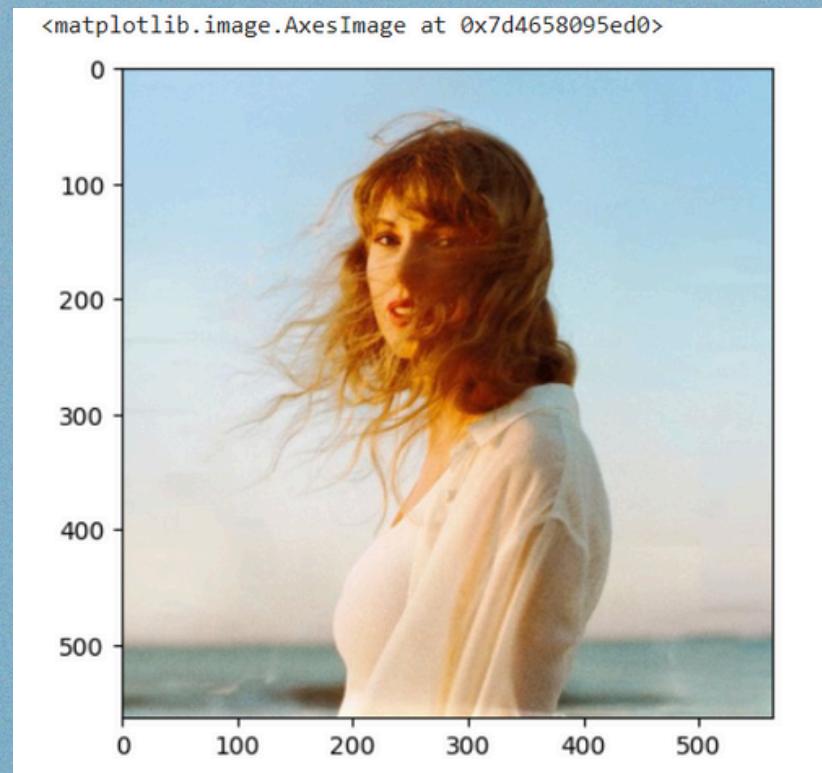


Tugas 03 : Histogram

Imports

Plot the image to Histogram

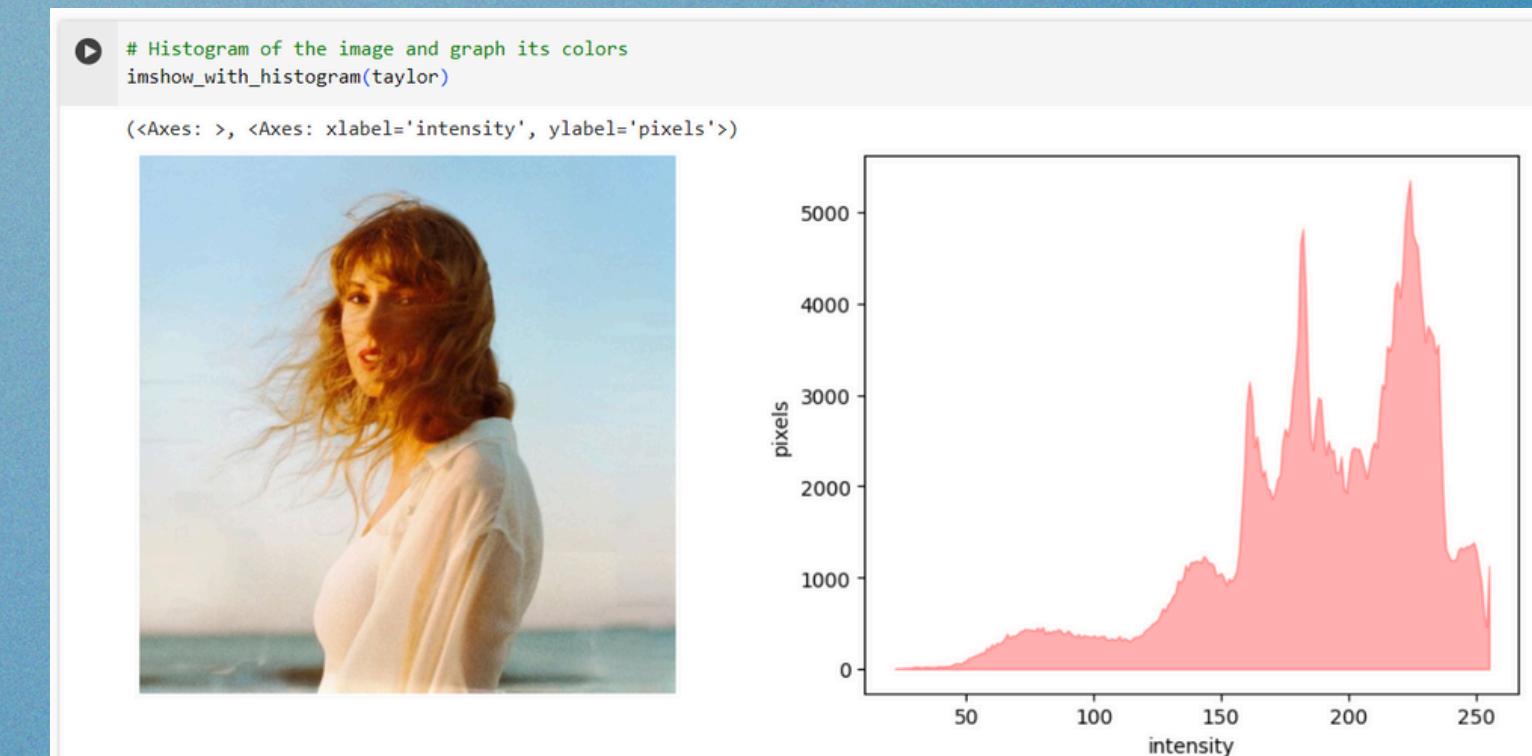
This is the image that will be used throughout this notebook.



The first step is to import all necessary libraries, prepare the image that will be used for the process, and mount the directory where the file is located. Then, store the image in a variable

```
img_path = './taylor.jpg'  
taylor = imread(img_path)  
  
# Plot the image with histogram  
plt.imshow(taylor)
```

Here, the original image is displayed with its histogram for the color contents.

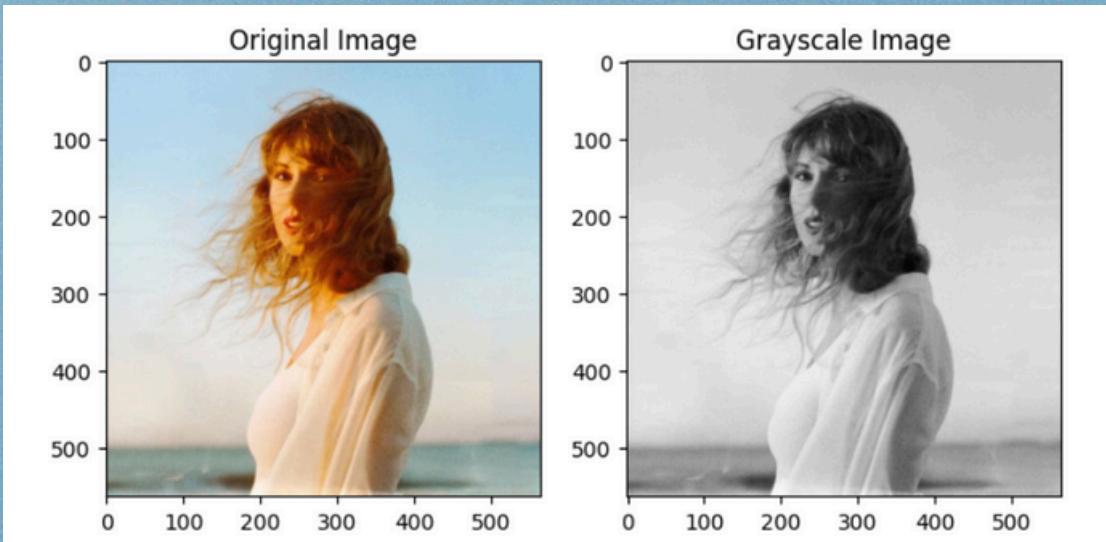


Grayscale The Image

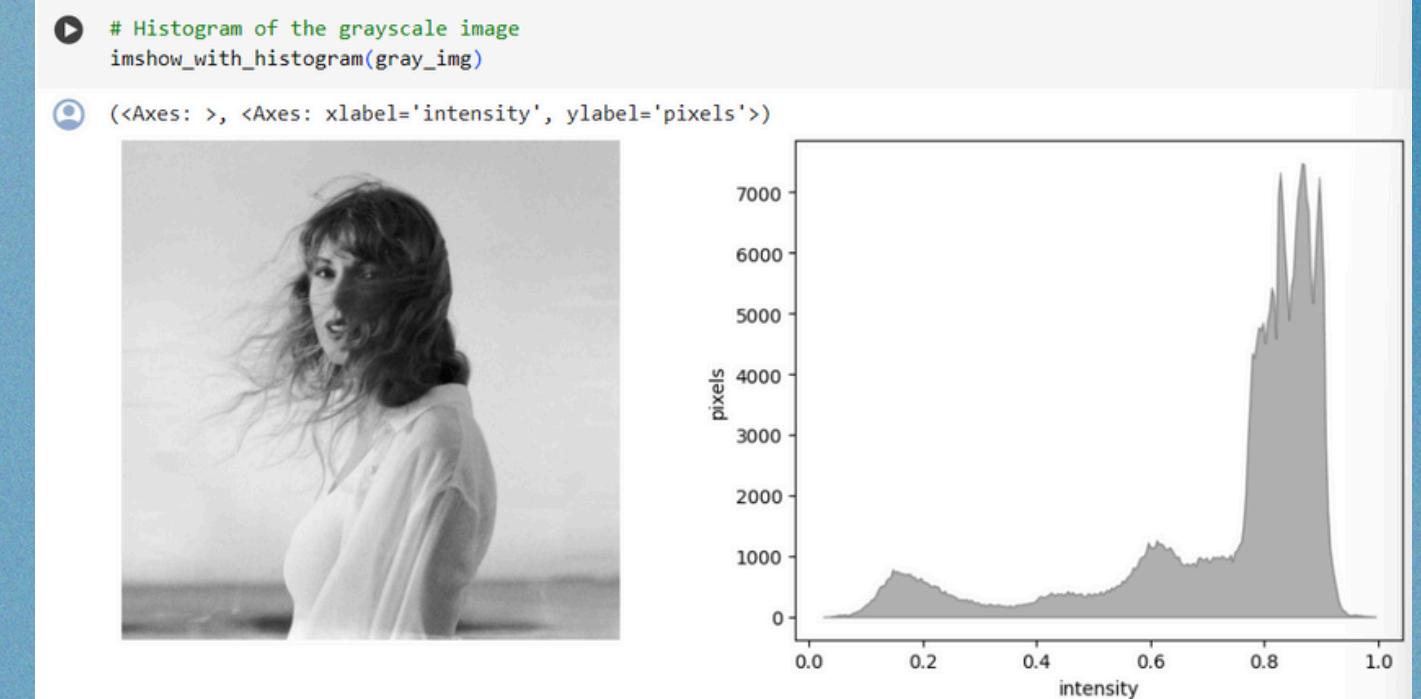
Convert RGB image to gray tones

```
from skimage.color import rgb2gray  
  
# Turn the image into grayscale  
gray_img = rgb2gray(taylor)
```

Below is a comparison between the original and processed image using *rgb2gray* function.

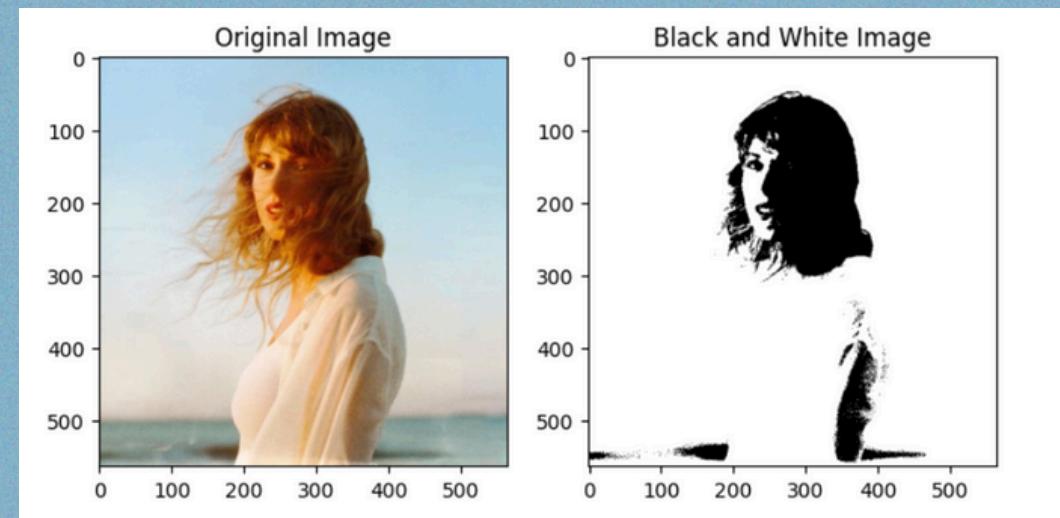


Plot the grayscaled image pixels against its intensity.

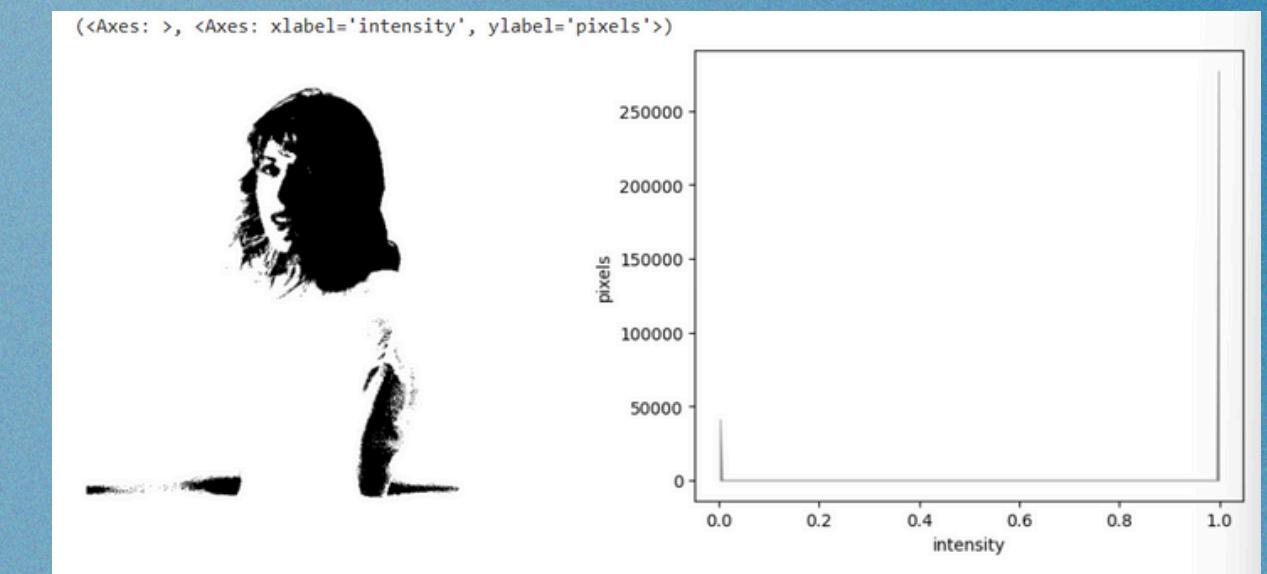


Convert to Black and White

Turn the previous grayscale image to its minimum and maximum color value to bring out the black and white.



```
bw_img = gray_img  
  
# Convert image to black and white  
np.min(bw_img), np.max(bw_img)  
cutoff = np.max(bw_img)/2  
  
bw_img[bw_img < cutoff] = 0 # Black mask  
bw_img[bw_img >= cutoff] = 1 # White mask
```

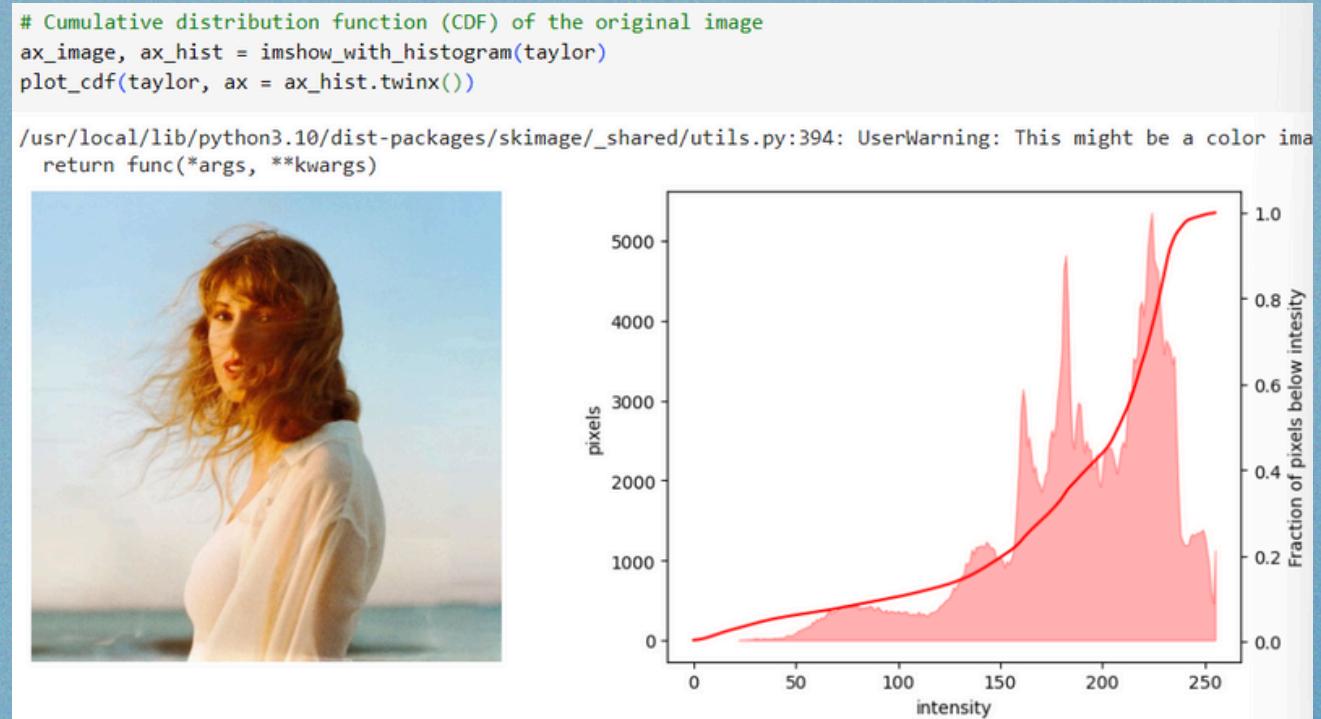


In comparison with the original image, the BW saturates the darkest parts of the image.

From the graph, it is visible that the intensity of the image is less sparse and more concentrated on both extreme ends of the level (0.0 and 1.0)

Higher Exposure and Contrast

The Cumulative Distribution Function (CDF) of the image gives the fraction of pixels below the intensity value.



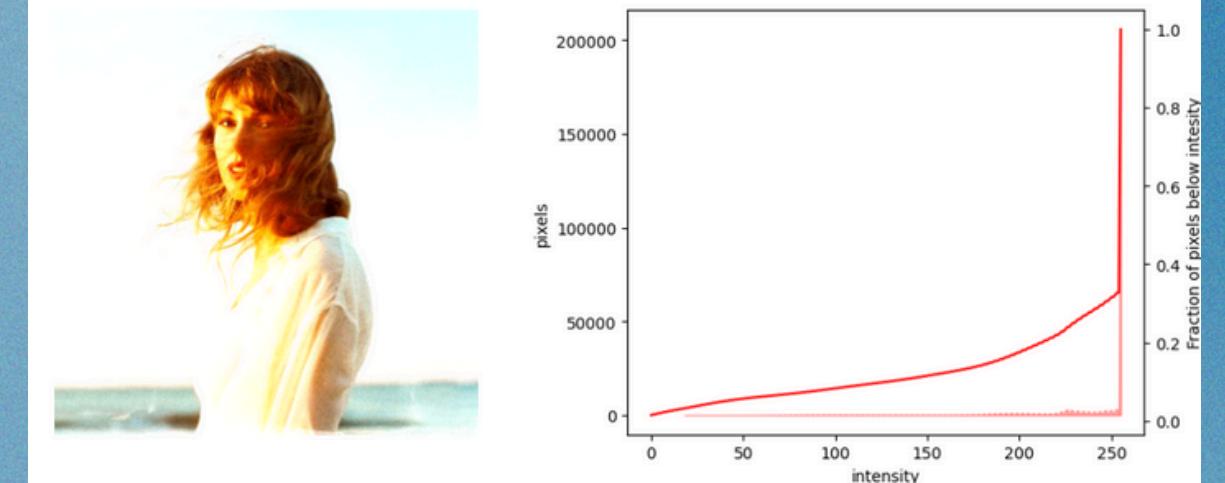
Enhance the image contrast to easily identify features

The image has visibly higher contrast and the histogram is noticeably stretched. The sharp peak on the right is due to all the pixels greater than 180 being piled into a single bin of 255 and at the lowest reaching 0.

```
# Enhance the contrast of the image to identify features
high_contrast = exposure.rescale_intensity(taylor, in_range=(10, 180)) # range set from (0, 255)

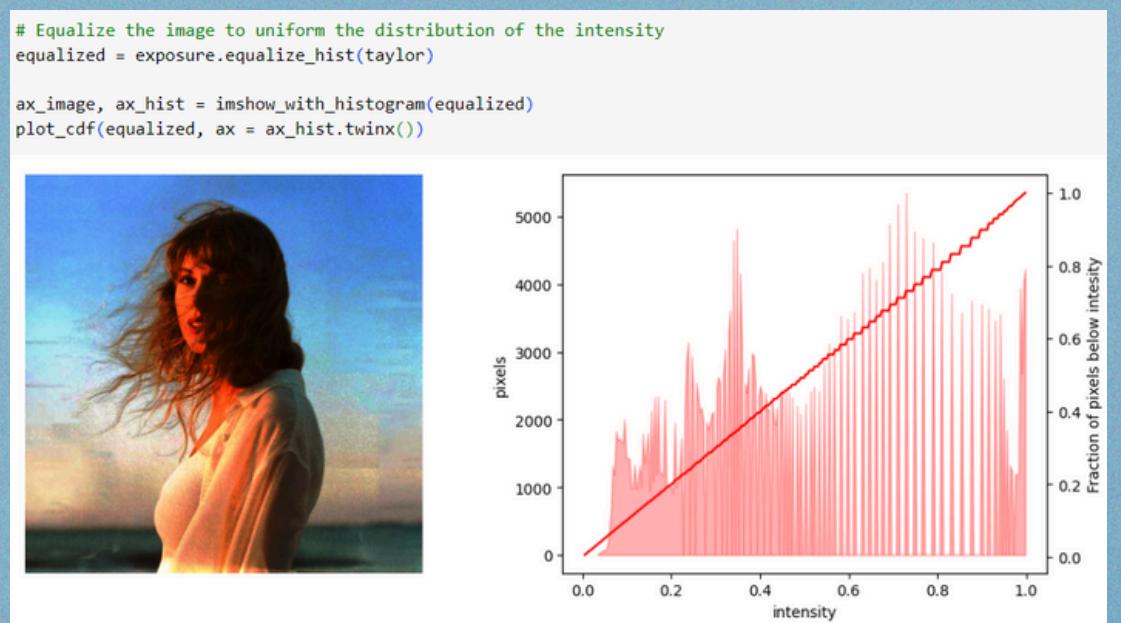
# Cumulative distribution function (CDF) of the image intensities
ax_image, ax_hist = imshow_with_histogram(high_contrast)

plot_cdf(high_contrast, ax = ax_hist.twinx())
```



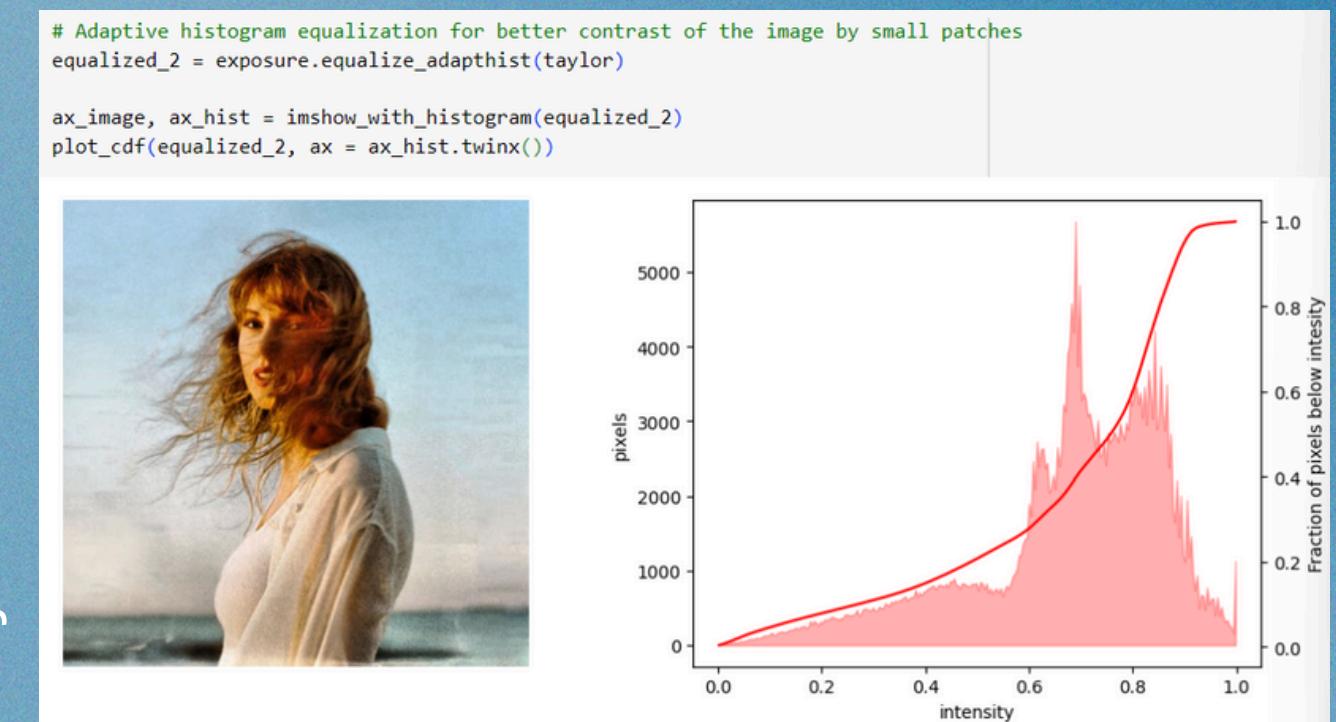
Equalize

Redistribute the intensities of the previous exposure process to enhance contrast using Histogram equalization.



This more even distribution reveals details that were missed before and produces a straight line in the CDF graph. The image intensities also change to 0.0 - 1.0

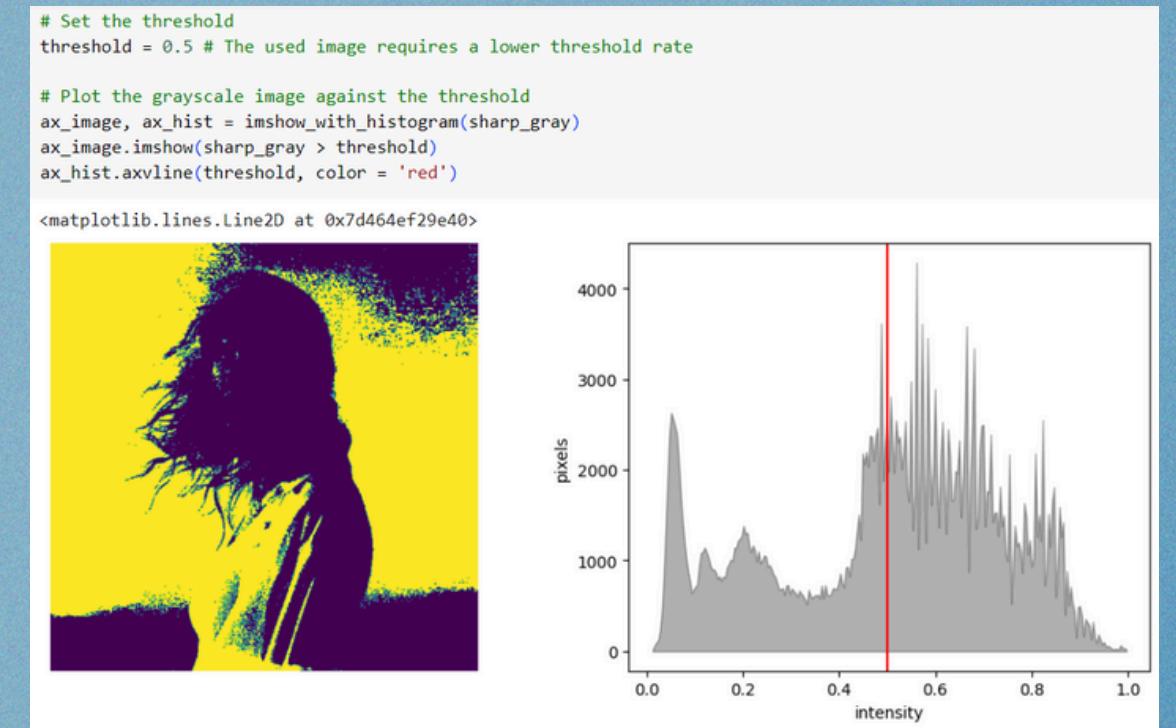
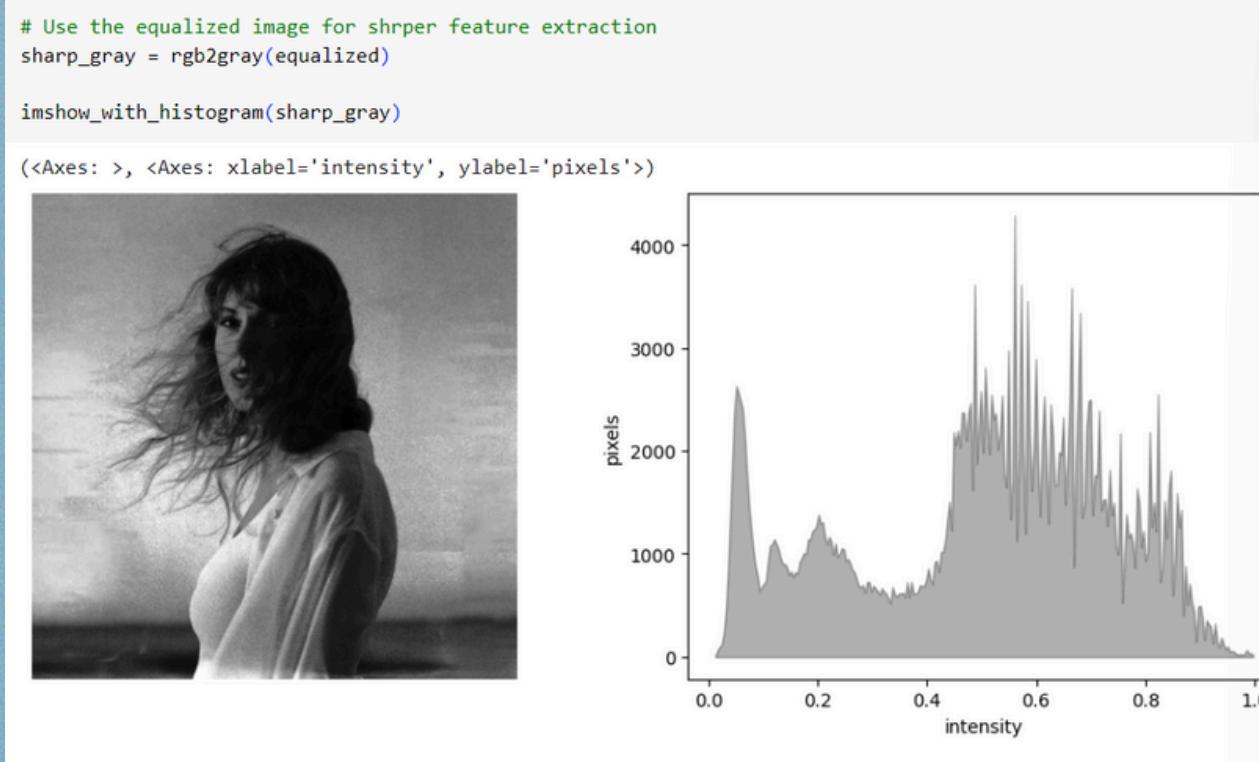
While *equalization_1* gives high contrast, it can give an overly-enhanced look. Before, the contrast in the hair and blouse is much improved, but the contrast in the sea is somewhat reduced.



This can be better addressed by looking at smaller patches of the image using contrast-limited adaptive histogram equalization.

Threshold

In this section, the equalized image will be used for sharper image segmentation or object extraction process.

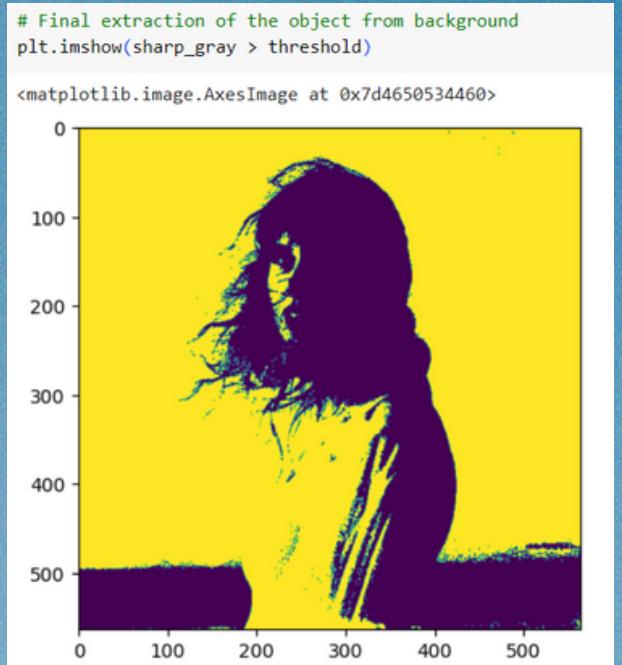


Thresholding to separate objects from the background

By setting the threshold manually, the optimal value for the process might not be achieved, thus Otsu threshold method is used to help with automatic image segmentation.

```
# Use otsu for better threshold according to the image
threshold = filters.threshold_otsu(sharp_gray)
print(threshold)

0.40989615463574836
```



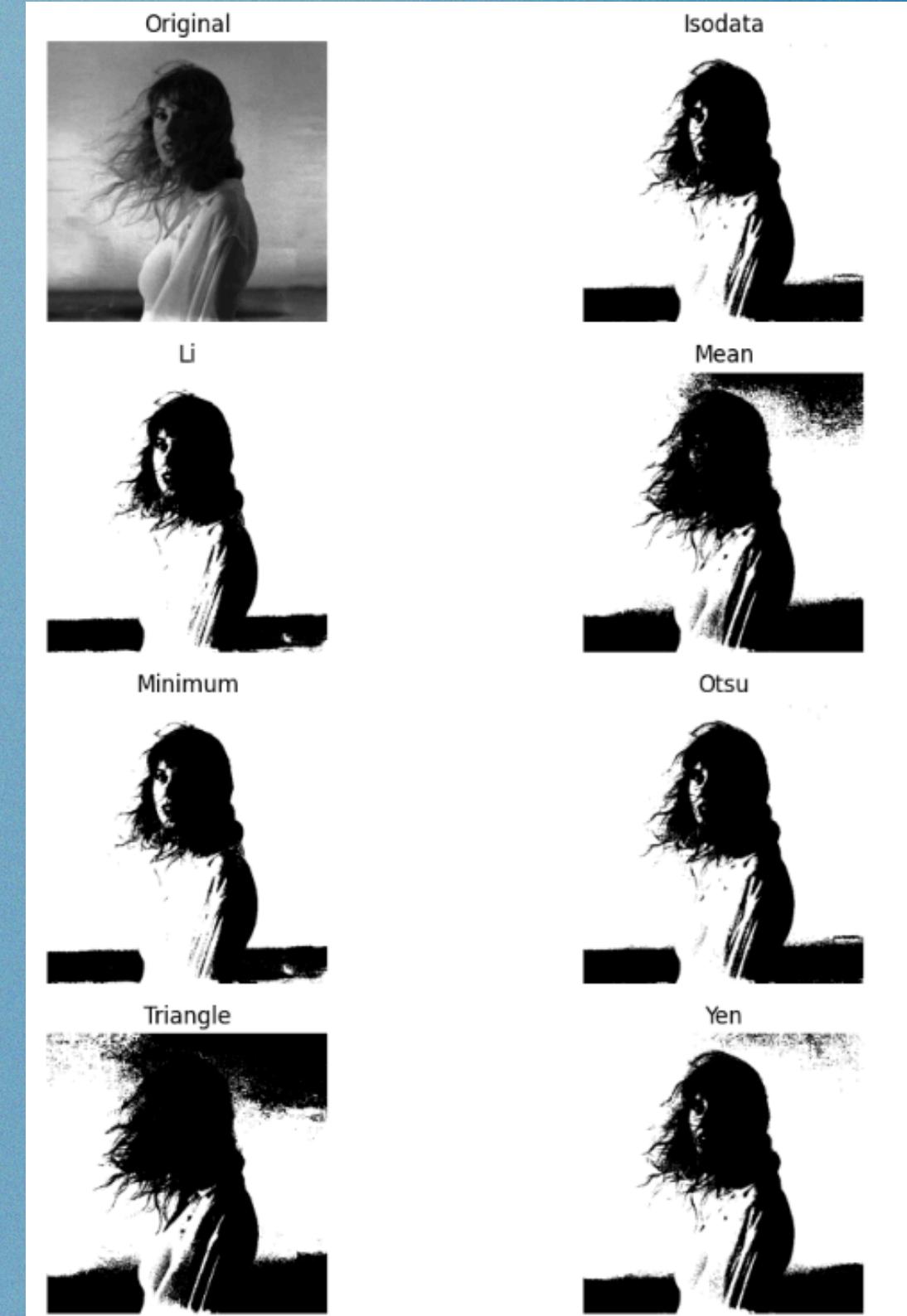
All Threshold

Compare all threshold methods to look at how it separate the object from the background of the image used

```
# Try all threshold to choose the best for the selected image
from skimage.filters import try_all_threshold

fig, ax = try_all_threshold(sharp_gray, figsize=(10, 10), verbose=False)
plt.show()
```

using *try_all_threshold* function will display seven methods of thresholding, we can see the comparison of how each method extracts from the image differently.



Access the full
notebook here :

https://colab.research.google.com/drive/IOM6BuN4uCeZvGFb5oVorZFvz2mGvg_5m?usp=sharing