

```
In [ ]: 1 python native types
        2 int float str bytes bool NoneType
        3 list,tuple,dict,set
        4
        5 fname='dog.jpge'
        6 row=450
        7 col=650
        8 resoln=450*650
```

```
In [2]: 1 print(type(''))
        2 print(type(0))
        3 print(type(0.0))
```

```
<class 'str'>
<class 'int'>
<class 'float'>
```

```
In [9]: 1 # list - collection of different types of items
        2 # ----- [] - mutable
        3
        4 img=['dog.jpge',450,660,14.24,True]
        5 print(type(img),len(img))
        6 print(img[0])
        7 img[0]='D:\\fig.bmp' # modification
        8 img
```

```
<class 'list'> 5
dog.jpge
```

Out[9]: ['D:\\fig.bmp', 450, 660, 14.24, True]

```
In [11]: 1 img=('dog.jpge',450,660,14.24,True)
        2 print(type(img),len(img))
        3 print(img[0])
        4 # img[0]='' # immutable - we can't add/modify/delete
```

```
<class 'tuple'> 5
dog.jpge
```

```
In [12]: 1 img={'image_name':'dog.jpge','row':450} # Key:value
        2 type(img)
```

Out[12]: dict

```
In [14]: 1 # function - Code block
2 # 1.definition
3 # 2.function Call - invoke a definition
4 #
5 # def functionName():
6 #     .....
7
8 # functionName()
9 def classification_img(a):
10     '''
11     classification method
12     '''
13     print('classification_method')
14
15 classification_img('a.jpg','b.jpg')
16
17 for v in ['a.jpg','b.jpg',...]:
18     classification_img(v)
19
```

```
In [16]: 1 for v in ['abc']:
2         print('Hello',v)
```

Hello abc

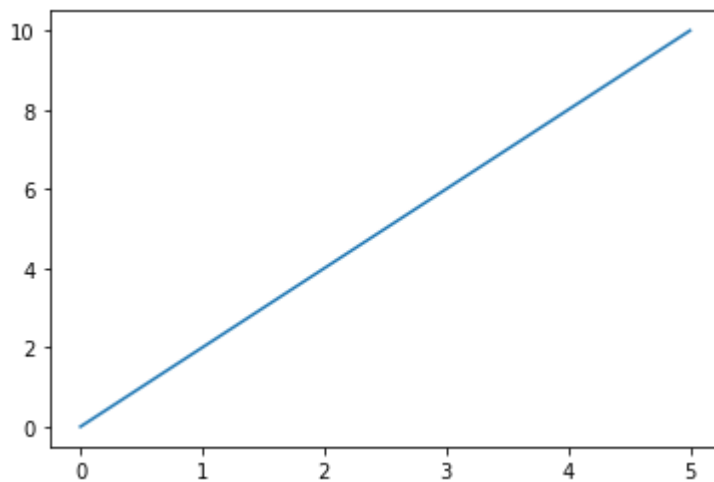
```
In [ ]: 1 File: ab.py
2 -----
3 def classification_img(a):
4     '''
5     classification method
6     '''
7     print('classification_method')
8
9 classification_img('a.jpg','b.jpg')
10
11 for v in ['a.jpg','b.jpg',...]:
12     classification_img(v)
13 -----
14 import ab <== module - existing python file
15 rv=ab.classification_img(..)
16 ..
17 from ab import classification_img
18 classification_img()
19
20 import httptemplatecode
21
22 httptemplatecode.function()
23
24 import httptemplatecode as hp
25 hp.function()
```

```
In [ ]: 1 list ->array ->numpy
2 -----
```

```
In [18]: 1 import array
         2 #help(array)
         3
         4 import numpy
         5 import matplotlib.pyplot
```

```
In [24]: 1 import numpy
         2 import matplotlib.pyplot as plt
         3 x=numpy.array([0,5])
         4 y=numpy.array([0,10])
         5 print(x,y)
         6 plt.plot(x,y)
         7 plt.show()
         8
```

[0 5] [0 10]



```
In [25]: 1 import numpy as np
         2 mylist=[10,20,30]
         3 np.array(mylist)
```

Out[25]: array([10, 20, 30])

```
In [26]: 1 print(type(np.array(mylist)))

<class 'numpy.ndarray'>
```

```
In [27]: 1 np.arange(0,10)
```

Out[27]: array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])

```
In [28]: 1 r=np.arange(0,10)
         2 r.shape
```

Out[28]: (10,)

```
In [30]: 1 np.zeros(shape=(3,2))
```

```
Out[30]: array([[0., 0.],
               [0., 0.],
               [0., 0.]])
```

```
In [31]: 1 np.ones(shape=(3,2))
```

```
Out[31]: array([[1., 1.],
               [1., 1.],
               [1., 1.]])
```

```
In [38]: 1 arr=np.random.randint(0,100,10)
        2 arr.max()
```

```
Out[38]: 97
```

```
In [39]: 1 arr.reshape(2,5)
```

```
Out[39]: array([[86, 37, 54, 33, 61],
               [10, 19, 81, 36, 97]])
```

```
In [42]: 1 arr[0:3]
```

```
Out[42]: array([86, 37, 54])
```

```
In [43]: 1 mat=np.arange(0,100).reshape(10,10)
        2 mat.shape
```

```
Out[43]: (10, 10)
```

```
In [44]: 1 mat
```

```
Out[44]: array([[ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9],
               [10, 11, 12, 13, 14, 15, 16, 17, 18, 19],
               [20, 21, 22, 23, 24, 25, 26, 27, 28, 29],
               [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
               [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
               [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
               [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
               [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
               [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
               [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

```
In [45]: 1 mat[4,3]
```

```
Out[45]: 43
```

```
In [48]: 1 mat[:,2].reshape(1,10)
```

```
Out[48]: array([[ 2, 12, 22, 32, 42, 52, 62, 72, 82, 92]])
```

```
In [49]: 1 mat[0:3,0:3]
```

```
Out[49]: array([[ 0,  1,  2],
                [10, 11, 12],
                [20, 21, 22]])
```

```
In [50]: 1 mat[0:3,0:3]=0
         2 mat
```

```
Out[50]: array([[ 0,  0,  0,  3,  4,  5,  6,  7,  8,  9],
                [ 0,  0,  0, 13, 14, 15, 16, 17, 18, 19],
                [ 0,  0,  0, 23, 24, 25, 26, 27, 28, 29],
                [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
                [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
                [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
                [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
                [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
                [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
                [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

```
In [51]: 1 import matplotlib.pyplot as plt
         2 from PIL import Image
```

```
In [54]: 1 pic=Image.open('C:\\Users\\Public\\Pictures\\Sample Pictures\\Koala.jpg')
         2 print(type(pic))
```

```
<class 'PIL.JpegImagePlugin.JpegImageFile'>
```

```
In [55]: 1 np.asarray(pic)
```

```
Out[55]: array([[101,  90,  58],
                [103,  92,  62],
                [110,  95,  66],
                ...,
                [ 96,  96,  70],
                [104, 103,  73],
                [ 92,  91,  60]],

               [[102,  89,  57],
                [108,  94,  65],
                [106,  92,  65],
                ...,
                [ 96,  96,  68],
                [100, 101,  70],
                [ 89,  90,  58]],

               [[106,  95,  65],
                [107,  93,  66],
                [106,  94,  68],
                ...,
                [ 96,  96,  68],
                [ 99, 100,  69],
                [ 95,  96,  65]],

               ...,

               [[226, 207, 193],
                [228, 209, 195],
                [223, 207, 194],
                ...,
                [143, 122,  95],
                [142, 112,  86],
                [147, 117,  89]],

               [[220, 202, 188],
                [214, 196, 184],
                [208, 192, 179],
                ...,
                [150, 124, 101],
                [145, 117,  93],
                [150, 118,  95]],

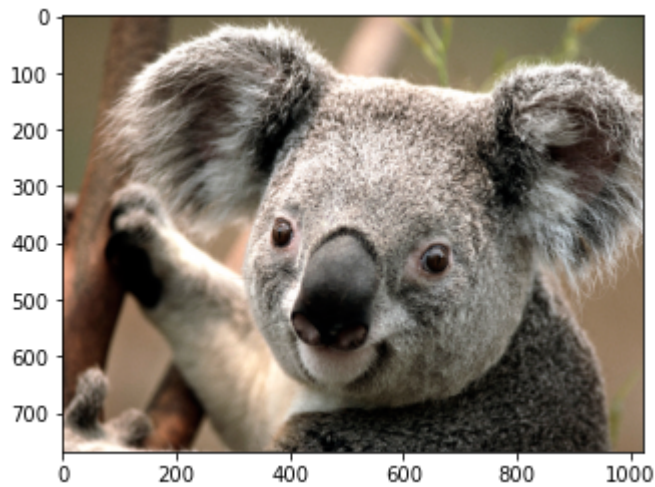
               [[218, 199, 185],
                [209, 191, 179],
                [204, 184, 173],
                ...,
                [141, 119,  95],
                [140, 112,  90],
                [146, 118,  96]]], dtype=uint8)
```

```
In [56]: 1 pic_arr=np.asarray(pic)
         2 pic_arr.shape
```

```
Out[56]: (768, 1024, 3)
```

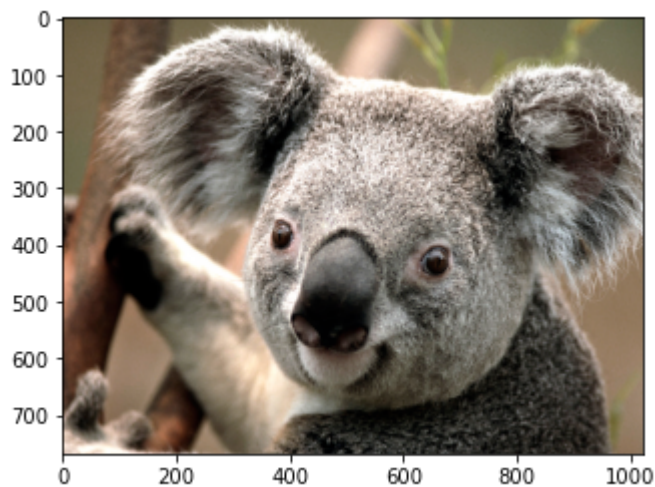
```
In [57]: 1 plt.imshow(pic_arr)
```

```
Out[57]: <matplotlib.image.AxesImage at 0x931a760>
```



```
In [58]: 1 pic_red=pic_arr.copy()
         2 plt.imshow(pic_red)
```

```
Out[58]: <matplotlib.image.AxesImage at 0xa874280>
```

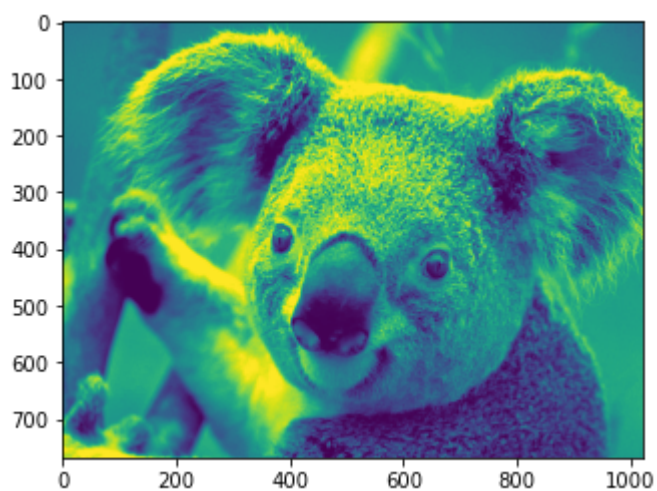


```
In [62]: 1 pic_red[:, :, 0]
```

```
Out[62]: array([[101, 103, 110, ..., 96, 104, 92],
                [102, 108, 106, ..., 96, 100, 89],
                [106, 107, 106, ..., 96, 99, 95],
                ...,
                [226, 228, 223, ..., 143, 142, 147],
                [220, 214, 208, ..., 150, 145, 150],
                [218, 209, 204, ..., 141, 140, 146]], dtype=uint8)
```

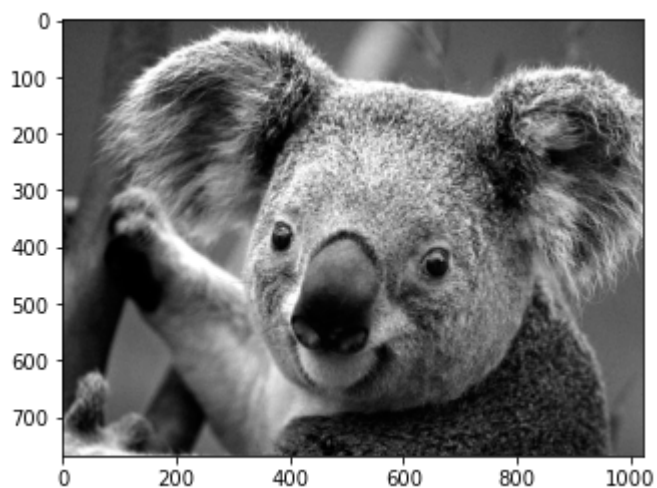
```
In [63]: 1 plt.imshow(pic_red[:, :, 0])
```

```
Out[63]: <matplotlib.image.AxesImage at 0xaf461f0>
```



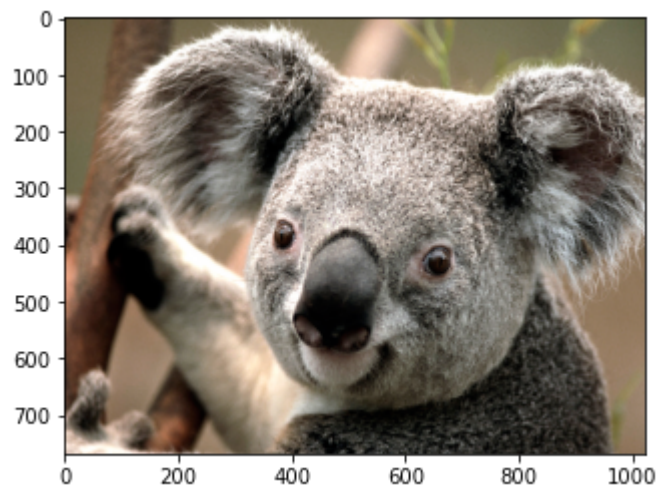
```
In [66]: 1 plt.imshow(pic_red[:, :, 2], cmap='gray')
```

```
Out[66]: <matplotlib.image.AxesImage at 0x9f14bb0>
```




```
In [67]: 1 plt.imshow(pic_red)
```

```
Out[67]: <matplotlib.image.AxesImage at 0x9f2baf0>
```



```
In [69]: 1 pic_red[:, :, 1]=0
```

```
In [70]: 1 pic_red
```

```
Out[70]: array([[101,  0, 58],
                [103,  0, 62],
                [110,  0, 66],
                ...,
                [ 96,  0, 70],
                [104,  0, 73],
                [ 92,  0, 60]],

               [[102,  0, 57],
                [108,  0, 65],
                [106,  0, 65],
                ...,
                [ 96,  0, 68],
                [100,  0, 70],
                [ 89,  0, 58]],

               [[106,  0, 65],
                [107,  0, 66],
                [106,  0, 68],
                ...,
                [ 96,  0, 68],
                [ 99,  0, 69],
                [ 95,  0, 65]],

               ...,

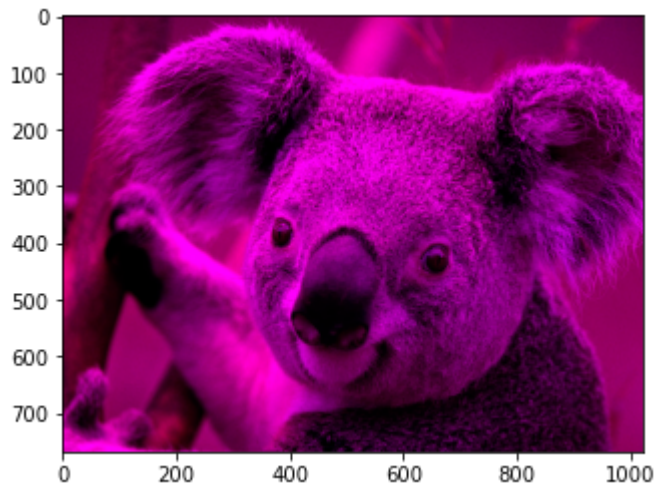
               [[226,  0, 193],
                [228,  0, 195],
                [223,  0, 194],
                ...,
                [143,  0, 95],
                [142,  0, 86],
                [147,  0, 89]],

               [[220,  0, 188],
                [214,  0, 184],
                [208,  0, 179],
                ...,
                [150,  0, 101],
                [145,  0, 93],
                [150,  0, 95]],

               [[218,  0, 185],
                [209,  0, 179],
                [204,  0, 173],
                ...,
                [141,  0, 95],
                [140,  0, 90],
                [146,  0, 96]]], dtype=uint8)
```

```
In [71]: 1 plt.imshow(pic_red)
```

```
Out[71]: <matplotlib.image.AxesImage at 0x9fd3c70>
```



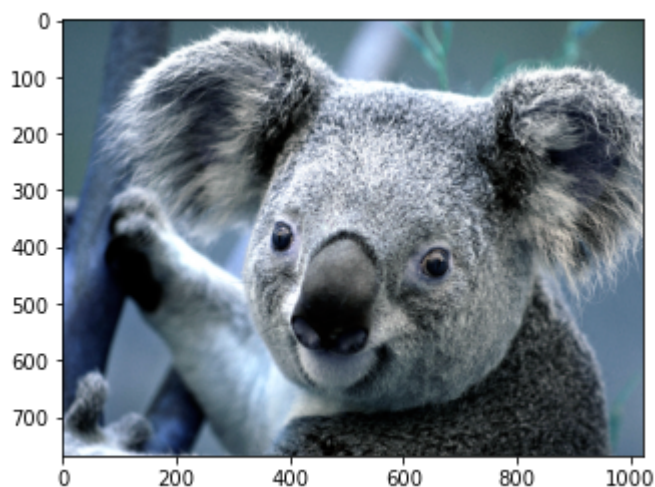
```
In [76]: 1 import cv2  
2 img=cv2.imread('C:\\Users\\Public\\Pictures\\Sample Pictures\\Koala.jpg')
```

```
In [78]: 1 type(img)  
2 img.shape
```

```
Out[78]: (768, 1024, 3)
```

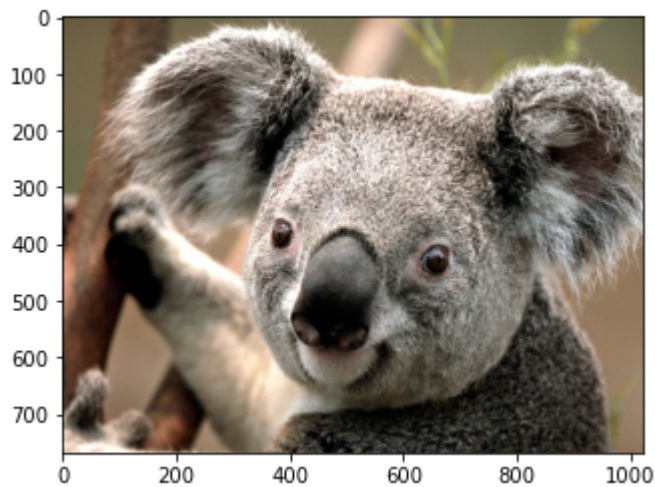
```
In [79]: 1 plt.imshow(img)
```

```
Out[79]: <matplotlib.image.AxesImage at 0xa8b8fa0>
```



```
In [81]: 1 fix_img=cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
        2 plt.imshow(fix_img)
```

Out[81]: <matplotlib.image.AxesImage at 0xaccbf70>



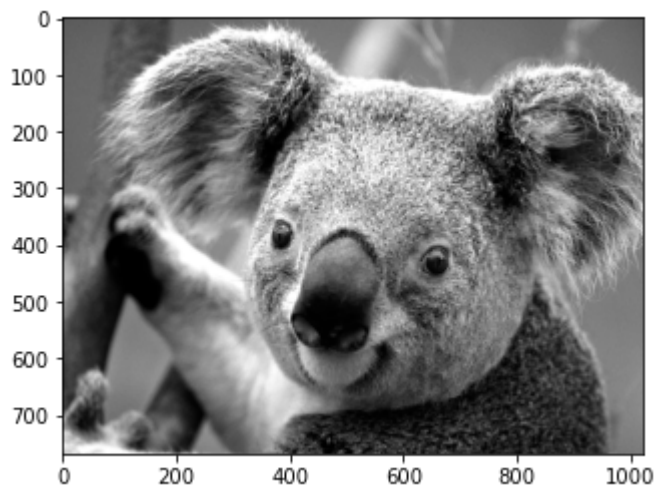
```
In [82]: 1 gray_img=cv2.cvtColor(img,cv2.IMREAD_GRAYSCALE)
        2 gray_img.max()
```

Out[82]: 255

```
In [87]: 1 img=cv2.imread('C:\\Users\\Public\\Pictures\\Sample Pictures\\Koala.jpg',cv2
```

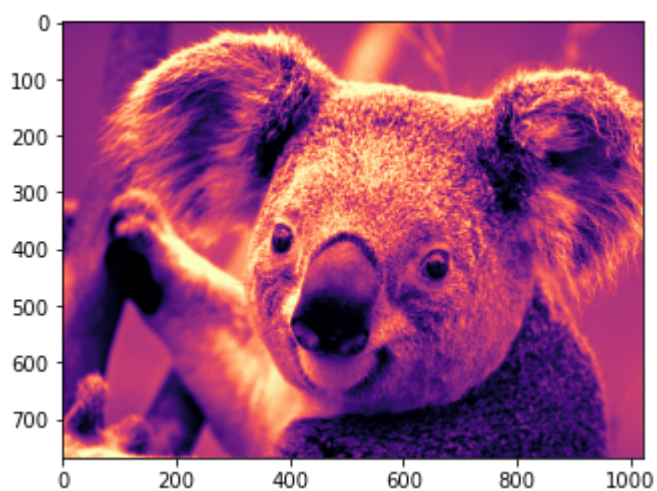
```
In [89]: 1 plt.imshow(img,cmap='gray')
```

Out[89]: <matplotlib.image.AxesImage at 0xd79d310>



```
In [90]: 1 plt.imshow(img,cmap='magma')
```

```
Out[90]: <matplotlib.image.AxesImage at 0xd7d7490>
```

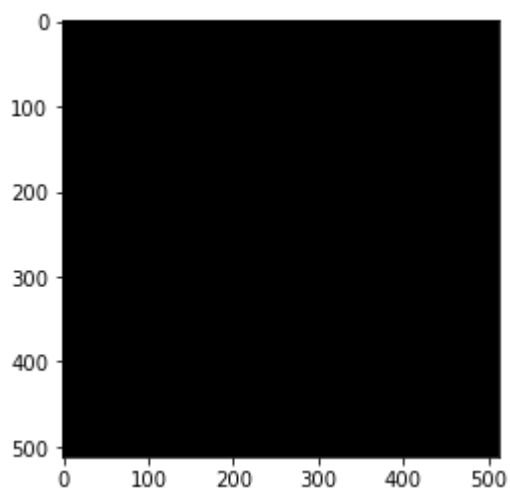


```
In [93]: 1 blank_img=np.zeros(shape=(512,512,3))  
2 blank_img.shape
```

```
Out[93]: (512, 512, 3)
```

```
In [94]: 1 plt.imshow(blank_img)
```

```
Out[94]: <matplotlib.image.AxesImage at 0xd818580>
```



```
In [96]: 1 cv2.rectangle(blank_img,pt1=(384,0),pt2=(510,150),color=(0,255,0),thickness=
```

```
Out[96]: array([[[ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 ...,
 [ 0., 255.,  0.],
 [ 0., 255.,  0.],
 [ 0., 255.,  0.]],

 [[ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 ...,
 [ 0., 255.,  0.],
 [ 0., 255.,  0.],
 [ 0., 255.,  0.]],

 [[ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 ...,
 [ 0., 255.,  0.],
 [ 0., 255.,  0.],
 [ 0., 255.,  0.]],

 ...,

 [[ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]],

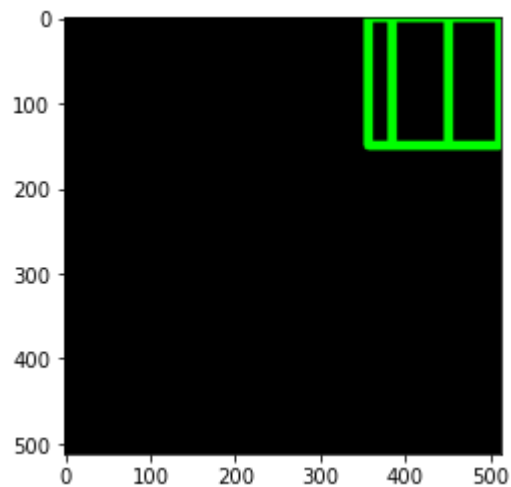
 [[ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]],

 [[ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 ...,
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.],
 [ 0.,  0.,  0.]])
```

```
In [97]: 1 plt.imshow(blank_img)
```

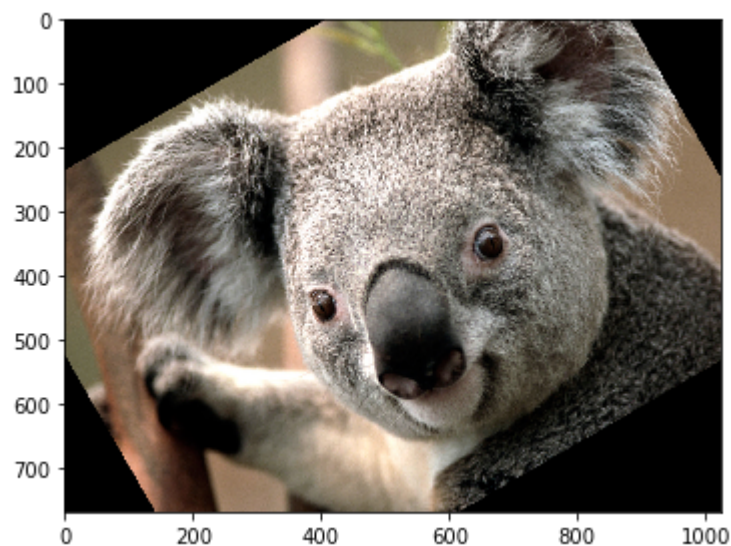
Clipping input data to the valid range for imshow with RGB data ([0..1] for floats or [0..255] for integers).

```
Out[97]: <matplotlib.image.AxesImage at 0xac92a30>
```



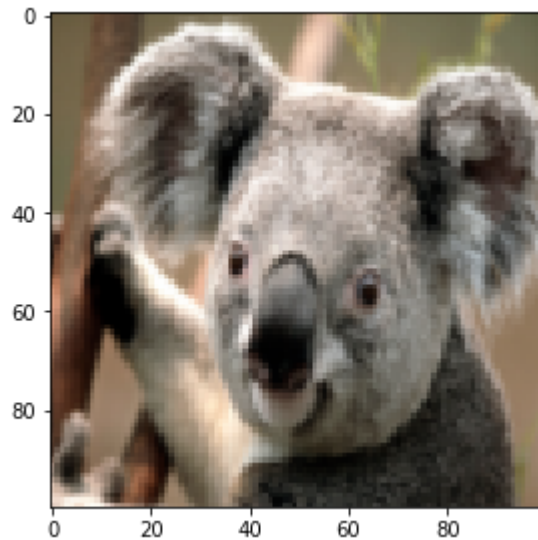
```
In [102]: 1 from skimage import io
2 from skimage.transform import rotate
3 img=io.imread('C:\\Users\\Public\\Pictures\\Sample Pictures\\Koala.jpg')
4 img_rot=rotate(img,30)
5 io.imshow(img_rot)
```

```
Out[102]: <matplotlib.image.AxesImage at 0x13751340>
```



```
In [103]: 1 from skimage.transform import resize
          2 img=io.imread('C:\\Users\\Public\\Pictures\\Sample Pictures\\Koala.jpg')
          3 img_res=resize(img,(100,100))
          4 io.imshow(img_res)
```

Out[103]: <matplotlib.image.AxesImage at 0x139fb6d0>

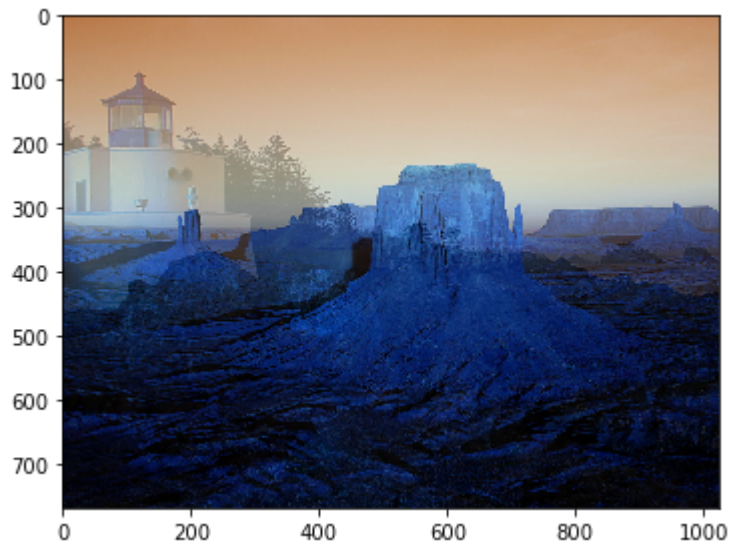


```
In [ ]: 1 img1=cv2.imread('dog1.jpg')
        2 img2=cv2.imread('dog2.jpg')
        3 final_img=cv2.addWeighted(img1,img2)
        4 io.imshow(final_img)
```



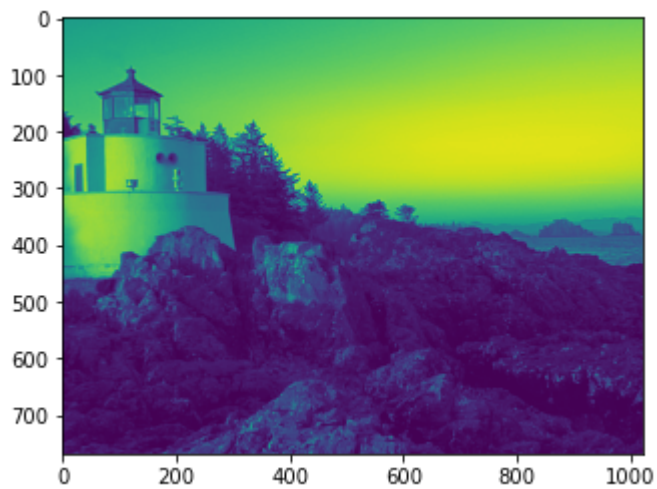
```
In [107]: img1=cv2.imread('C:\\Users\\Public\\Pictures\\Sample Pictures\\Lighthouse.jpg')
img2=cv2.imread('C:\\Users\\Public\\Pictures\\Sample Pictures\\Desert.jpg')
a=0.30
b=0.60
final_img=cv2.addWeighted(img1,a,img2,b,0.0)
io.imshow(final_img)
```

Out[107]: <matplotlib.image.AxesImage at 0x13aae640>



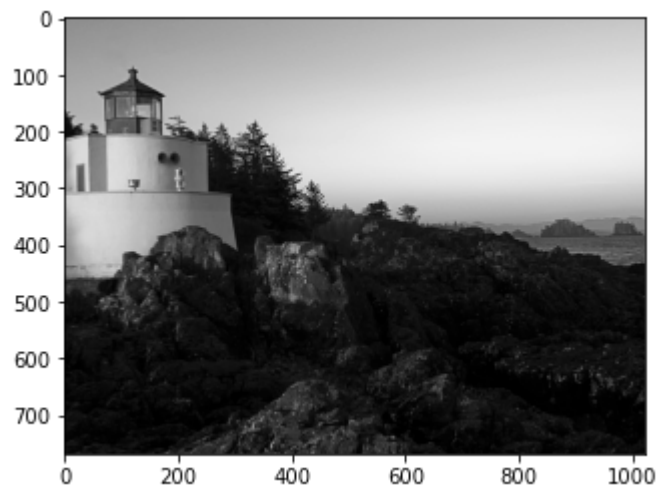
```
In [109]: img1=cv2.imread('C:\\Users\\Public\\Pictures\\Sample Pictures\\Lighthouse.jpg',0)
plt.imshow(img1)
```

Out[109]: <matplotlib.image.AxesImage at 0x13a384f0>



```
In [110]: 1 plt.imshow(img1,cmap='gray')
```

```
Out[110]: <matplotlib.image.AxesImage at 0x13a69550>
```

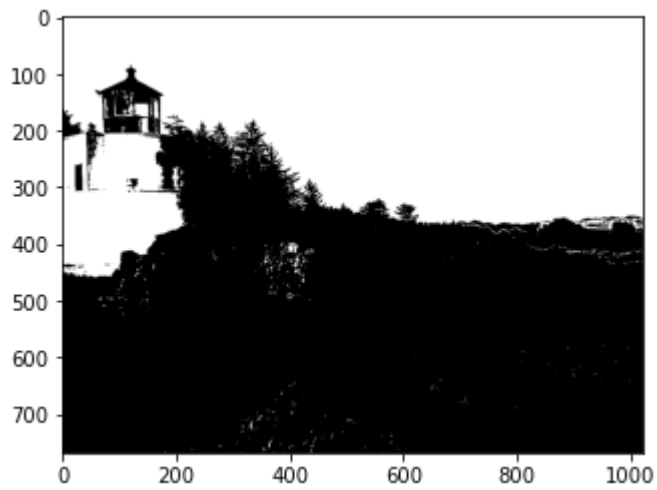


```
In [112]: 1 cv2.threshold(img1,127,255,cv2.THRESH_BINARY)
```

```
Out[112]: (127.0,
array([[255, 255, 255, ..., 255, 255, 255],
       [255, 255, 255, ..., 255, 255, 255],
       [255, 255, 255, ..., 255, 255, 255],
       ...,
       [  0,   0,   0, ...,   0,   0,   0],
       [  0,   0,   0, ...,   0,   0,   0],
       [  0,   0,   0, ...,   0,   0,   0]], dtype=uint8))
```

```
In [113]: 1 re,thresh1=cv2.threshold(img1,127,255,cv2.THRESH_BINARY)
          2 plt.imshow(thresh1,cmap='gray')
```

Out[113]: <matplotlib.image.AxesImage at 0x13f183a0>



```
In [114]: 1 re,thresh1=cv2.threshold(img1,127,255,cv2.THRESH_BINARY_INV)
          2 plt.imshow(thresh1,cmap='gray')
```

Out[114]: <matplotlib.image.AxesImage at 0x15b6b790>

