

Task_1

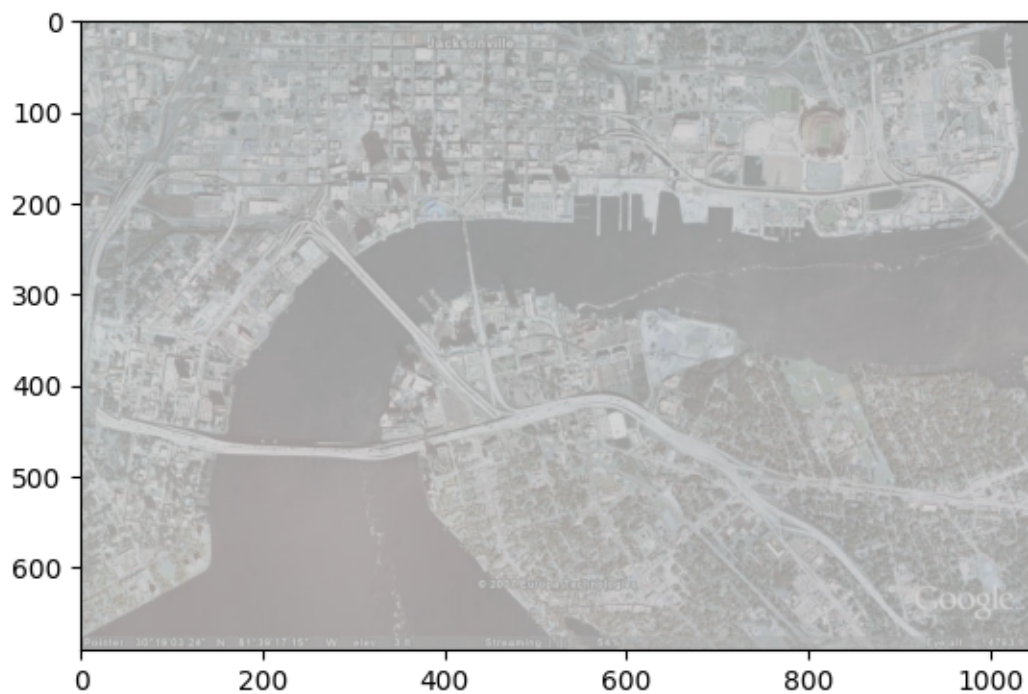
April 26, 2023

0.1 Task 1 - Image Enhancement

a) Visualize the initial image and the corresponding histogram (figure, imshow, imhist...).

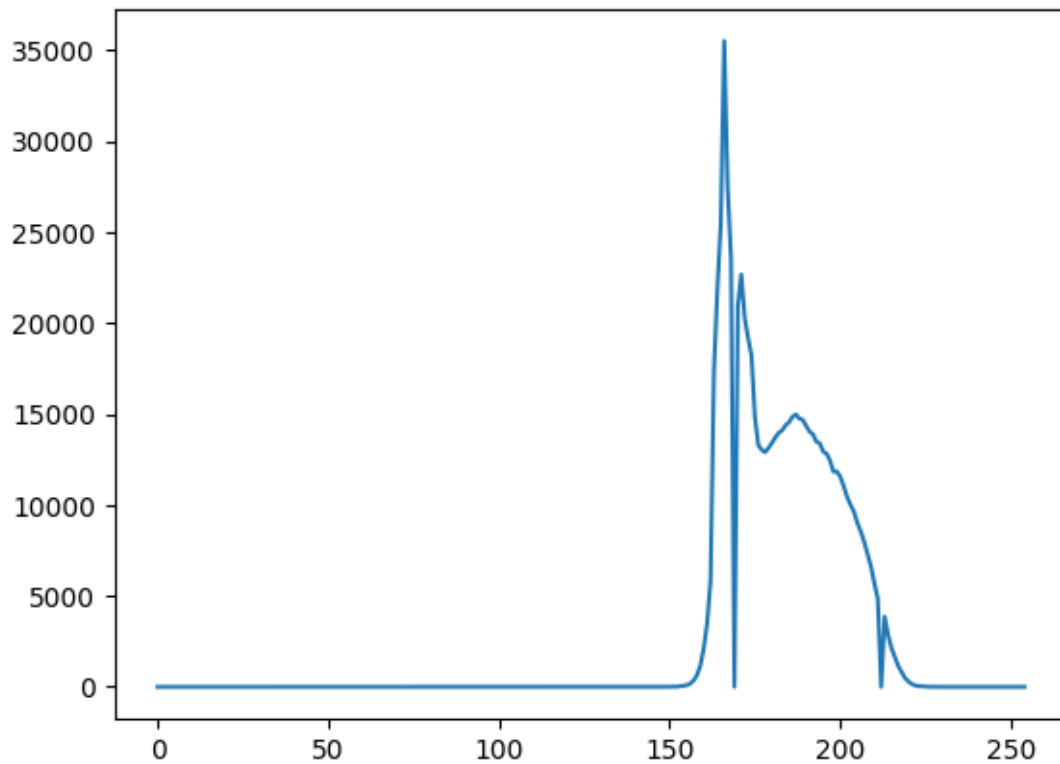
```
[ ]: from matplotlib import pyplot as plt
import cv2
import numpy as np
```

```
[ ]: #read image and show
img = cv2.imread("input_sat_image.jpg")
plt.imshow(img)
plt.show()
img.shape
```



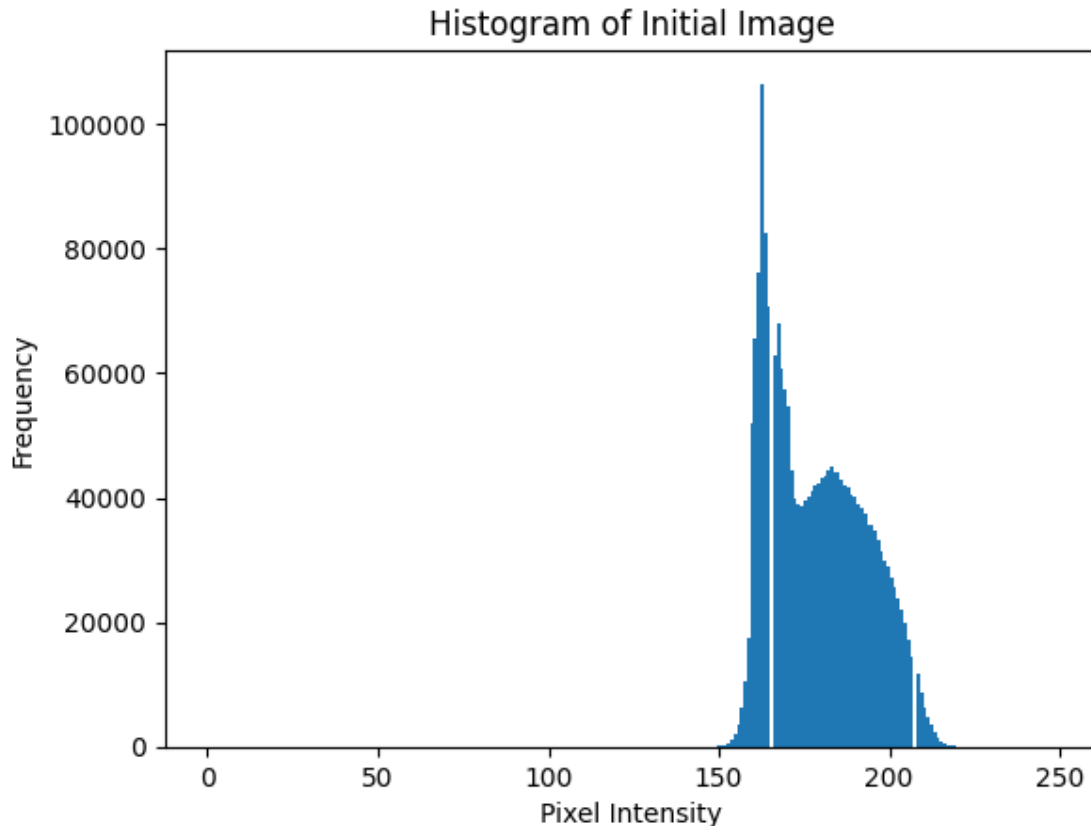
```
[ ]: (691, 1048, 3)
```

```
[ ]: img=cv2.imread("input_sat_image.jpg",cv2.IMREAD_GRAYSCALE)
img.shape
histogram = cv2.calcHist([img],[0],None,[255],[0,249])
plt.plot(histogram)
plt.show()
```



```
[ ]: img=cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
plt.hist(img.ravel(), bins=255, range=(0, 249))
plt.title('Histogram of Initial Image')
plt.xlabel('Pixel Intensity')
plt.ylabel('Frequency')
plt.show()

plt.savefig("After_Streched")
```



<Figure size 640x480 with 0 Axes>

b) The histogram of the initial grayscale image shows the pixel intensities are clustered around the middle of the 150-255 intensity range, with a peak around 160. This indicates that the image has low contrast, as most of the pixel values are concentrated in a narrow range.

c) Enhance the image using contrast stretching (self-written code; built-in min, max are allowed).

```
[ ]: # Calculate minimum and maximum pixel values
min_val=np.min(img)
max_val=np.max(img)

#vectorized operations
contrast_stretching= np.zeros_like(img)
# Perform contrast stretching
contrast_stretching = 255*((img - min_val)/ (max_val - min_val))

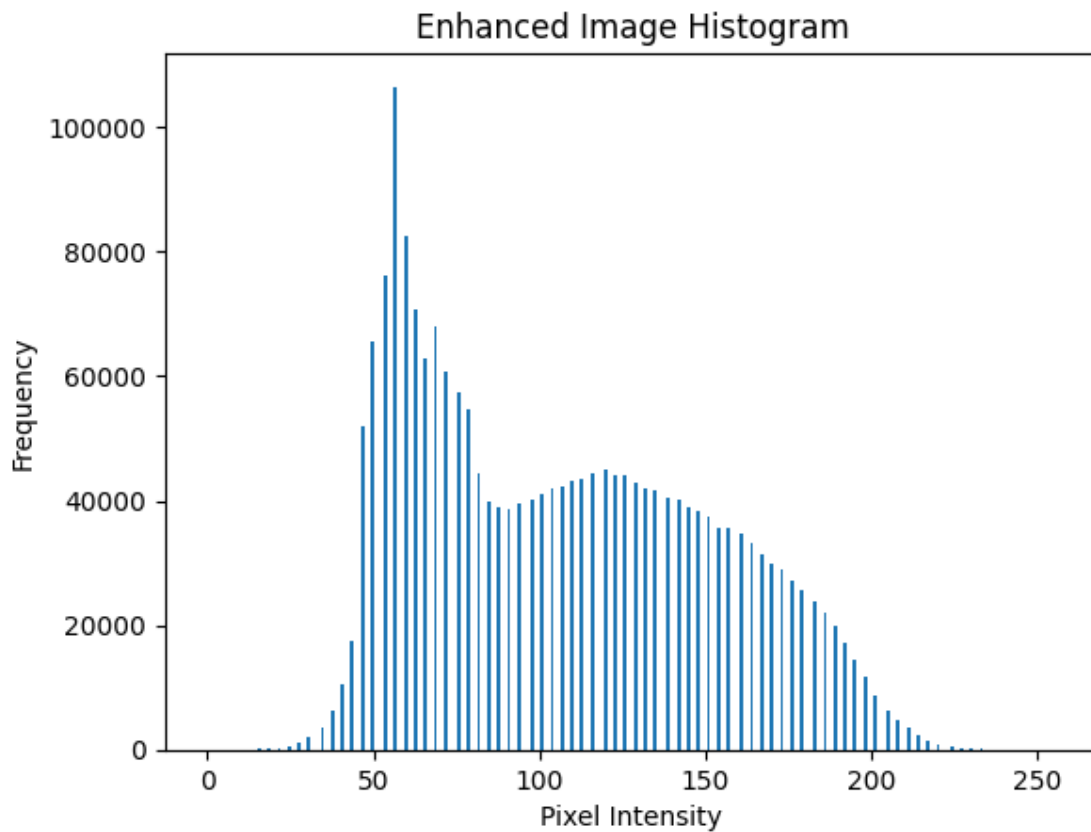
# Round the pixel values to the nearest integer
contrast_stretching = np.round(contrast_stretching)
```

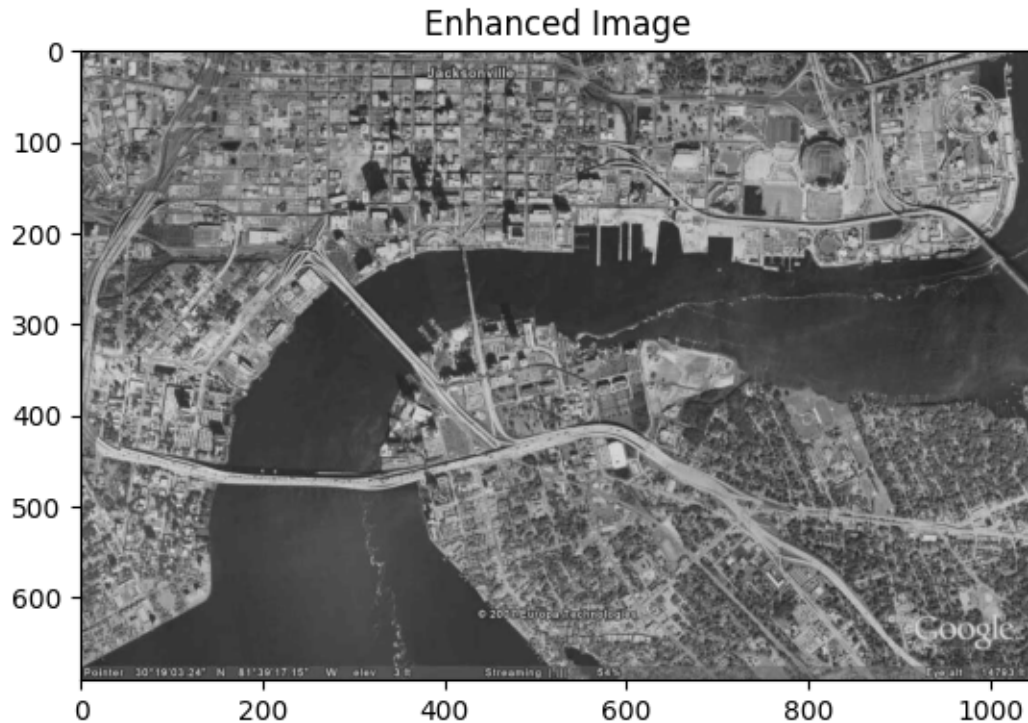
```

#pixel values to the range [0, 255]
contrast_stretching = np.clip(contrast_stretching, 0, 255)
contrast_stretching = contrast_stretching.astype('uint8')

plt.figure()
plt.hist(contrast_stretching.ravel(), bins=255, range=(0, 256))
plt.title('Enhanced Image Histogram')
plt.xlabel('Pixel Intensity')
plt.ylabel('Frequency')
plt.show()
plt.figure()
plt.imshow(contrast_stretching, cmap='gray')
plt.title("Enhanced Image")
plt.savefig("enhanced_image.png")
plt.show()

```





d) Shortly describe the differences compared to the initial histogram. Differences are

1. Histogram of the enhanced image shows an increased spread of pixel intensities compared to the initial histogram.
2. The contrast of the image has been enhanced, resulting in a greater range of pixel values.
3. The pixel values in the enhanced image are distributed over a wider range of intensities than in the initial image, which is reflected in the shape of the histogram.

```
[ ]: cv2.imwrite("Enhanced.jpg", contrast_stretching)
```

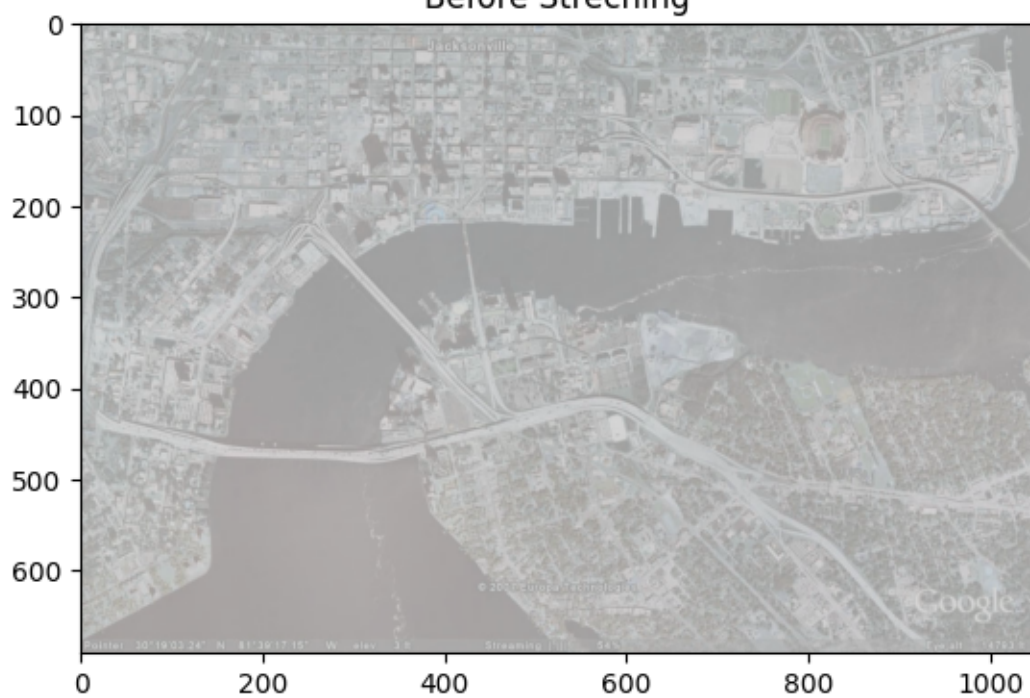
```
[ ]: True
```

e) Visualize the resulting enhanced image.

```
[ ]: img = cv2.imread("input_sat_image.jpg")
plt.title("Before Streching")
plt.imshow(img)
plt.show()

plt.title("After Streching")
plt.imshow(contrast_stretching)
plt.show()
```

Before Stretching



After Stretching

