the element at the 2nd index



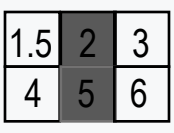

```
>>> b[1,2]
  6.0
```

Select the element at row 0 coloumn 2
(equivalent to b[1] [2])

Slicing

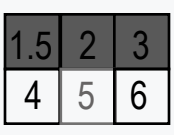

```
>>> a[0:2]
  array([1,2])
```

Select items at index 0 and 1




```
>>> b[0:2,1]
  array([ 2. , 5.])
```

Select items at row 0 and 1 in coloumn 1




```
>>> b[:1]
  array([[1.5,2.,3.]])
```

Select all items at row 0
(equivalent to ([b0:1, :])
Same as [1, : , :]

```
>>> c[[1,...]
  array([[[3., 2., 1.],
          [ 4., 5., 6.]]])
```

```
>>> a[ : :-1]
  array([3, 2, 1])
```

Reversed array a

Boolean Indexing


```
>>> a[a<2]
  array([1])
```

Select elements from a less than 2

Fancing Indexing

```
>>> b[[1,0,1,0], [0,1,2,0]]
  array([4., 2., 6., 1.5])
```

Select elements (1,0), (0,1), (1,2) and (0,0)

```
>>> b[[1,0,1,0]] [:,[0,1,2,0]]
  array([[ 4., 5., 6., 4.],
         [1.5, 2., 3., 1.5],
         [ 4., 5., 6., 4, ],
         [1.5, 2., 3., 1.5]])
```

Select a subset of a matrix's rows and coloumns.

Array Manipulation

Transposing Array

```
>>> i = np.transpose(b)
>>> i.T
```

Permute array dimensions
Permute array dimensions

Changing Array Shape

```
>>> b.ravel()
>>> g.reshape(3,-2)
```

Flatten the array
Reshape,but dont change data

Adding/Removing Elements

```
>>> h.resize( (2,6) )
>>> np.append (h,g)
>>> np.insert (a,1,5)
>>> np.delete (a,[1])
```

Return a new array with shape(2,6)
Append items to an array
Insert items to an array
Delete items from an array

Combining Arrays

```
>>> np.concatenate((a,d),
    axis=0)
  array([1,2,3,10,15,20]),
```

Concatenate arrays

```
>>> np.vstack((a,b))
  array([[1., 2., 3. ],
         [1.5, 2., 3.],
         [4. , 5., 6.])
```

Stack arrays vertically (row-wise)

```
>>> np.r_[e,f]
```

Stack arrays vertically (row-wise)

```
>>> np.hstack((e,f))
  array([[ 7., 7., 1., 0.],
         [ 7., 7., 0., 1.]])
```

Stack arrays horizontally (column-wise)

```
>>> np.coloumn_stack((a.d))
  array([[1,10],
         [2,15],
         [3,20]])
```

Create stacked column-wise arrays

```
>>> np.c_[a,d]
```

Create stacked column-wise arrays

Splitting Arrays

```
>>> np.hsplit(a,3)
  [array([1],array([2]),array
  ([3])
```

Split the array horizontally at the 3rd index

```
>>> np.vsplit(c,2)
  [array([[[1.5, 2., 1.],
         [4., 5., 6. ]]]),
  array([[[ 3., 2., 3.],
         [ 4., 5., 6.]]])
```

Split the array vertically at the 2nd index