

# NumPy is a robust tool for image processing in Python. It lets you manipulate images using array operations. This article explores several image processing techniques using NumPy.

```
In [1]: import numpy as np # Used for numerical operations on Arrays
```

```
In [17]: ones_arr = np.ones((5,5),dtype= int)
```

```
In [18]: ones_arr
```

```
Out[18]: array([[1, 1, 1, 1, 1],  
                 [1, 1, 1, 1, 1],  
                 [1, 1, 1, 1, 1],  
                 [1, 1, 1, 1, 1],  
                 [1, 1, 1, 1, 1]])
```

```
In [19]: ones_arr*255
```

```
Out[19]: array([[255, 255, 255, 255, 255],  
                  [255, 255, 255, 255, 255],  
                  [255, 255, 255, 255, 255],  
                  [255, 255, 255, 255, 255],  
                  [255, 255, 255, 255, 255]])
```

```
In [2]: import matplotlib.pyplot as plt # used to display the Image
```

```
In [3]: %matplotlib inline
```

```
In [4]: from PIL import Image #Python Imaging Library used for opening and manipulating
```

```
In [51]: # Load the image using PIL (Python Imaging Library)  
ele = Image.open(r'/Users/aviswe/Desktop/FSDS/01FSDS/Morning Batch/Elephant.jpg')
```

```
In [52]: ele
```

Out [52]:

In [53]: `type(ele)`Out [53]: `PIL.JpegImagePlugin.JpegImageFile`In [54]: `# Convert the image to a NumPy array  
ele_arr = np.asarray(ele)`In [55]: `ele_arr`

```
Out[55]: array([[ [184, 109, 103],  
    [184, 109, 103],  
    [184, 109, 103],  
    ...,  
    [173, 126, 120],  
    [173, 126, 120],  
    [173, 126, 120]],  
  
   [[184, 109, 103],  
    [184, 109, 103],  
    [184, 109, 103],  
    ...,  
    [173, 126, 120],  
    [173, 126, 120],  
    [173, 126, 120]],  
  
   [[182, 107, 101],  
    [182, 107, 101],  
    [182, 107, 101],  
    ...,  
    [173, 126, 120],  
    [173, 126, 120],  
    [173, 126, 120]],  
  
   ...,  
  
   [[ 78,  51,  34],  
    [ 76,  49,  32],  
    [ 73,  46,  29],  
    ...,  
    [ 84,  57,  40],  
    [ 85,  58,  41],  
    [ 86,  59,  42]],  
  
   [[ 81,  54,  37],  
    [ 77,  50,  33],  
    [ 73,  46,  29],  
    ...,  
    [ 84,  57,  40],  
    [ 85,  58,  41],  
    [ 86,  59,  42]],  
  
   [[ 83,  56,  39],  
    [ 78,  51,  34],  
    [ 72,  45,  28],  
    ...,  
    [ 84,  57,  40],  
    [ 85,  58,  41],  
    [ 86,  59,  42]]], dtype=uint8)
```

```
In [56]: plt.imshow(ele_arr) # showing the Numpy array with axis
```

```
Out[56]: <matplotlib.image.AxesImage at 0x13eeffc50>
```



```
In [57]: ele_arr.shape # returns the shape of the image
```

Out[57]: (2150, 3461, 3)

```
In [58]: ele_red = ele_arr.copy() # copy the Numerical array to ele_red variable
```

In [59]: ele\_red

```
Out[59]: array([[ [184, 109, 103],  
    [184, 109, 103],  
    [184, 109, 103],  
    ...,  
    [173, 126, 120],  
    [173, 126, 120],  
    [173, 126, 120]],  
  
   [[184, 109, 103],  
    [184, 109, 103],  
    [184, 109, 103],  
    ...,  
    [173, 126, 120],  
    [173, 126, 120],  
    [173, 126, 120]],  
  
   [[182, 107, 101],  
    [182, 107, 101],  
    [182, 107, 101],  
    ...,  
    [173, 126, 120],  
    [173, 126, 120],  
    [173, 126, 120]],  
  
   ...,  
  
   [[ 78,  51,  34],  
    [ 76,  49,  32],  
    [ 73,  46,  29],  
    ...,  
    [ 84,  57,  40],  
    [ 85,  58,  41],  
    [ 86,  59,  42]],  
  
   [[ 81,  54,  37],  
    [ 77,  50,  33],  
    [ 73,  46,  29],  
    ...,  
    [ 84,  57,  40],  
    [ 85,  58,  41],  
    [ 86,  59,  42]],  
  
   [[ 83,  56,  39],  
    [ 78,  51,  34],  
    [ 72,  45,  28],  
    ...,  
    [ 84,  57,  40],  
    [ 85,  58,  41],  
    [ 86,  59,  42]]], dtype=uint8)
```

```
In [60]: ele_arr == ele_red # comparing two numerical arrays
```

```
Out[60]: array([[[ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True],
   ...,
   [ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True]],

   [[ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True],
   ...,
   [ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True]],

   [[ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True],
   ...,
   [ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True]],

   ...,

   [[ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True],
   ...,
   [ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True]],

   [[ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True],
   ...,
   [ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True]],

   [[ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True],
   ...,
   [ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True]],

   [[ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True],
   ...,
   [ True,  True,  True],
   [ True,  True,  True],
   [ True,  True,  True]]])
```

```
In [61]: plt.imshow(ele_red) # showing the copied numerical array image
```

```
Out[61]: <matplotlib.image.AxesImage at 0x13ef8c910>
```

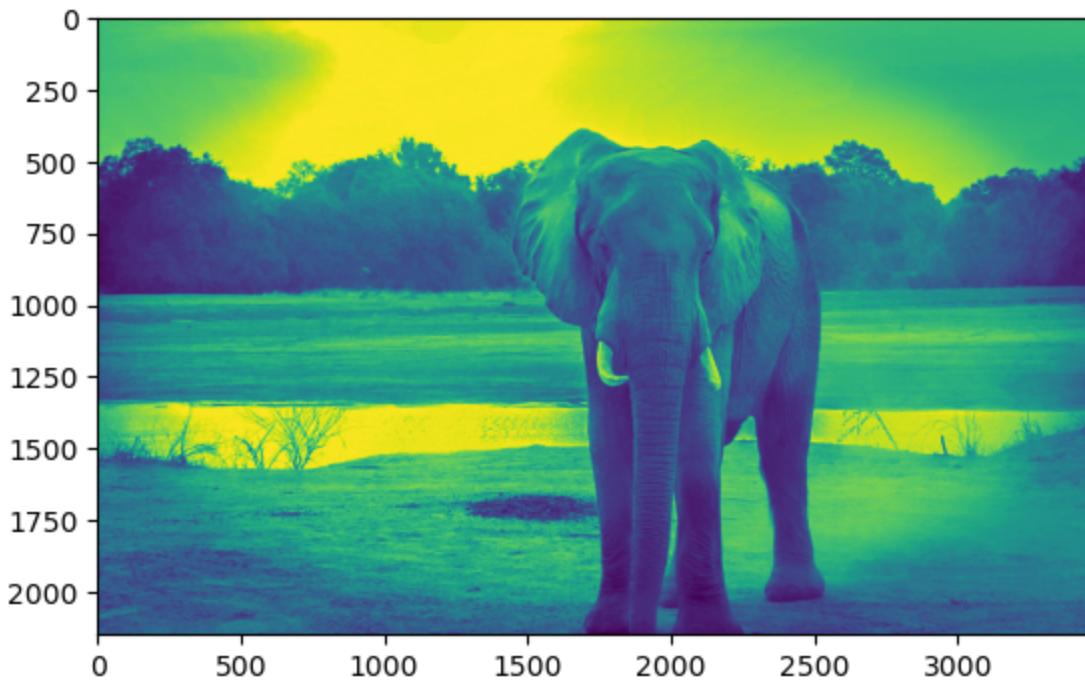


```
In [62]: ele_red.shape
```

```
Out[62]: (2150, 3461, 3)
```

```
In [63]: #R G B  
plt.imshow(ele_red[:, :, 0])
```

```
Out[63]: <matplotlib.image.AxesImage at 0x13effe510>
```

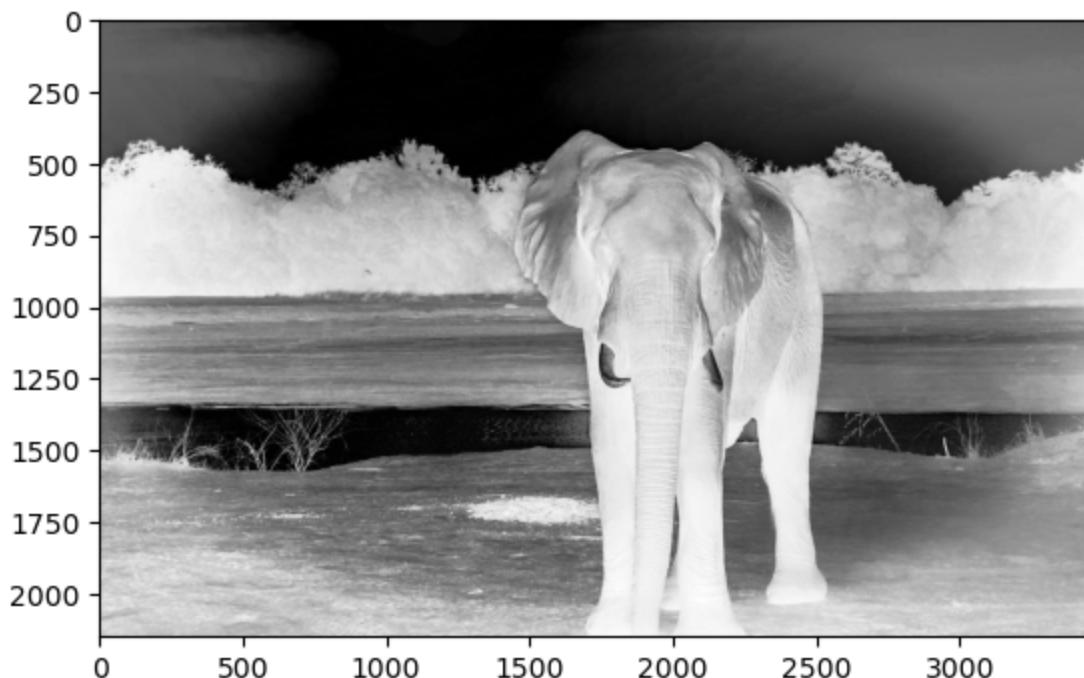


```
In [64]: ele_red[:, :, 0]
```

```
Out[64]: array([[184, 184, 184, ..., 173, 173, 173],  
   [184, 184, 184, ..., 173, 173, 173],  
   [182, 182, 182, ..., 173, 173, 173],  
   ...,  
   [ 78,  76,  73, ...,  84,  85,  86],  
   [ 81,  77,  73, ...,  84,  85,  86],  
   [ 83,  78,  72, ...,  84,  85,  86]], dtype=uint8)
```

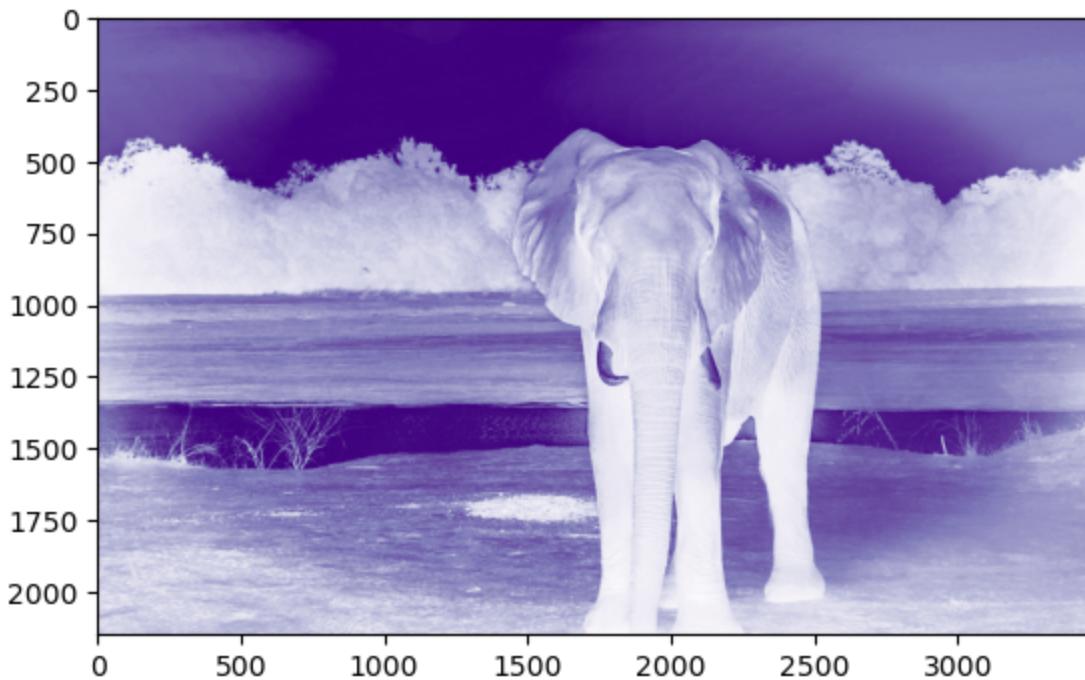
```
In [65]: plt.imshow(ele_red[:, :, 0], cmap = 'Greys')
```

```
Out[65]: <matplotlib.image.AxesImage at 0x13f0770d0>
```



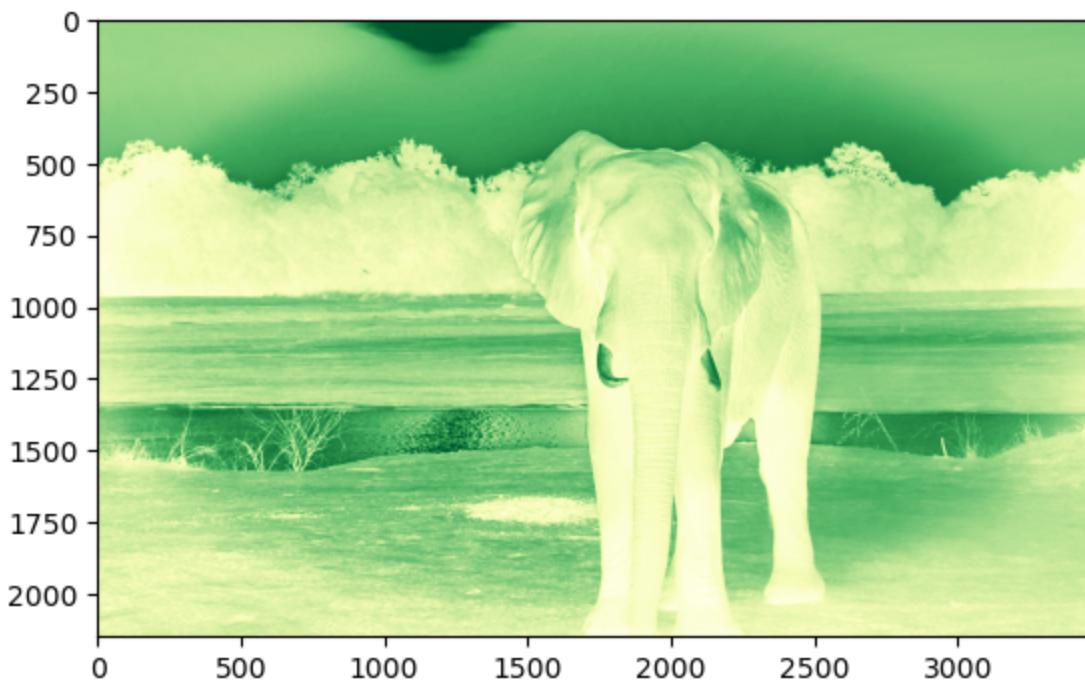
```
In [95]: plt.imshow(ele_red[:, :, 0], cmap="Purples")
```

```
Out[95]: <matplotlib.image.AxesImage at 0x13f988f10>
```



```
In [67]: plt.imshow(ele_red[:, :, 1], cmap='YlGn')
```

```
Out[67]: <matplotlib.image.AxesImage at 0x13f1aed10>
```



```
In [68]: ele_red[:, :, 0]
```

```
Out[68]: array([[184, 184, 184, ..., 173, 173, 173],
   [184, 184, 184, ..., 173, 173, 173],
   [182, 182, 182, ..., 173, 173, 173],
   ...,
   [ 78,   76,   73, ...,   84,   85,   86],
   [ 81,   77,   73, ...,   84,   85,   86],
   [ 83,   78,   72, ...,   84,   85,   86]], dtype=uint8)
```

```
In [69]: ele_red[:, :, 1]
```

```
Out[69]: array([[109, 109, 109, ..., 126, 126, 126],  
                 [109, 109, 109, ..., 126, 126, 126],  
                 [107, 107, 107, ..., 126, 126, 126],  
                 ...,  
                 [ 51,  49,  46, ...,  57,  58,  59],  
                 [ 54,  50,  46, ...,  57,  58,  59],  
                 [ 56,  51,  45, ...,  57,  58,  59]], dtype=uint8)
```

```
In [70]: ele_red[:, :, 2]
```

```
Out[70]: array([[103, 103, 103, ..., 120, 120, 120],  
                 [103, 103, 103, ..., 120, 120, 120],  
                 [101, 101, 101, ..., 120, 120, 120],  
                 ...,  
                 [ 34,  32,  29, ...,  40,  41,  42],  
                 [ 37,  33,  29, ...,  40,  41,  42],  
                 [ 39,  34,  28, ...,  40,  41,  42]], dtype=uint8)
```

```
In [71]: ele_red[:, :, 1] = 0
```

```
In [72]: ele_red[:, :, 1]
```

```
Out[72]: array([[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]], dtype=uint8)
```

```
In [73]: plt.imshow(ele_red)
```

```
Out[73]: <matplotlib.image.AxesImage at 0x13f253d10>
```



```
In [77]: ele
```

Out [77]:



In [ ]: