

# Report: Color Quantization

Submitted By:

Janvi Soni (17)  
Mukul Singh (25)

Submitted To:

Dr. Vasudha Bhatnagar

## Color Quantization

Color quantization or color image quantization is quantization applied to color spaces; it is a process that reduces the number of distinct colors used in an image, usually with the intention that the new image should be as visually similar as possible to the original image.

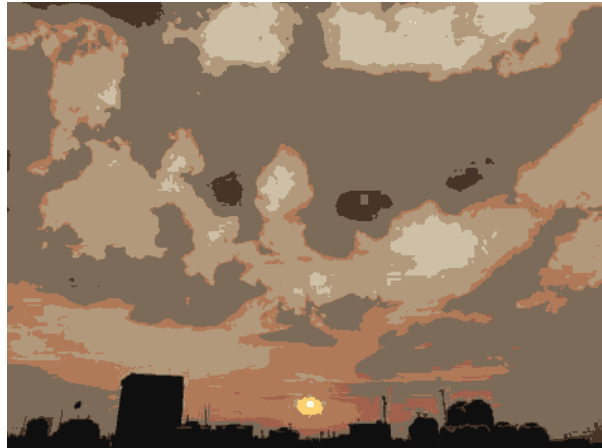
It uses Some clustering technique to group similar colors into one group and a single color is assigned to every color as their representative which is replaced at every position in the image inplace of original colors.

The Clustering scheme used here is **K-means clustering** which clusters the points on the basis of the euclidean distances between them and tries to minimize the SSE. Representative for each cluster is the mean of the cluster members.

These means are written in a separate table called a codebook; whose indexes for each color are used to map original images to new images with fewer colors.

# For outdoor Image

## Using 4-bit Codebook



Size of codebook: **16**

$2^{24}$  colors are mapped to 16 colors. There is a very visible loss in image detail.

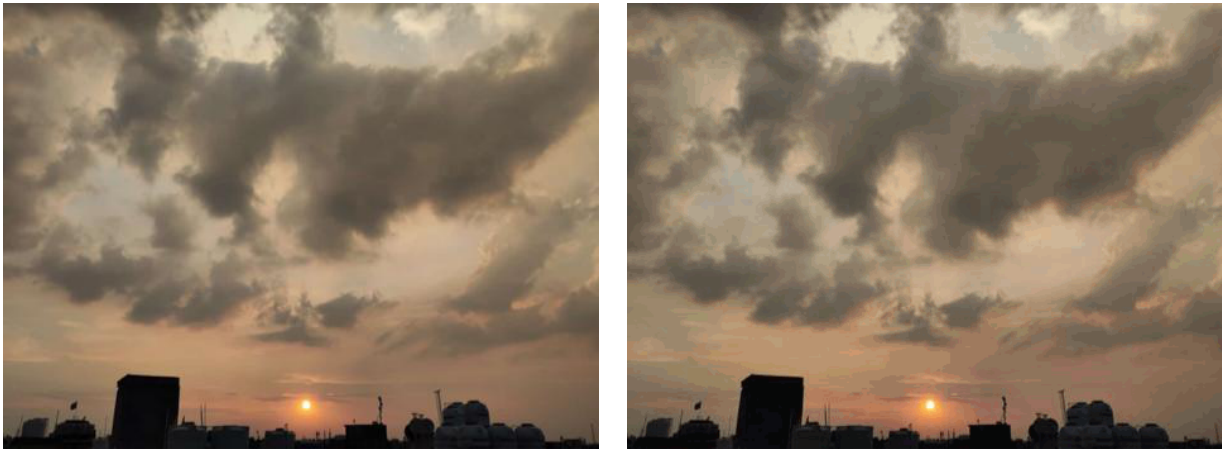
## Using 8-bit Codebook



Size of codebook: **256**

$2^{24}$  colors are mapped to 256 colors. There is still a very visible loss in image detail but much better than the 4-bit codebook.

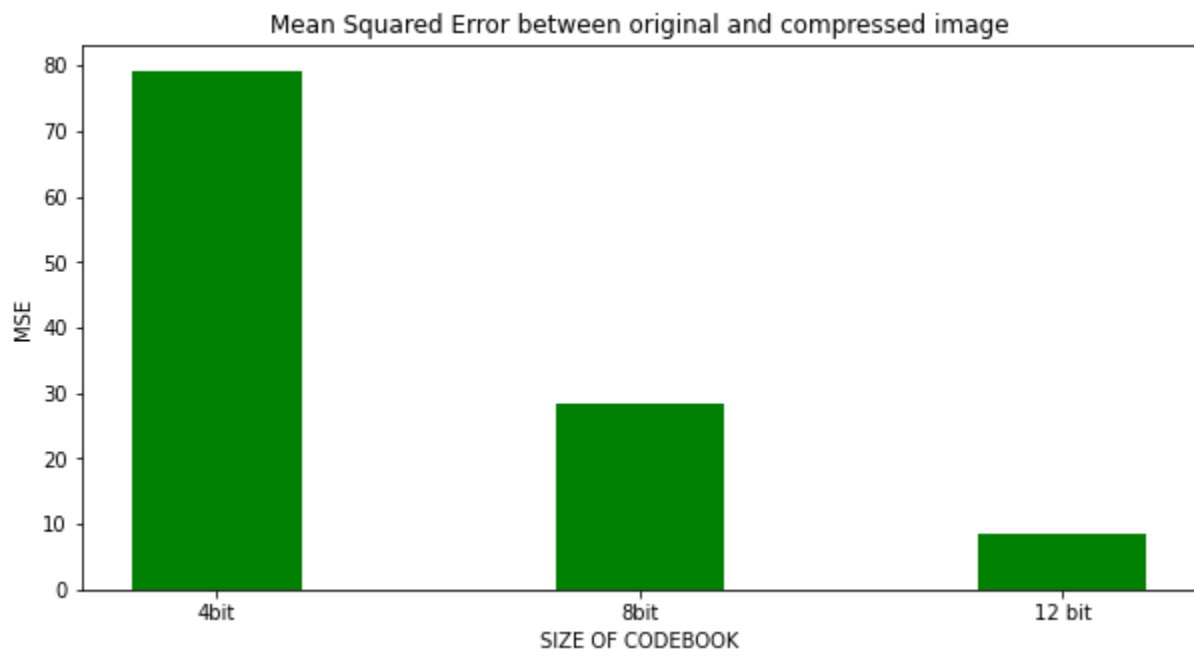
## Using 12-bit Codebook



Size of codebook: **4096**

$2^{24}$  colors are mapped to 4096 colors. The compressed image looks good but some loss of detail can be seen on close observation.

## Reconstruction Error



As the codebook size is increased the reconstruction error reduces substantially. Even though numerically, there is still a large error for the 12-bit codebook, the compressed image with the 12-bit codebook is quite acceptable.

# For Indoor Image

Using 4-bit Codebook



Size of codebook: 16

$2^{24}$  colors are mapped to 16 colors. Both images look similar in quality, but the compressed image looks like it only has variants of the yellow color in the whole image.



## Using 8-bit Codebook



Size of codebook: **256**

$2^{24}$  colors are mapped to 256 colors. Both images look similar in quality, but the compressed image looks just a little washed out.

As indoor images have lower number of colors than outdoor images, an 8 bit codebook is able to provide good enough quality.

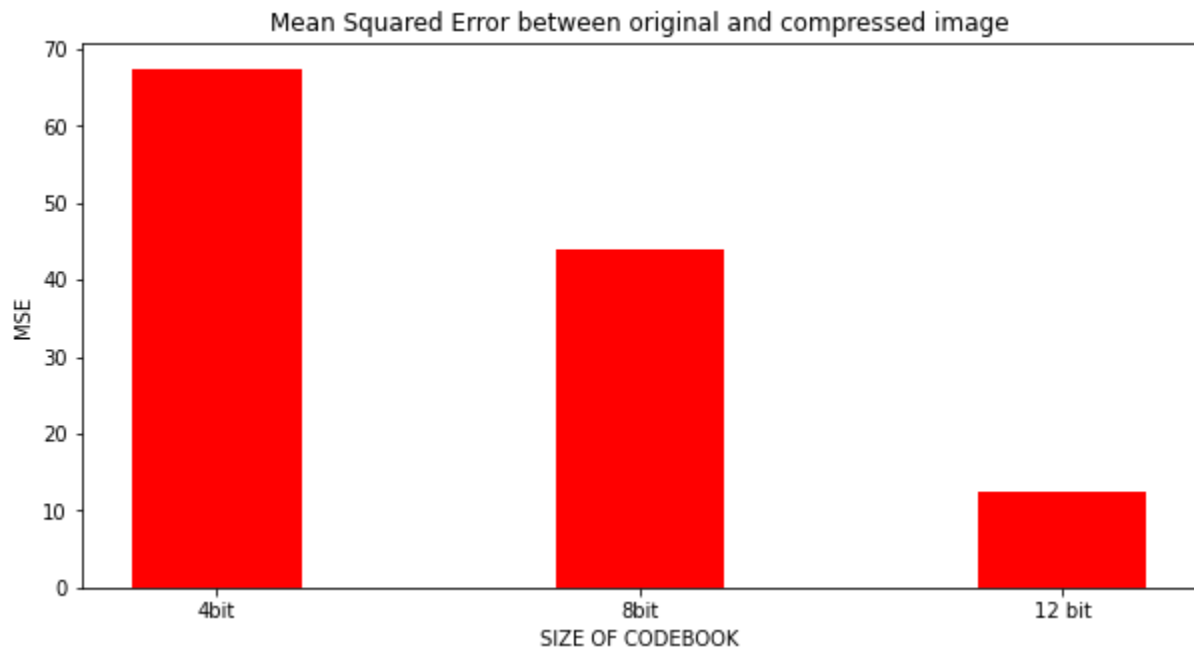
Using 12-bit Codebook



Size of codebook: **4096**

$2^{24}$  colors are mapped to 4096 colors. The compressed image looks similar to the original with no easily visible loss in quality.

## Reconstruction Error



The reconstruction error is the same or even higher for some codebook sizes for the indoor image. Even then, the images compressed with same size codebooks are visually better, when compared to outdoor one, due to the lower number of colors in them.

Code:

[https://colab.research.google.com/drive/1Muljvulpz34oeArxj6lnqhhoprksbm32?usp=sharing#scrollTo=6c-IWS\\_gX-30](https://colab.research.google.com/drive/1Muljvulpz34oeArxj6lnqhhoprksbm32?usp=sharing#scrollTo=6c-IWS_gX-30)