

(1)

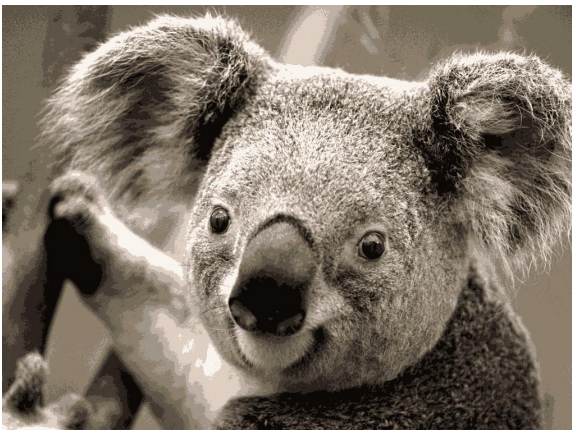
- K=2, Koala



- K=5



- K=10



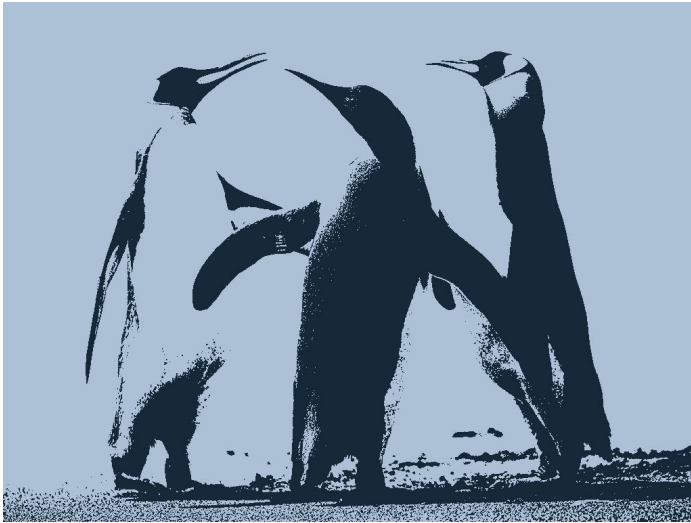
- K=15



- K=20



- K=2, Penguin



- K=5



- K=10



- K=15



- K=20



Koala Image

Compression Ratio Formula used as per Wikipedia:

Uncompressed Image Size/Compressed Image Size

K=2	Compression Ratio(in KB) (Gave the Same Compression Ratio for k=2 for multiple random initializations)
Iteration 1	762.5302734375/129.3076171875 =5.897025171624714
Iteration 2	762.5302734375/129.3076171875 =5.897025171624714

Iteration 3	762.5302734375/129.3076171875 =5.897025171624714
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Average for K=2: 5.897025171624714

Variance for K=2: 0

K=5	Compression Ratio
Iteration 1	762.530273437/172.3583984375 =4.424096999915012
Iteration 2	762.530273437/172.142578125 =4.429643622996018
Iteration 3	762.530273437/173.53125 =4.394195705024311

Average for K=5: 4.415978776

Variance for K=5: 0.000363567892

K=10	Compression Ratio
Iteration 1	762.530273437/159.751953125 =4.773214089225239
Iteration 2	762.530273437/159.5458984375 =4.7793787299158375
Iteration 3	762.530273437/160.4208984375 =4.753310079076647

Average for K=10: 4.768634299

Variance for K=10: 0.0001856244952

K=15	Compression Ratio
Iteration 1	762.530273437/156.05078125 =4.8864239405241685
Iteration 2	762.530273437/155.68359375 =4.8979488144523895
Iteration 3	762.530273437/152.669921875 =4.994633285145905

Average for K=15: 4.926335347

Variance for K=15: 0.003531661976

K=20	Compression Ratio
Iteration 1	762.530273437/152.6513671875

	=4.99524038000192
Iteration 2	762.530273437/152.078125 =5.0140694030617485
Iteration 3	762.530273437/152.822265625 =4.9896542910090105

Average for K=20: 4.999654691

Variance for K=20: 0.0001636390327

Penguin Image

Compression Ratio Formula used as per Wikipedia:

Uncompressed Image Size/Compressed Image Size

K=2	Compression Ratio(in KB)
Iteration 1	759.6044921875/83.220703125 =9.127590415170504
Iteration 2	759.6044921875/83.220703125 =9.127590415170504
Iteration 3	759.6044921875/83.220703125 =9.127590415170504

Average for K=2: 9.127590415170504

Variance for K=2: 0

K=5	Compression Ratio
Iteration 1	759.6044921875/103.705078125 KB =7.324660526960092
Iteration 2	759.6044921875/103.724609375 =7.323281300016947
Iteration 3	759.6044921875/100.6591796875 =7.546301236963377

Average for K=5: 7.398081021

Variance for K=5: 0.01647739981

K=10	Compression Ratio
Iteration 1	759.6044921875/113.890625 =6.669596309507477

Iteration 2	759.6044921875/116.44140625 =6.5234912274816335
Iteration 3	759.6044921875/113.916015625 =6.668109729961423

Average for K=10: 6.620399089

Variance for K=10: 0.007043902695

K=15	Compression Ratio
Iteration 1	759.6044921875/113.2021484375 =6.710159680466533
Iteration 2	759.6044921875/111.080078125 =6.8383503595730835
Iteration 3	759.6044921875/113.857421875 =6.716185295514398

Average for K=15: 6.754898445

Variance for K=15: 0.00523224352

K=20	Compression Ratio
Iteration 1	759.6044921875/114.861328125 =6.613230968049108
Iteration 2	759.6044921875/113.43359375 =6.696468542305176
Iteration 3	759.6044921875/113.6787109375 =6.682029431219772

Average for K=20: 6.663909647

Variance for K=20: 0.001978368372

2)Is there a tradeoff between image quality and degree of compression. What would be a good value of K for each of the two images?

-Lesser the compression, higher the image quality.

-For Penguin Image - k=20 is a good value because image quality is not degraded that much and we can see the eyes and colors of penguins.

-For Koala Image - $k=20$ is a good value because image quality is not degraded that much and we can see the minute hairs and its colors which define the image quality with a compressed image size of 152 KB.

Increasing the value of K gives better colors in the images and makes the image quality sharper because it will get a chance to pick more centroids.