Indian Institute of Technology, Jodhpur

Principle of Biological Vision

Assignment 3 Spatial Envelop Representation

Dipinti Manandhar

M20CS020

Google Colab Link:
https://colab.research.google.com/drive/1JK5pvJuhKukExH0zLjVEYG8MV_ye2GtN#scrollTo=g-viVWLoSbj_

1) Access the images and show them, just to check if you are working with the correct set of images.

Results:

image 1

image 2

image 3

image 4

image 5

image 6

image 7

image 8

image 9

image 10

image 11

image 12

image 13

image 14

image 15

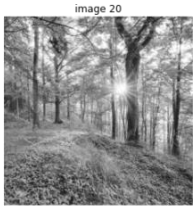
image 16

image 17

image 18

image 19

image 20



2) For each image

a) Create DoG and extract edges.

- **You can borrow <u>your own code</u> from programming assignment 1 with appropriate corrections (if needed).**
- **Use an appropriate pair of sigmas and window sizes learned from programming assignment 1 for the DoG filter. Experimentation with multiple DoG filters is not needed.**

Results:

Values of sigma used: low sigma =3, High sigma = 7

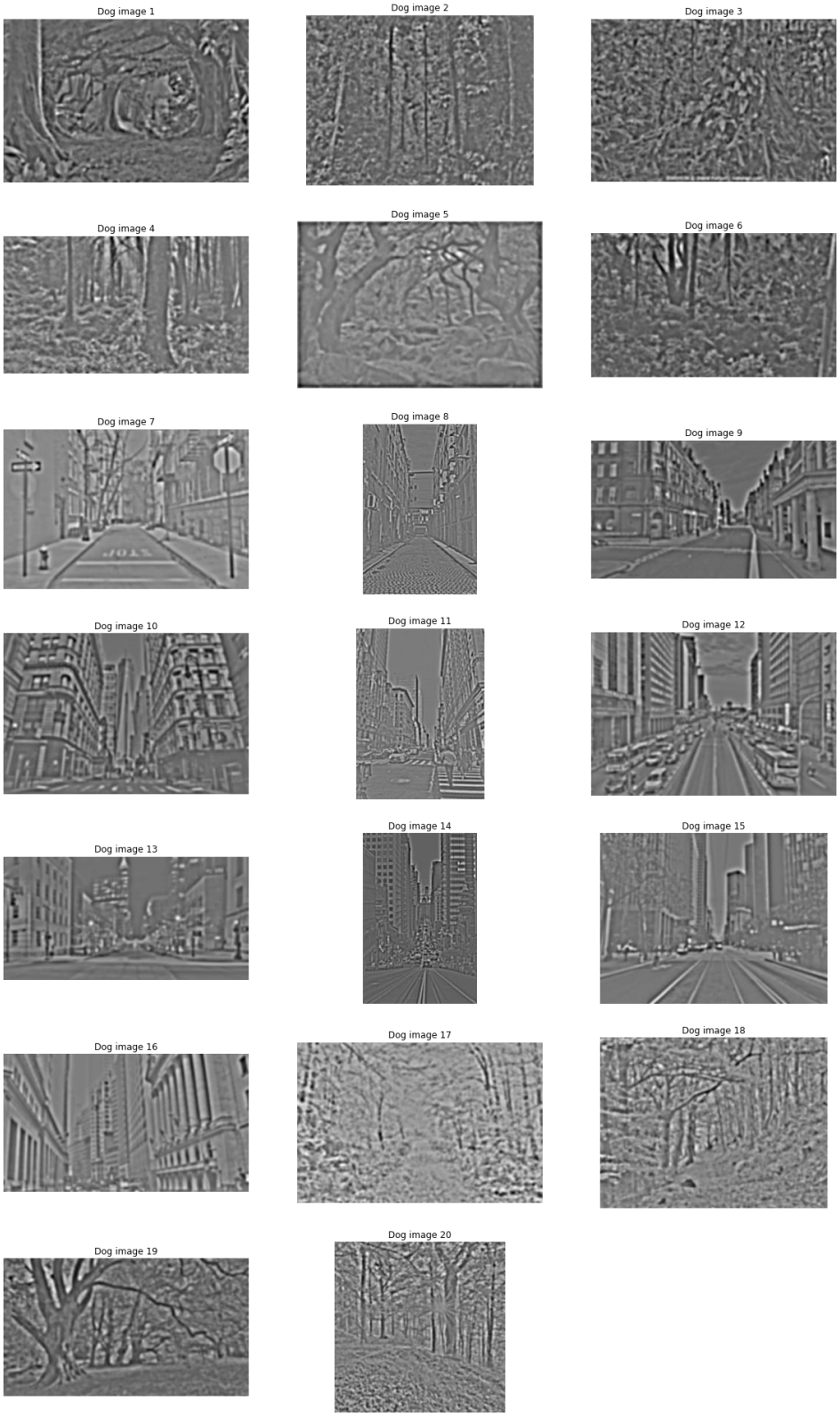
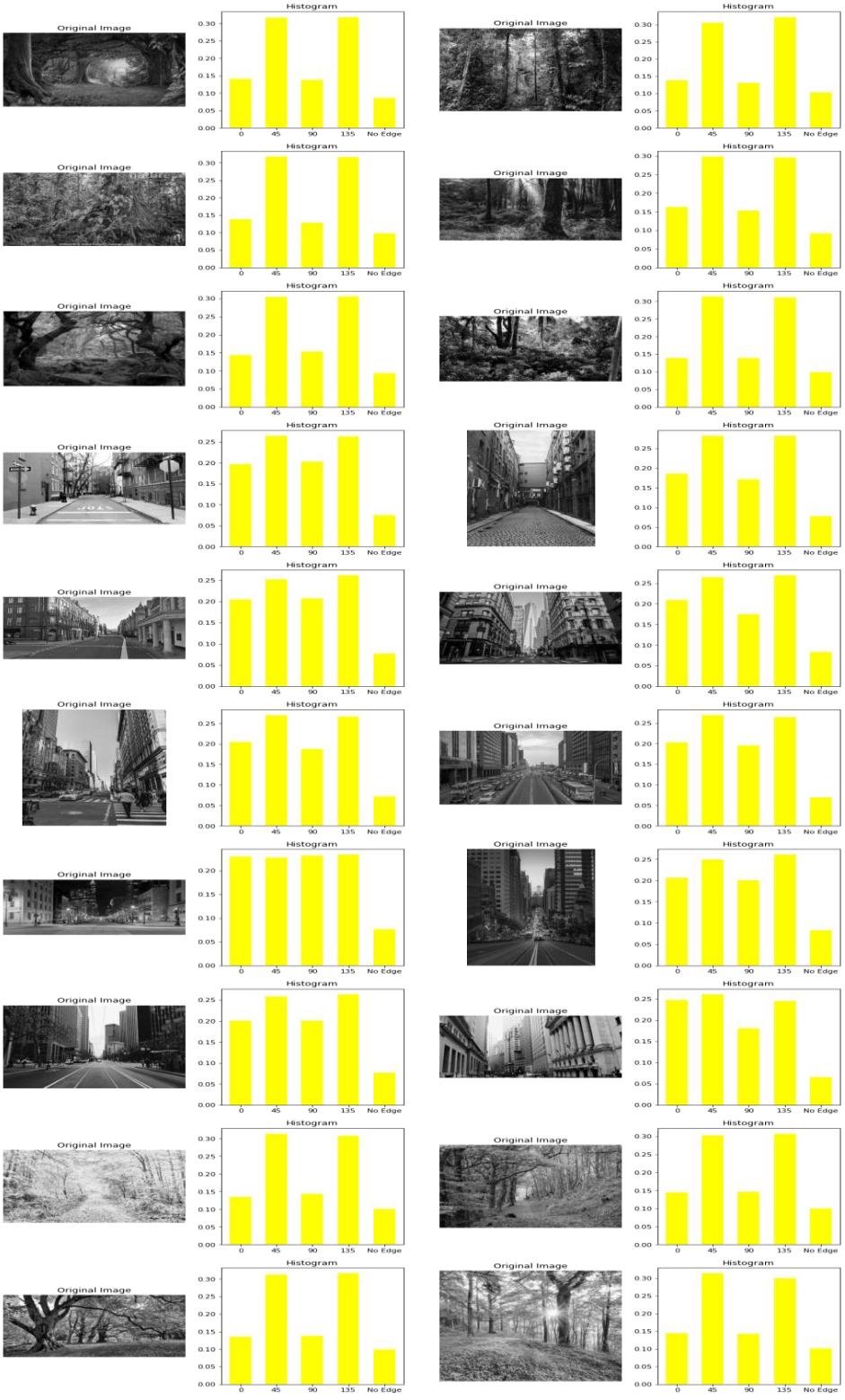


Figure: Snapshot

b. Compute the global edge histogram (we treat it as a simplified spatial envelop representation)

- **Keep an entry for "no edge", i.e. for the image locations where you find no edge.**
- **Normalize with respect to image size**
- **Each image will be represented by a histogram with five numbers, adding upto 1**


Original Image
Histogram
0
45
90
135
No Edge

3) **Observe the four oriented edge orientation maps and the corresponding histograms for a few forest and city images, and comment on the differences observed.**

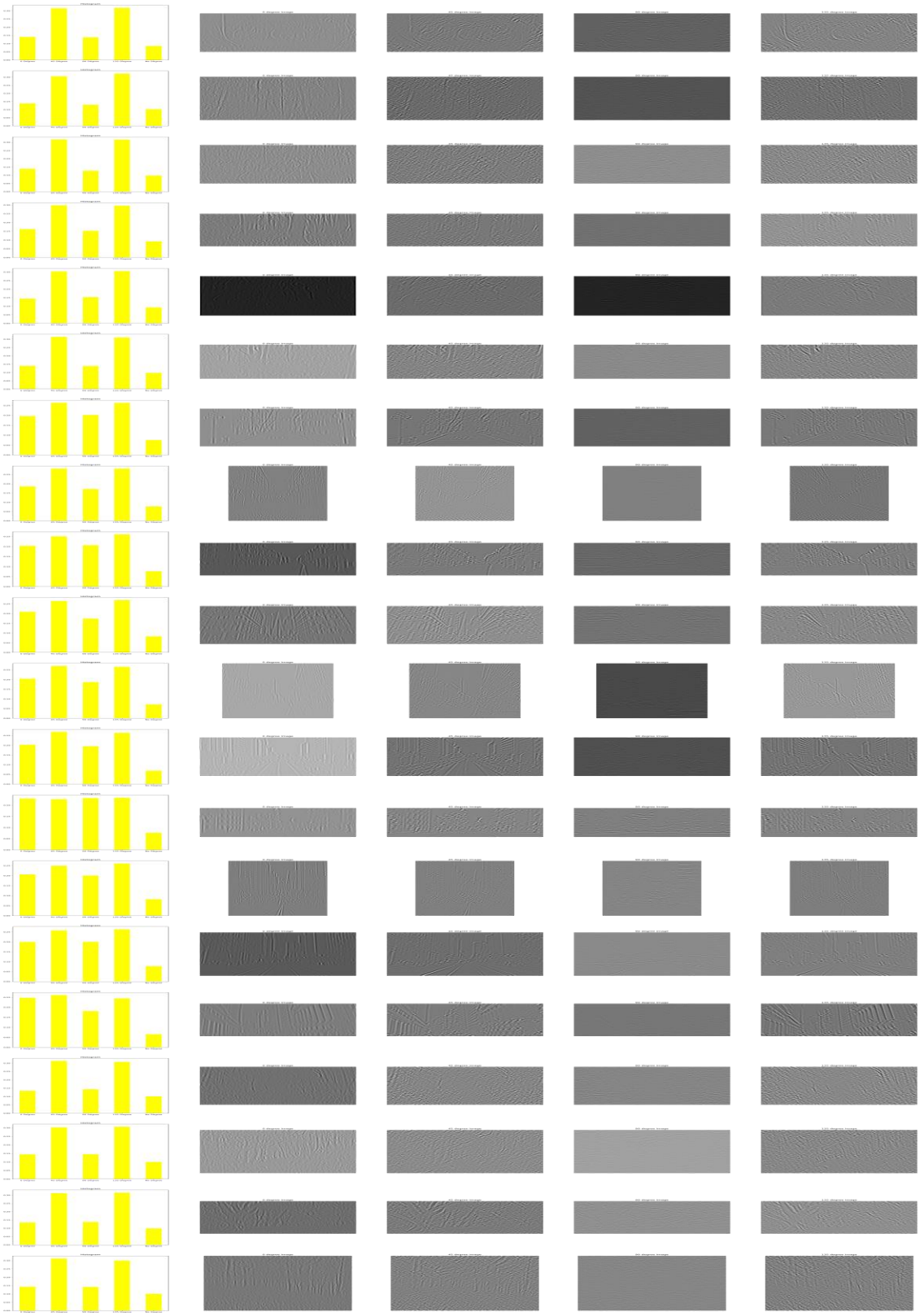


Figure: Snapshot

Comments:

Here, in the image containing the buildings i.e the images of cities consists many edges of 0 degree, 45 degree, 90 degree and 135 degrees as we can observe that there are many edges of 0, 45, 90 and 135 degree. Therefore, the histogram plot is also observed as same
In the forest image, it consists of many edges of 45 degree and 135 degrees. Therefore, the histogram plot is also observed as same. It doesn't contains many 0 and 90 degree edges. One of the reason may be the image doesn't contain horizontal and vertical egdes. It consists of angled edges like 45 and 135 degree edges of root, branches.

4) Apply k-means clustering algorithm (k=2) on the histograms, and show the images in each cluster separately. Comment on the clustering performance.

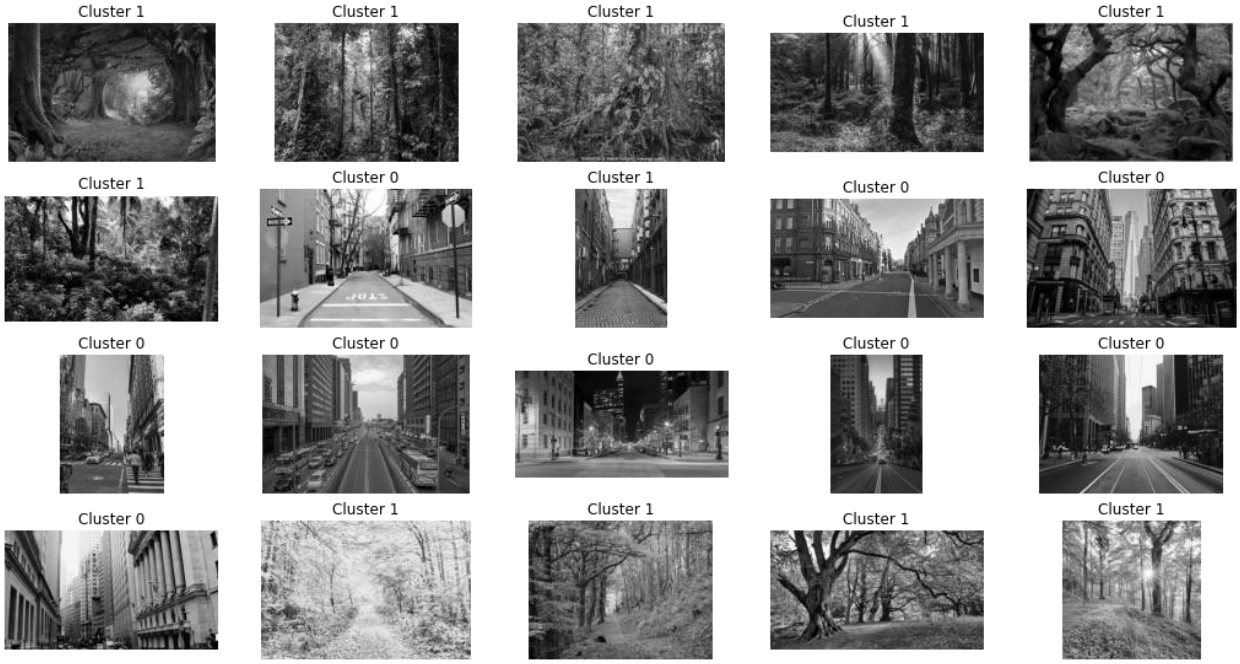


Figure: Snapshot of the images after applying k-means clustering

The clustering performance highly depends on the value of sigma chosen in the difference of gaussain filter. When I selected low sigma and high sigma as 4 and 8 respectively, the clustered data were not so much accurate. So I selected low and high sigma as 3 and 7 . From the above figure we can see that all the images have been accurately clustered into cluster 1 and 2 except for a building image which has been clustered to cluster 1 except 0. It is due to the buildings have importnant edges of 0,45,90,135 degrees whereas of forest has important 45 and 135 degrees .