

What is NumPy?

- NumPy is scientific computing library for Python
- Support large number of data in the form of multi-dimensional array and matrix
- Use for mathematic calculation like linear algebra, Fourier transform, and random number capabilities, etc.



Multidimensional NumPy array



1D Array

1	2	3
---	---	---

```
array( [1, 2, 3 ] )
```

2D Array

1	2	3
1	2	3
1	2	3

```
array( [ [1, 2, 3],  
        [1, 2, 3],  
        [1, 2, 3] ] )
```

3D Array

1	2	3
1	2	3
1	2	3

```
array( [ [ [1, 2, 3],  
          [1, 2, 3],  
          [1, 2, 3],  
          [1, 2, 3],  
          [1, 2, 3],  
          [1, 2, 3],  
          [1, 2, 3],  
          [1, 2, 3],  
          [1, 2, 3] ] ] )
```



NumPy vs Python List



- **Written in Python and C**

Fast Process



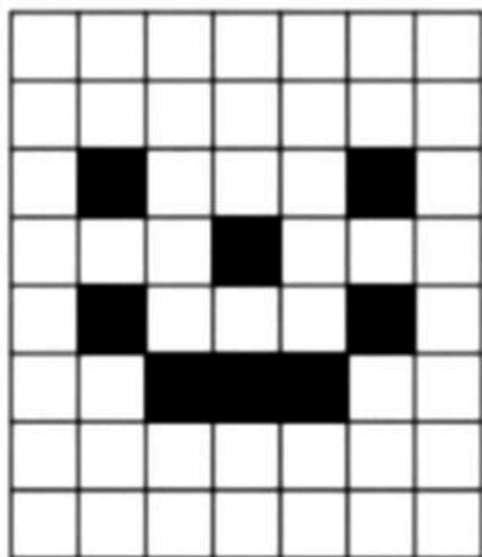
Use less memory to store data



Convenient



NumPy for Machine Learning



**Black & White
smiley face
image**



1	1	1	1	1	1	1
1	1	1	1	1	1	1
1	0	1	1	1	0	1
1	1	1	0	1	1	1
1	0	1	1	1	0	1
1	1	0	0	0	1	1
1	1	1	1	1	1	1
1	1	1	1	1	1	1

**Black & White
smiley face
image in binary
format**



```
array([ [1,  1,  1,  1,  1,  1,  1],  
        [1,  1,  1,  1,  1,  1,  1],  
        [1,  0,  1,  1,  1,  0,  1],  
        [1,  1,  1,  0,  1,  1,  1],  
        [1,  0,  1,  1,  1,  0,  1],  
        [1,  1,  0,  0,  0,  1,  1],  
        [1,  1,  1,  1,  1,  1,  1],  
        [1,  1,  1,  1,  1,  1,  1]])
```

**Black & White
smiley face
image in NumPy
array format**

NumPy for Machine Learning



Student ID	Sleep Hr	Study Hr	Percentage
101	6	8	80
102	8	6	70
103	10	2	40
104	5	10	95

st_pre_prediction.tsv

Student ID,	Sleep Hr,	Study Hr,	Percentage
101,	6,	8,	80
102,	8,	6,	70
103,	10,	2,	40
104,	5,	10,	95

st_pre_prediction.csv



```
array( [ [101,      6,      8]
         [102,      8,      6]
         [103,     10,      2]
         [104,      5,     10] ] )
```

**NumPy 2D array
(matrix)**

```
array( [ 80,
         70,
         40,
         95 ] )
```

**NumPy 1D array
(vector)**