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DIP_E2 Code

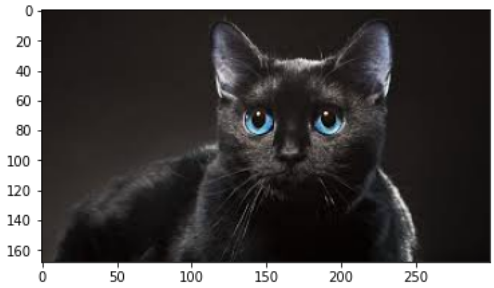
```
import cv2
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
```

```
cat = cv2.imread('/content/cat1.jpg')

```

```
plt.imshow(cat)
```

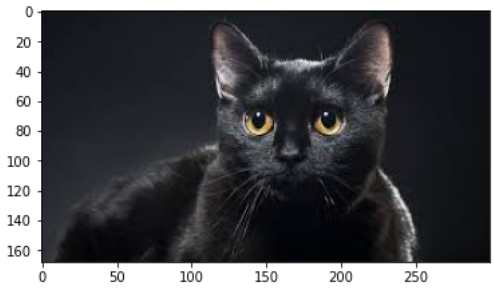
```
<matplotlib.image.AxesImage at 0x7f55e0596a00>
```




```
show_cat = cv2.cvtColor(cat, cv2.COLOR_BGR2RGB)
```

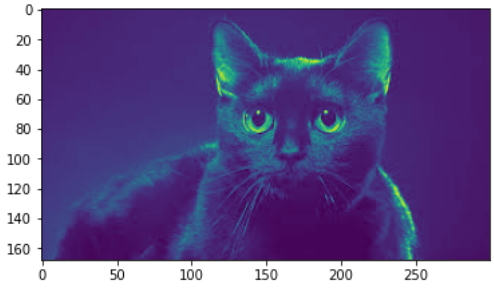
```
plt.imshow(show_cat)
```

```
<matplotlib.image.AxesImage at 0x7f55df6d2e80>
```




```
img_gray = cv2.imread('cat1.jpg', cv2.IMREAD_GRAYSCALE)
plt.imshow(img_gray)
```

```
<matplotlib.image.AxesImage at 0x7f55df6a2f10>
```

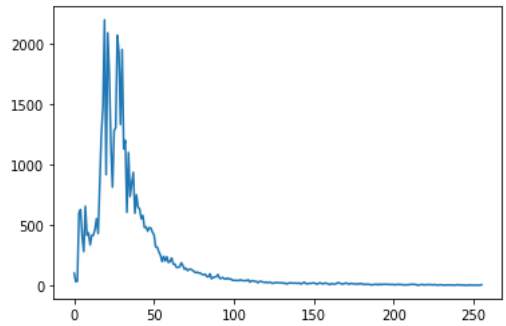



```
plt.imshow(img_gray, cmap='gray')
```

```
<matplotlib.image.AxesImage at 0x7f55df5f6e20>
```

```
1 hist_values = cv2.calcHist([img_gray],channels = [0], mask=None, histSize = [256], ranges = [0, 256])
2 plt.plot(hist_values)
```

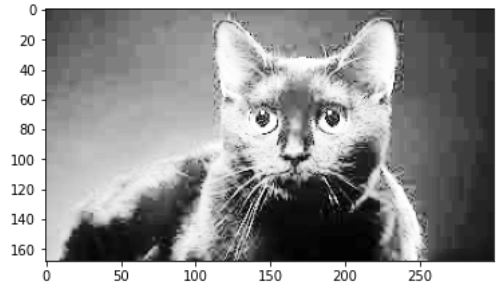
```
[<matplotlib.lines.Line2D at 0x7f55df5cb3d0>]
```



Histogram Equalization

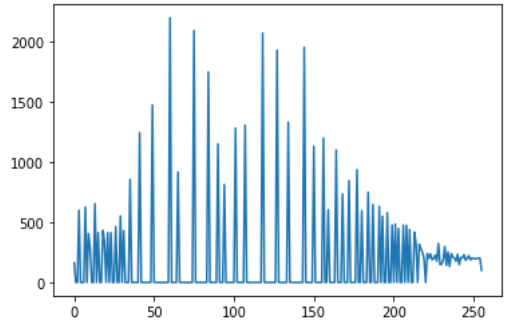
```
1   eq_cat = cv2.equalizeHist(img_gray)
2   plt.imshow(eq_cat, cmap = 'gray')
```

```
<matplotlib.image.AxesImage at 0x7f55df4eac40>
```



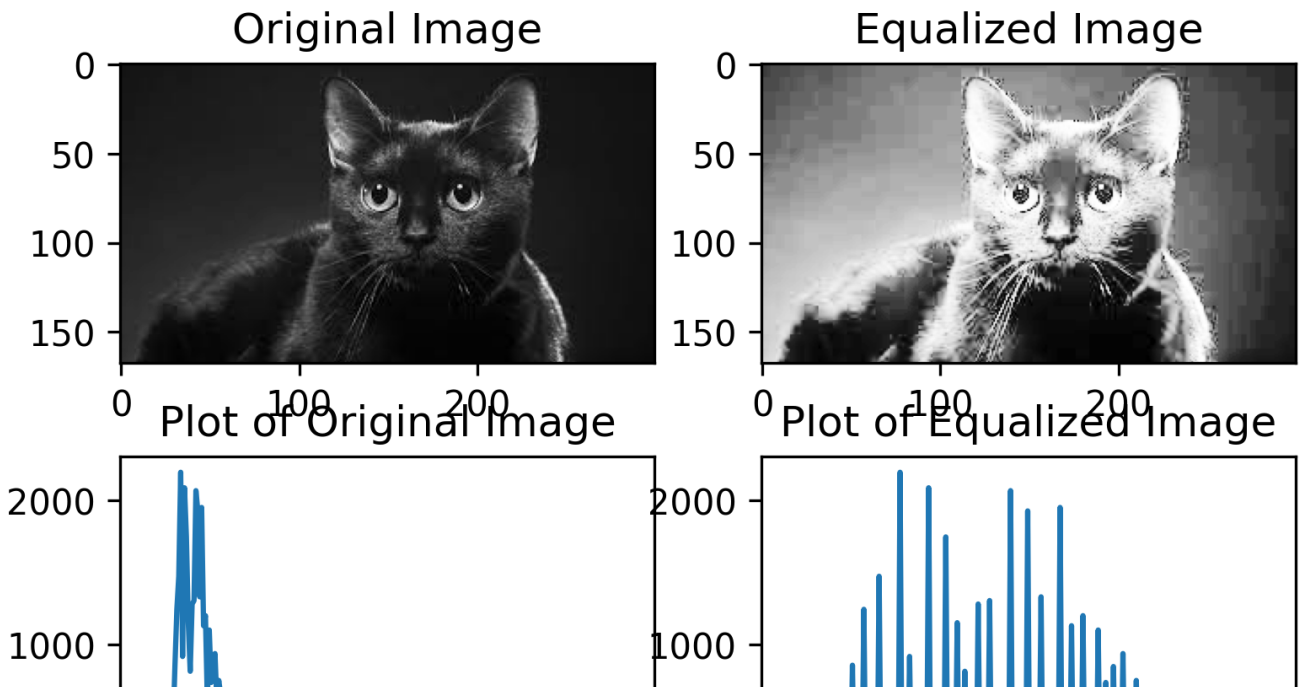
```
1   hist_values_eq = cv2.calcHist([eq_cat],channels = [0], mask=None, histSize = [256], ranges = [0, 256])
2   plt.plot(hist_values_eq)
```

```
[<matplotlib.lines.Line2D at 0x7f55df467e20>]
```

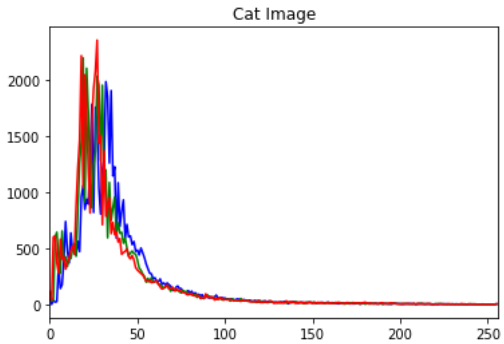


```
1   fig = plt.figure(dpi=300)
2   plt.subplot(221), plt.imshow(img_gray, cmap='gray'), plt.title('Original Image')
3   plt.subplot(222), plt.imshow(eq_cat, cmap='gray'), plt.title('Equalized Image')
4   plt.subplot(223), plt.plot(hist_values), plt.title('Plot of Original Image')
5   plt.subplot(224), plt.plot(hist_values_eq), plt.title('Plot of Equalized Image')
```

```
(<matplotlib.axes._subplots.AxesSubplot at 0x7f55d5d95a30>,
 [<matplotlib.lines.Line2D at 0x7f55d5c44460>],
 Text(0.5, 1.0, 'Plot of Equalized Image'))
```




```
1 img = cat
2 color = ('b', 'g', 'r')
3 for i, col in enumerate(color):
4   histr = cv2.calcHist([img],[i],None,[256],[0,256])
5   plt.plot(histr,color = col)
6   plt.xlim([0, 256])
7 plt.title('Cat Image')
8 plt.show()
```



Masking

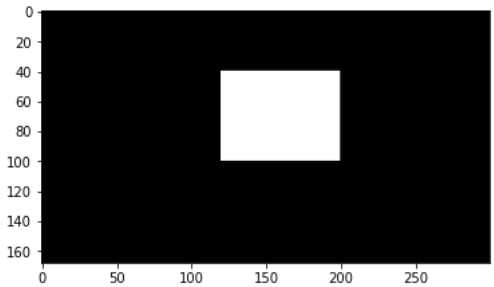
```
1 img.shape
```

```
(168, 300, 3)
```

```
1 mask = np.zeros(img.shape[:2], np.uint8)
2 mask[40:100, 120:200] = 255
```

```
1 plt.imshow(mask, cmap='gray')
```

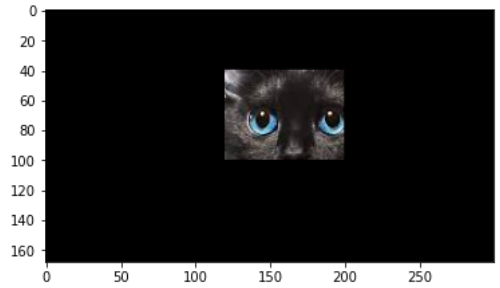
```
<matplotlib.image.AxesImage at 0x7f55d5d5aa30>
```



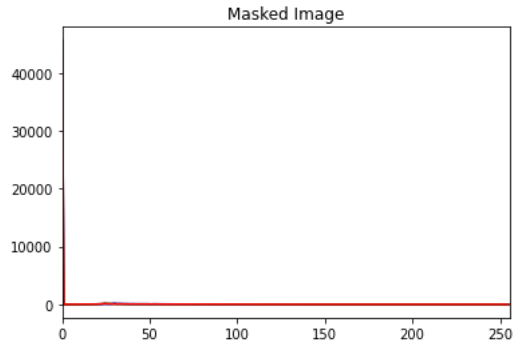
```
masked_img = cv2.bitwise_and(img, img, mask = mask)
show_masked_img = cv2.bitwise_and(cat, cat, mask=mask)
```

```
plt.imshow(show_masked_img)
```

```
<matplotlib.image.AxesImage at 0x7f55d5ccba60>
```

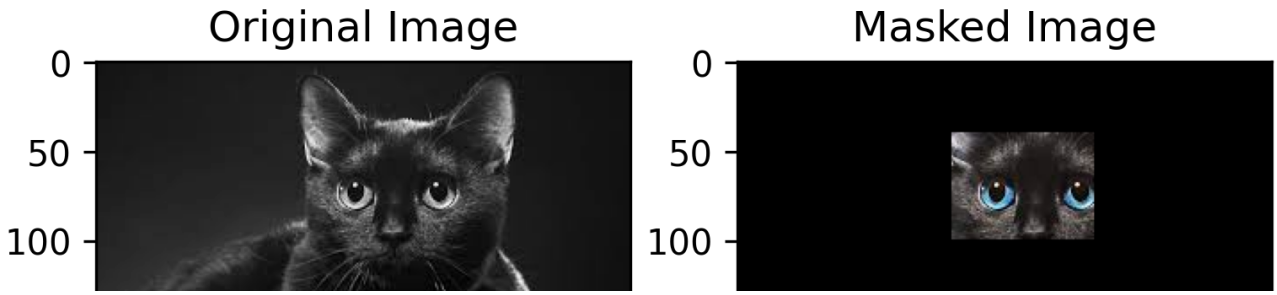



```
img2 = show_masked_img
color = ('b', 'g', 'r')
for i, col in enumerate(color):
  histr = cv2.calcHist([img2],[i],None,[256],[0,256])
  plt.plot(histr,color = col)
  plt.xlim([0, 256])
plt.title('Masked Image')
plt.show()
```




```
fig = plt.figure(dpi=300)
plt.subplot(221), plt.imshow(img_gray, cmap='gray'), plt.title('Original Image')
plt.subplot(222), plt.imshow(show_masked_img, cmap='gray'), plt.title('Masked Image')
plt.subplot(223), plt.plot(hist_values), plt.title('Plot of Original Image')
plt.subplot(224), plt.plot(histr), plt.title('Plot of Masked Image')
```

```
(<matplotlib.axes._subplots.AxesSubplot at 0x7f55d5adbc10>,
 [<matplotlib.lines.Line2D at 0x7f55d5a59e20>],
 Text(0.5, 1.0, 'Plot of Masked Image'))
```



PostLab Questions

1. A bright image will have what kind of histogram?

- A bright image will have the histogram whose component are biased toward high side of gray scale. A high contrast image will have the histogram that covers wide range of gray scale and the distribution of pixel is approximately uniform.

2. What is 'Dynamic range' and 'Contrast' of digital images?

- Dynamic range describes the ratio between the brightest and darkest parts of an image, from pure black to brightest white. The term contrast refers to the amount of color or grayscale differentiation that exists between various image features in both analog and digital images. Images having a higher contrast level generally display a greater degree of color or grayscale variation than those of lower contrast.

3. An image with dynamic range 0 to 7 is given below (3 bit). Perform the following on the image.

a) Determine the histogram of the Image.

b) What is the effect on histogram if MSB of every pixel is made 1.