

2.1 Exercise- 1:

1. Read and display the image.

Format: JPEG
Mode: RGB
Size: (960, 639)

matplotlib to display the image

```
[5] print("Displaying image using Pillow's .show() method:")  
display(image_colored)
```

Displaying image using Pillow's .show() method:



2. Display only the top left corner of 100x100 pixels.

```
display(top_left_crop)
```



3. Show the three color channels (R, G, B).

```
image_display_COLORED:
```

(639, 960, 3)

Red Channel



Green Channel



Blue Channel



+ Code

+ Text

4. Modify the top 100 × 100 pixels to a value of 210 and display the resulting image:

Image with Modified Top-Left 100×100 Pixels



2.2 Exercise- 2:

1. Load and display a grayscale image



Grayscale Image



2. Extract and display the middle section of the image (150 pixels).

Middle 150-Pixel Section



3. Apply a simple threshold to the image (e.g., set all pixel values below 100 to 0)



Binary Image (Threshold 100)



4. Rotate the image 90 degrees clockwise and display the result.



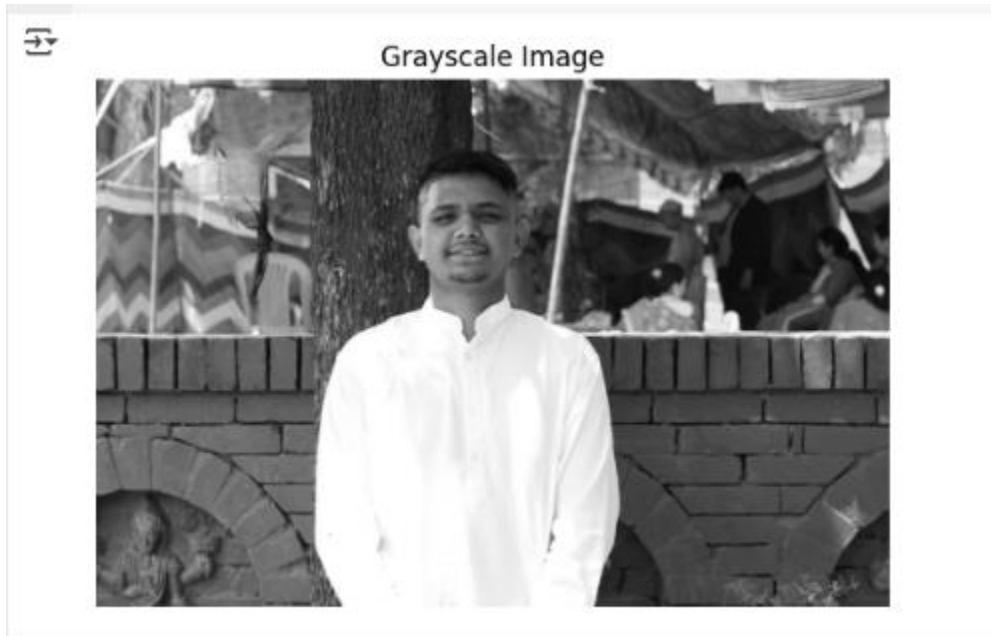
5. Convert the grayscale image to an RGB image



3 Image Compression and Decompression using PCA.

1. Load and Prepare Data

- Fetch an image of you choice.{If colour convert to grayscale}



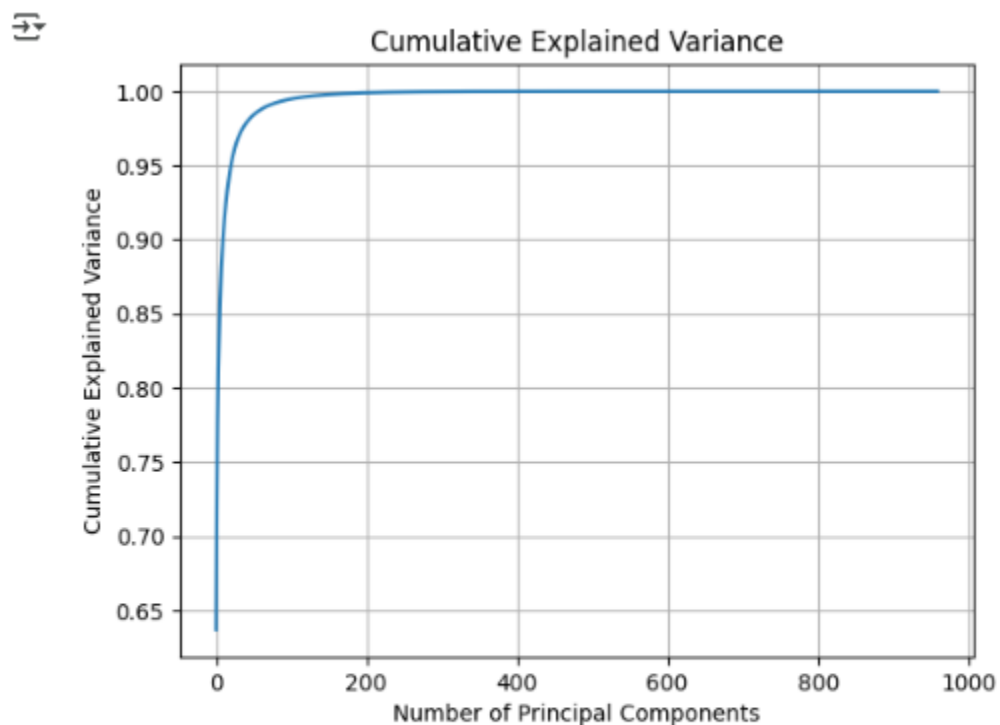
Center the dataset- Standardize the Data.



Calculate the covariance matrix of the Standardize data.

```
Covariance Matrix:  
[[0.39244643 0.38994572 0.37225586 ... 0.09524069 0.09813295 0.0972154 ]  
 [0.38994572 0.40168299 0.39356847 ... 0.08624734 0.08859676 0.08770974]  
 [0.37225586 0.39356847 0.39885271 ... 0.07289899 0.07517511 0.07486797]  
 ...  
 [0.09524069 0.08624734 0.07289899 ... 0.42276649 0.43200949 0.43099886]  
 [0.09813295 0.08859676 0.07517511 ... 0.43200949 0.44440512 0.44539684]  
 [0.0972154  0.08770974 0.07486797 ... 0.43099886 0.44539684 0.44912762]]
```

2. Eigen Decomposition and Identifying Principal Components:



Top 5 Eigenvalues: [443.89204883 60.19232147 37.38905885 24.76887621 15.91311501]

Top 5 Eigenvectors:

```
[[-0.01418479 -0.0119998  0.04481991 -0.00492539  0.03880738]  
 [-0.01515347 -0.01259291  0.04443382 -0.00371449  0.03925545]  
 [-0.01558175 -0.01303177  0.04465699 -0.00346793  0.03704136]  
 ...
```

3. Reconstruction and Experiment:

