

Colab: <https://colab.research.google.com/drive/1HhGv2oN8ohnHUQO3j6hTw8oDtG6fY8dq?usp=sharing>

```
import numpy as np
```

```
A = np.arange(12).reshape(3, 4)
```

```
A.reshape(12)
```

```
↳ array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11])
```

+ Code

+ Text

```
A.reshape(-1)
```

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

```
A.reshape(-1, 6)
```

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

```
A.reshape(6, -1)
```

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

Saving...



```
A.reshape(-2, 6) # any negative number is actually a placeholder
```

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

```
A.reshape(-1, -1) # ambiguity, at max one placeholder
```

```
-----
-----
ValueError                                Traceback (most recent
call last)
<ipython-input-10-886d65bac847> in <module>
----> 1 A.reshape(-1, -1)
```

```
ValueError: can only specify one unknown dimension
```

```
A.reshape(-1,) # learner's doubt
```

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

```
A.reshape(-1) # learner's doubt
```

File "[<ipython-input-12-3af00e8df445>](#)", line 1

```
A.reshape(-1)
```

SyntaxError: invalid syntax

SEARCH STACK OVERFLOW

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

```
b = np.ones(5) * 2 # by default it gives floating values
```

```
a, b
```

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

```
a * b
```

```
array([0., 2., 4., 6., 8.])
```

```
A = np.arange(12).reshape(3, 4)
```

```
A
```

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

```
B = np.arange(12).reshape(3, 4)*2
```

```
B
```

Saving...



```
[16, 18, 20, 22]])
```

```
A * B # elementwise operation
```

```
array([[ 0,  2,  8, 18],
       [32, 50, 72, 98],
       [128, 162, 200, 242]])
```

```
# A --> (3, 4), B --> (3, 4), A*B elementwise operation
```

```
# A --> (3, 4), B --> (4, 3), A*B, error
```

```
A.shape
```

```
(3, 4)
```

```
B.T.shape
```

```
(4, 3)
```

A * B.T # elementwise operation is not possible here

```
-----
ValueError                                Traceback (most recent call last)
<ipython-input-22-12b92cc04dd3> in <module>
----> 1 A * B.T
```

ValueError: operands could not be broadcast together with shapes (3,4) (4,3)

SEARCH STACK OVERFLOW

```
np.matmul(A, B.T)
```

```
array([[ 28,  76, 124],
       [ 76, 252, 428],
       [124, 428, 732]])
```

```
np.matmul(A.T, B)
```

```
array([[160, 184, 208, 232],
       [184, 214, 244, 274],
       [208, 244, 280, 316],
       [232, 274, 316, 358]])
```

A @ B.T # same as matmul

```
array([[ 28,  76, 124],
       [ 76, 252, 428],
       [124, 428, 732]])
```

Saving...



mul = @ for 2 arrays

```
array([[ 28,  76, 124],
       [ 76, 252, 428],
       [124, 428, 732]])
```

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

```
b = np.array([2, 2, 2])
```

```
np.dot(a, b) # np.dot applies dot product for 1D arrays
```

```
12
```

```
A = np.arange(12).reshape(3, 4)
```

```
A
```

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

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

A @ a

```
-----
ValueError                                Traceback (most recent call last)
<ipython-input-32-1527a3029676> in <module>
----> 1 A @ a
```

ValueError: matmul: Input operand 1 has a mismatch in its core dimension 0, with gufunc signature (n?,k),(k,m?)->(n?,m?) (size 3 is different from 4)

SEARCH STACK OVERFLOW

a @ A

```
array([32, 38, 44, 50])
```

Vectorisation

```
A = np.arange(12)
```

```
A
```

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

```
A * 2 # vectorising the multiplication operation
```

```
array([ 0,  2,  4,  6,  8, 10, 12, 14, 16, 18, 20, 22])
```

```
def custom_fn(x):
```

```
    if x%2 == 0:
```

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```
        return -1
```

```
custom_fn(4)
```

```
1
```

```
custom_fn(3)
```

```
-1
```

```
custom_fn([3, 4, 5])
```

```

-----
TypeError                                Traceback (most recent call last)
<ipython-input-39-2e1bb584ead2> in <module>
----> 1 custom_fn([3, 4, 5])

<ipython-input-36-3a7f5f662f7c> in custom_fn(x)
      1 def custom_fn(x):
----> 2     if x%2 == 0:
      3         return 1
      4     else:

```

lets try vectorise the custom function

```

TypeError: unsupported operand type(s) for %: 'list' and 'int'

```

```

custom_vectorised_fn = np.vectorize(custom_fn)

```

```

# custom function vectorized

```

```

custom_vectorised_fn([3, 4, 5])

```

```

array([-1,  1, -1])

```

example of log math.log and converts it into vectorised function, please check the

```

np.log([4, 5, 6])

```

```

array([1.38629436, 1.60943791, 1.79175947])

```

```

B = np.arange(24).reshape(2, 3, 4)

```

```

B

```

```

array([[[ 0,  1,  2,  3],
        [ 4,  5,  6,  7],
        [ 8,  9, 10, 11]],

```

```

       [[12, 13, 14, 15],

```

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```

B[0]

```

```

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

```

```

B[0, 0, 0]

```

```

0

```

```

B[1, 1, 1]

```

```

17

```

```

import numpy as np

```

```
import matplotlib.pyplot as plt # imread, imshow, imwrite
```

```
!gdown 17tYTDPU5hpby9t0kGd7w_-zBsbY7sEd
```

Downloading...

From: https://drive.google.com/uc?id=17tYTDPU5hpby9t0kGd7w_-zBsbY7sEd

To: /content/fruits.png

100% 4.71M/4.71M [00:00<00:00, 55.9MB/s]

```
!gdown 1o-8yqdTM7cfz_mAaNCi2nH0urFu7pcqI
```

Downloading...

From: https://drive.google.com/uc?id=1o-8yqdTM7cfz_mAaNCi2nH0urFu7pcqI

To: /content/emma_stone.jpeg

100% 80.3k/80.3k [00:00<00:00, 44.5MB/s]

```
img = plt.imread("fruits.png")  
plt.imshow(img)
```

<matplotlib.image.AxesImage at 0x7efffa5d8e50>



```
type(img)
```

numpy.ndarray

```
img.ndim
```

3

```
img.shape
```

(1333, 2000, 3)

I have to go to

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