

Colab: <https://colab.research.google.com/drive/1-xBKiv-ZdLJaEUSHWIsvGDAM6HERWYk?usp=sharing>

```
import numpy as np
```

+ Code

+ Text

```
x = np.arange(9)
x

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

np.split(x, 3)

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

np.split(x, [3, 5, 6])

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

```
x = np.arange(16).reshape(4, 4)
x

array([[ 0,  1,  2,  3],
       [ 4,  5,  6,  7],
       [ 8,  9, 10, 11],
       [12, 13, 14, 15]])
```

Saving...



```
array([[ 4,  5],
       [ 8,  9],
       [12, 13]]), array([[ 2,  3],
       [ 6,  7],
       [10, 11],
       [14, 15]])]

np.split(x, 2, axis=0)

[array([[0, 1, 2, 3],
       [4, 5, 6, 7]]), array([[ 8,  9, 10, 11],
       [12, 13, 14, 15]])]

np.hsplit(x, 2)

[array([[ 0,  1],
       [ 4,  5],
       [ 8,  9],
       [12, 13]]), array([[ 2,  3],
       [ 6,  7],
       [10, 11],
       [14, 15]])]

np.vsplit(x, 2)

[array([[0, 1, 2, 3],
       [4, 5, 6, 7]]), array([[ 8,  9, 10, 11],
       [12, 13, 14, 15]])]
```

```
data = np.arange(5)
data

array([0, 1, 2, 3, 4])

np.vstack((data, data, data))

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

```
data = np.arange(5).reshape(5, 1)
data

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

```
np.hstack((data, data, data))
```

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

```
a = np.array([[1], [2], [3]])
b = np.array([[4], [5], [6]])
np.hstack((a, b))
```

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

```
z = np.array([[2, 4]])
z
```

```
array([[2, 4]])
```

```
np.concatenate((z,z), axis=0)
```

```
array([[2, 4],
       [2, 4]])
```

```
np.concatenate((z,z), axis=1)
```

Saving...



```
# why not np.stack()?
# another function in numpy np.stack, but it something different?
# np.stack is different np.concatenate
```

Broadcasting

```
[[0, 0, 0],      [[0, 1, 2],
 [10, 10, 10], and [0, 1, 2],
 [20, 20, 20],    [0, 1, 2],
 [30, 30, 30]]    [0, 1, 2]]
```

```
data = np.array([0, 10, 20, 30]).reshape(4,1)
np.hstack((data, data, data))
```

```
array([[ 0,  0,  0],
       [10, 10, 10],
       [20, 20, 20],
       [30, 30, 30]])
```

```
np.tile(np.array([0, 10, 20, 30]), (3,2))
```

```
array([[ 0, 10, 20, 30,  0, 10, 20, 30],
       [ 0, 10, 20, 30,  0, 10, 20, 30],
       [ 0, 10, 20, 30,  0, 10, 20, 30]])
```

```
a = np.tile(np.arange(0,40,10), (3,1)).T
a
```

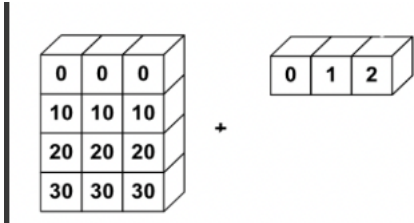
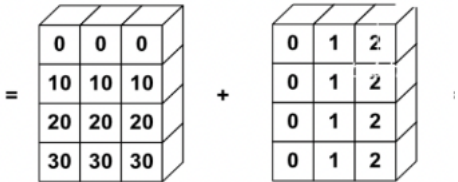
```
array([[ 0,  0,  0],
       [10, 10, 10],
       [20, 20, 20],
       [30, 30, 30]])
```

```
b = np.tile(np.arange(3), (4, 1))
b
```

```
array([[0, 1, 2],
       [0, 1, 2],
       [0, 1, 2],
       [0, 1, 2]])
```

```
a + b
```

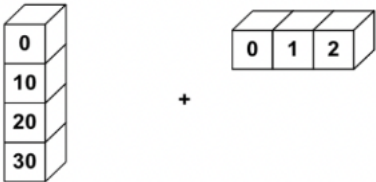
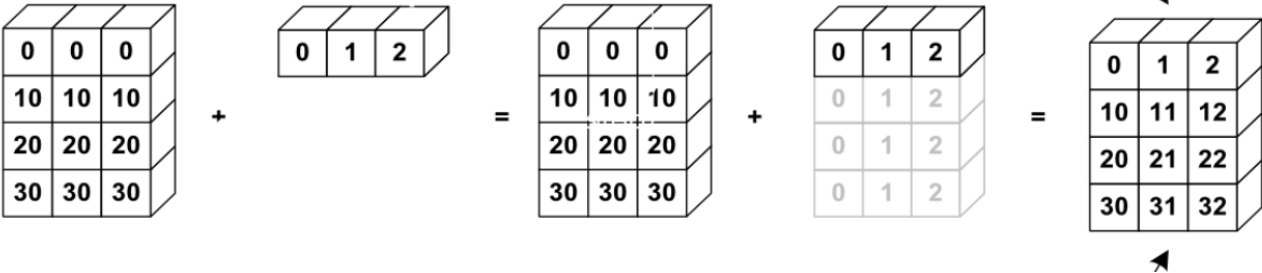
```
array([[ 0,  1,  2],
       [10, 11, 12],
       [20, 21, 22],
       [30, 31, 32]])
```



```
a
array([[ 0,  1,  2],
       [10, 11, 12],
       [20, 21, 22],
       [30, 31, 32]])
```

```
b = np.arange(0,3)
b
array([0, 1, 2])
```

```
a + b
array([[ 0,  1,  2],
       [10, 11, 12],
       [20, 21, 22],
       [30, 31, 32]])
```



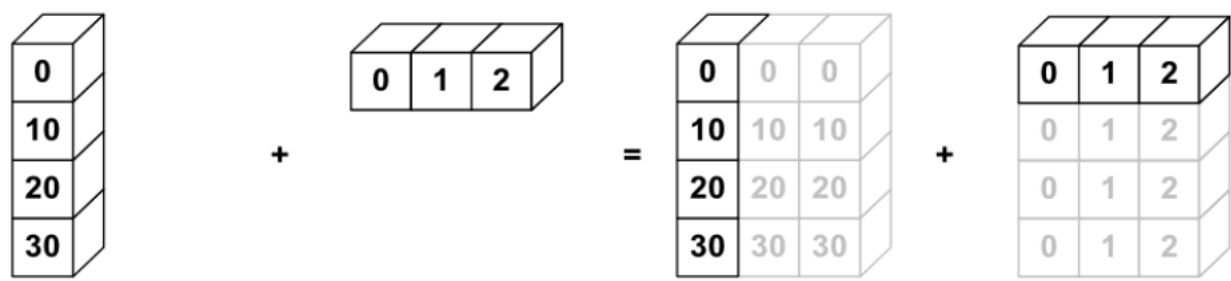
```
a = np.arange(0, 40, 10).reshape(4, 1)
a
array([[ 0],
       [10],
       [20],
       [30]])
```

```
b = np.arange(3)
b

array([0, 1, 2])

a + b

array([[ 0,  1,  2],
       [10, 11, 12],
       [20, 21, 22],
       [30, 31, 32]])
```



```
a = np.arange(8).reshape(2,4)
b = np.arange(16).reshape(4,4)
```

```
print(a*b)
```

Saving... X

Traceback (most recent call last)

<ipython-input-43-2e8364a6b7d1> in <module>

2 b = np.arange(16).reshape(4,4)

3

----> 4 print(a*b)

ValueError: operands could not be broadcast together with shapes (2,4) (4,4)

SEARCH STACK OVERFLOW

- For each dimension (going from right side)
1. The size of each dimension should be same OR
 2. The size of one dimension should be 1