**K-means clustering on images:**

Image compression ratio for different values of K are reported below:

**Koala.jpg:**

C:\Emkae\UTD\kmeans>javac KMeans.java

C:\Emkae\UTD\kmeans>java KMeans C:\Emkae\UTD\kmeans\Koala.jpg 2

Original Image:C:\Emkae\UTD\kmeans\Koala.jpg

Output Image:C:\Emkae\UTD\kmeans\Koala\_output\_k2.jpg

Image width: 1024

Image height: 768

Input Image size: 762.5302734375 KB

Output Image size: 127.1005859375 KB

Compression Ratio: 83.33173247476086

C:\Emkae\UTD\kmeans>java KMeans C:\Emkae\UTD\kmeans\Koala.jpg 5

Original Image:C:\Emkae\UTD\kmeans\Koala.jpg

Output Image:C:\Emkae\UTD\kmeans\Koala\_output\_k5.jpg

Image width: 1024

Image height: 768

Input Image size: 762.5302734375 KB

Output Image size: 171.5166015625 KB

Compression Ratio: 77.50691250731592

C:\Emkae\UTD\kmeans>java KMeans C:\Emkae\UTD\kmeans\Koala.jpg 10

Original Image:C:\Emkae\UTD\kmeans\Koala.jpg

Output Image:C:\Emkae\UTD\kmeans\Koala\_output\_k10.jpg

Image width: 1024

Image height: 768

Input Image size: 762.5302734375 KB

Output Image size: 159.583984375 KB

Compression Ratio: 79.0717837790764

C:\Emkae\UTD\kmeans>java KMeans C:\Emkae\UTD\kmeans\Koala.jpg 15

Original Image:C:\Emkae\UTD\kmeans\Koala.jpg

Output Image:C:\Emkae\UTD\kmeans\Koala\_output\_k15.jpg

Image width: 1024

Image height: 768

Input Image size: 762.5302734375 KB

Output Image size: 153.81640625 KB

Compression Ratio: 79.82815743739683

C:\Emkae\UTD\kmeans>java KMeans C:\Emkae\UTD\kmeans\Koala.jpg 20

Original Image:C:\Emkae\UTD\kmeans\Koala.jpg

Output Image:C:\Emkae\UTD\kmeans\Koala\_output\_k20.jpg

Image width: 1024

Image height: 768

Input Image size: 762.5302734375 KB

Output Image size: 151.9404296875 KB

Compression Ratio: 80.07417738281396

**Penguins.jpg :**

C:\Emkae\UTD\kmeans>java KMeans C:\Emkae\UTD\kmeans\Penguins.jpg 2

Original Image:C:\Emkae\UTD\kmeans\Penguins.jpg

Output Image:C:\Emkae\UTD\kmeans\Penguins\_output\_k2.jpg

Image width: 1024

Image height: 768

Input Image size: 759.6044921875 KB

Output Image size: 83.0205078125 KB

Compression Ratio : 89.0705612372804

C:\Emkae\UTD\kmeans>java KMeans C:\Emkae\UTD\kmeans\Penguins.jpg 5

Original Image:C:\Emkae\UTD\kmeans\Penguins.jpg

Output Image:C:\Emkae\UTD\kmeans\Penguins\_output\_k5.jpg

Image width: 1024

Image height: 768

Input Image size: 759.6044921875 KB

Output Image size: 108.158203125 KB

Compression Ratio : 85.76124756535769

C:\Emkae\UTD\kmeans>java KMeans C:\Emkae\UTD\kmeans\Penguins.jpg 10

Original Image:C:\Emkae\UTD\kmeans\Penguins.jpg

Output Image:C:\Emkae\UTD\kmeans\Penguins\_output\_k10.jpg

Image width: 1024

Image height: 768

Input Image size: 759.6044921875 KB

Output Image size: 112.92578125 KB

Compression Ratio : 85.13360802740941

C:\Emkae\UTD\kmeans>java KMeans C:\Emkae\UTD\kmeans\Penguins.jpg 15

Original Image:C:\Emkae\UTD\kmeans\Penguins.jpg

Output Image:C:\Emkae\UTD\kmeans\Penguins\_output\_k15.jpg

Image width: 1024

Image height: 768

Input Image size: 759.6044921875 KB

Output Image size: 111.8984375 KB

Compression Ratio: 85.2688552199374

C:\Emkae\UTD\kmeans>java KMeans C:\Emkae\UTD\kmeans\Penguins.jpg 20

Original Image:C:\Emkae\UTD\kmeans\Penguins.jpg

Output Image:C:\Emkae\UTD\kmeans\Penguins\_output\_k20.jpg

Image width: 1024

Image height: 768

Input Image size: 759.6044921875 KB

Output Image size: 112.259765625 KB

Compression Ratio: 85.22128729100645

There is a trade-off between Quality of Image and the compression ratio. The main aim is to reconstruct the original data exactly from the compressed representation without any loss of data rather than more compression.