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CS-6375: Machine Learning
Assignment-5
K-Means Clustering for Image Compression

Image-1: Koala.jpg

Observations:

- Results after applying K-Means Algorithm for image Compression on the **Koala.jpg** image.
- Each observation has **20** iterations.

K Value	Size before compression (in KB)	Size after compression (in KB)	Ratio
2	762.53	128.75	5.92
5	762.53	169.912	4.48
10	762.53	172.494	4.42
15	762.53	167.75	4.54
20	762.53	157.10	4.85
25	762.53	155.666	4.90

Compressed Images:

K = 2

K = 5

K = 10

K = 15

K = 20

K = 25

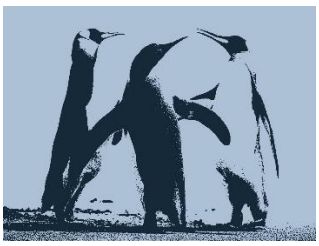
Image-2: Penguins.jpg

Observations:

- Results after applying K-Means Algorithm for image Compression on the **Penguins.jpg** image.
- Each observation has **20** iterations.

K Value	Size before compression (in KB)	Size after compression (in KB)	Ratio
2	759.604	83.220	9.12
5	759.604	99.867	7.60
10	759.604	113.913	6.66
15	759.604	114.317	6.64
20	759.604	111.603	6.80
25	759.604	112.0947	6.77

Compressed Images:



K = 2

K = 5

K = 10

K = 15

K = 20

K = 25

Discussion

1. **Is there a tradeoff between image quality and degree of compression?**

   - ⇨ Yes. 'K' represents the degree of compression.
   - ⇨ Smaller value of K means fewer clusters, and hence fewer colors to represent the image.
   - ⇨ Therefore, for smaller 'K' values, a lot of details in the image are compromised, which produces a lower image quality.
   - ⇨ Higher 'K' values show more colors due to a larger number of clusters, and hence produces a better-quality image.
   - ⇨ However, higher values of K take longer to execute.

2. **What would be a good value of K for each of the two images?**

   - ⇨ For Koala.jpg, k= 15 gives a compression ratio of 4.54, which is close to that for k=20 and 25. Hence k=15 would be a good choice for k, as it has almost the same compression ratio as of greater values of k.
   - ⇨ For Penguins.jpg, k= 15 gives a compression ratio of 6.64, which is close to that for k=20. Hence k=15 would be a good choice for k, as it has almost the same compression ratio as of greater values of k.