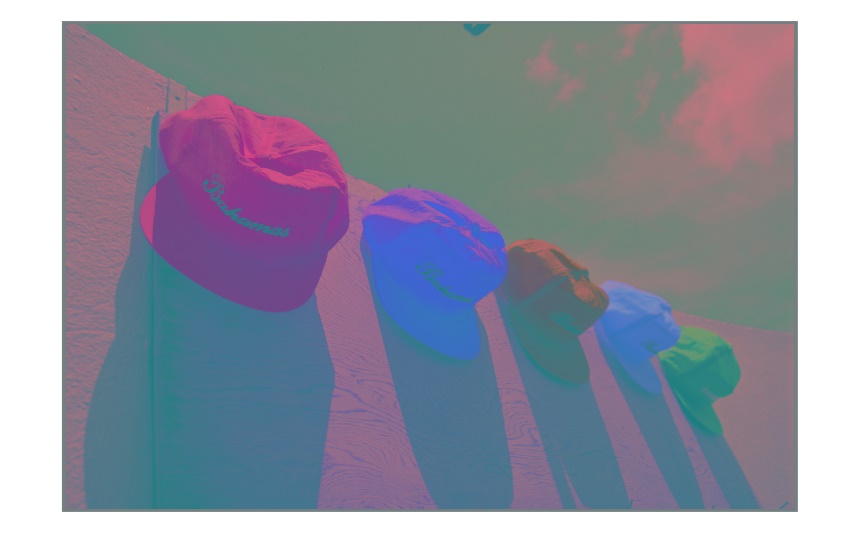
PROJECT – 3

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**Compression**



Ycbcr Image is given above. The size of X matrix is found to be 64x98304. The size of C matrix is found to be 64x64.A picture containing text, line, diagram, plot

Description automatically generated

A picture containing text, screenshot, line, diagram

Description automatically generated

Size of T matrix is found to be 64x64.

A picture containing text, line, diagram, screenshot

Description automatically generated

As can be seen from the MSE vs K figure, when we increase the number of principal components, the mean square error between the original and reconstructed image decreases. It is noticeable from reconstructed images as well. If you look at it carefully, you can see that when K=1 the image is in least quality whereas when K = 4, the image is as close as the original image in terms of quality.

A picture containing black and white, sky, outdoor, cloud

Description automatically generated

Several hats on a wall

Description automatically generated with low confidence

A picture containing black and white, sky, cloud, outdoor

Description automatically generated

A picture containing black and white, sky, cloud, fashion accessory

Description automatically generated

A picture containing screenshot, text, design

Description automatically generated

**Detection**

The size of L matrix is found to be 10304x20 and size of x is found to be 3x20.

Blur close-up of a person's face

Description automatically generated

A picture containing jaw, human face, x-ray film, skin

Description automatically generated

A picture containing text, diagram, line, plot

Description automatically generated

I trained detector for 10 epochs with a learning rate of 0.001 and I got the following results in testing dataset.

A picture containing text, font, receipt, screenshot

Description automatically generated

As you can see from the results, my detector can perfectly distinguish the male faces from female faces i.e., recall is 100%.

**Restoration**

2D blur kernel is shown below:

A black and white pixelated rectangle

Description automatically generated with low confidence

A picture containing line, plot, text, screenshot

Description automatically generated

When restoring the image from the blurred image, I put a termination condition such that if the change in loss is less than 1 for 3 consecutive times then break the process. I got following MSE results for blurred image without noise and lambda:

A picture containing text, font, screenshot, line

Description automatically generated

A picture containing text, line, diagram, plot

Description automatically generated

As you can see from the graph, ||a||^2 is inverse proportional to ||b-Ha||^2.

I chose lambda based on the best outcome I got from MSE results, and I found it to be 0.01. All the restored images with their corresponding lambdas and MSE results is shown below:

A picture containing text, screenshot, font, line

Description automatically generated

A black text on a white background

Description automatically generated with low confidence

A picture containing text, font, line, screenshot

Description automatically generated

A picture containing text, font, line, screenshot

Description automatically generated

A picture containing text, font, line, screenshot

Description automatically generated

A black text on a white background

Description automatically generated with low confidence

A picture containing text, screenshot, font, line

Description automatically generated

A person using a camera

Description automatically generated with low confidence