**README**

* Run the program.
* Enter 1 if you want to create the vocabulary again, 0 if you desire to use existing “vocabulary.yml”.
* Choose to use train images or test images. Both options create class means using training images but similarity matrix is created according to your choice.
* Check the results in “class\_means.yml”, “train\_similarity\_matrix.txt” and “test\_similarity\_matrix.txt”.

**EE 576 HW5**

**Methodology:**

I used SIFT method to find feature points and choose the cluster size as “5” for Bag of Features vocabulary. Normalized mean class histograms are created using “BOWImgDescriptorExtractor” and then total is averaged. Similarity matrix is created using L2 norm between class histogram and image histogram and then total distance is averaged.

Class Means are shown below:

**(Air Cond) class\_1\_mean:** 0.178106 0.293933 0.0765752 0.0940962 0.35729

**(Car) class\_2\_mean:** 0.289565 0.15106 0.16187 0.14681 0.250696

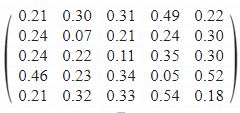
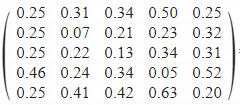
**(Cent Heat) class\_3\_mean:** 0.237335 0.326893 0.149632 0.121585 0.164555

**(Tree) class\_4\_mean:** 0.38892 0.0672174 0.239431 0.216297 0.088135

**(Umbrella) class\_5\_mean:** 0.107069 0.304127 0.0954793 0.0899923 0.403332

The dominant words for each class are highlighted. As you can see for the 1. class and 5. Class, words 2. And 5. Are highly dominant thus we can expect low accuracy in these object recognitions.

Similarity Matrices are shown below:

*Train Images Test Images*

As expected, values are minimum for left diagonal members of the training images. Via the similarity matrix of test images and visual inspection of class 1 and 5 we can verify out previous hypothesis. Class 1 test images are equally similar to class 1 and 5. That’s because training images for both classes includes elements from both classes. For the 2. 3. and 4. classes we see accurate recognition.

**References**

1. <http://isl.ee.boun.edu.tr/courses/ee576/lectures/sunum/featuresPres.pdf>
2. EE576 Homework 3

**Fehmi Ayberk Uçkun**

**2015401009**