

NUMPY CHEAT SHEET

Becoming Human.AI

SWIPE 

WHAT IS NUMPY ?

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

<pre>>>> np.zeros((3,4))</pre>	Create an array of zeros
<pre>>>> np.ones((2,3,4),dtype=np.int16)</pre>	Create an array of ones
<pre>>>> d = np.arange(10,25,5)</pre>	Create an array of evenly spaced values (step value)
<pre>>>> np.linspace(0,2,9)</pre>	Create an array of evenly spaced values (number of samples)
<pre>>>> e = np.full((2,2),7)</pre>	Create a constant array
<pre>>>> f = np.eye(2)</pre>	Create a 2X2 identity matrix
<pre>>>> np.random.random((2,2))</pre>	Create an array with random values
<pre>>>> np.empty((3,2))</pre>	Create an empty array

I/O

Saving & Loading On Disk

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

Saving & Loading Text Files

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

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

DATA TYPES

```
>>> np.int64
>>> np.float32
>>> np.complex
>>> np.bool
>>> np.object
>>> np.string_
>>> np.unicode_
```

Signed 64-bit integer types
Standard double-precision floating point
Complex numbers represented by 128 floats
Boolean type storing TRUE and FALSE
Python object type values
Fixed-length string type
Fixed-length unicode type

ASKING FOR HELP

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

ARRAY MATHEMATICS

Arithmetic Operations

```
>>> 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([[ 0.66666667,  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.]])
```

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()
```

Array-wise sum

```
>>> a.min()
```

Array-wise minimum value

```
>>> b.max(axis=0)
```

Maximum value of an array row

```
>>> b.cumsum(axis=1)
```

Cumulative sum of the elements

```
>>> a.mean()
```

Mean

```
>>> b.median()
```

Median

COPYING ARRAYS

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

Create a view of the array with the same data

```
>>> np.copy(a)
```

Create a copy of the array

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

Create a deep copy of the array

SORTING ARRAYS

```
>>> a.sort()
```

Sort an array

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

Sort the elements of an array's axis

SUBSETTING, SLICING, INDEXING

SUBSETTING

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

Select the element at the 2nd index

```
3
```

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

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

```
6.0
```

Slicing

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

Select items at index 0 and 1

Select items at rows 0 and 1 in column 1

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

Reversed array a

BOOLEAN INDEXING

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

Select elements from a less than 2

FANCY INDEXING

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

Select a subset of the matrix's rows
and columns

ARRAY MANIPULATION

TRANSPOSING ARRAY

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

Permute array dimensions
Permute array dimensions

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 in an array
Delete items from an array

SPLITTING ARRAYS

```
>>> np.hsplit(a,3)
[array([1]),array([2]),array([3])] index
>>> np.vsplit(c,2) Split the array
[array([[ 1.5, 2. , 1. ], [ 4. , 5. , 6. ]]),
```

Split the array
horizontally at the 3rd
vertically at the 2nd index

CHANGING ARRAY SHAPE

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

Flatten the array
Reshape, but don't change data

COMBINING ARRAYS

```
>>> np.concatenate((a,d),axis=0)
array([ 1, 2, 3, 10, 15, 20])
>>> np.vstack((a,b))
array([[ 1. , 2. , 3. ],
       [ 1.5, 2. , 3. ],
       [ 4. , 5. , 6. ]])
>>> np.r_[e,f]
>>> np.hstack((e,f))
array([[ 7., 7., 1., 0.],
       [ 7., 7., 0., 1.]])
>>> np.column_stack((a,d))
array([[ 1, 10],
       [ 2, 15],
       [ 3, 20]])
>>> np.c_[a,d]
```

Concatenate arrays
Stack arrays vertically (row-wise)
Stack arrays vertically (row-wise)
Stack arrays horizontally (column-wise)
Create stacked column-wise arrays
Create stacked

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