Textons

Natalia Andrea Durán Castro
Universidad de los Andes
na.duran@uniandes.edu.co

Ana M. Velosa Orduz
Universidad de los Andes
am.velosa@uniandes.edu.co

Abstract

In the paper shown below there will be the classification of images form the cifra10 dataset based on textons and using classifier like SVM and KNN.

1. Introduction

Texton are the equivalent of atoms but in image processing, or how Béla Julesz in 1981 describe them, ”the putative units of pre-attentive human texture perception.”[3].Since then textons have acquire a lot of importance in the application of computer and machine vision, especially trying to find better solution to the segmentation and classification problems.[1]

In this laboratory we are going to focus on the classification problem. This problem it's about identifying to what class an unknow object is member of based on different cues like similarity, symmetry, common fate,illusobry or subjective contours or even proximity [1].

To do that we can use algorithms called classifiers like K-Means, if we don't know what we want to find, Super Vector Machines where you know what you want and you map the data in to a higher ideational space and construct an optimal separating hyperplane in this space or use K nearest neighbor where you classified point using the distance between them.[2] So it comes to mind which one of the classifiers mentioned earlier its better, and the answer is that depends on the problem that you are working on. For that reason, we use both and compare them to choose the better one.

For the classification problems the evaluator it's the ACA matrix that have predictions on the y axis and labels on the x axis, and also can be evaluated by the perdition-recall curve.

2. Method

For this lab we use a dataset called CIFAR-10, which have 60'000 32x32 color images divided in 10 classes. This dataset it divided also in 50'000 images for training and 10'000 for testing, which are chosen 100 randomly from each one of the class. Those images are organized in to batches, where you will find 5 training batches and 1 testing bath that has the images already explained before.[4]

Once we have downloaded the data set we access cifar10.py to use the cifar10load and that way we can assess to all of the 5 data batches and the training batch. After we have all of the information organized in to 2 different variables, we create 16 filters to be able to identify all of the textons on each training image, creating a texton dictionary which tell us witch texture assign to each pixel make a texton map later on.

After we obtain the texton map we obtain the texton histogram for each image to use it in the classifier algorithm and train the model because to images are alike if their histogram its alike. Keeping what was said before on mind we have to considerate that the histogram do not take into consideration the spatial information.

The texton histogram gives us the number of pixels that belongs to a certain texture, for that reason we would like to have this information before we calculate the Euclidean distance and compare this histogram with others.

In the figure 1 we can observe how a histogram without normalizing with k 135 from the dataset will look like. But it's important to know that the histograms that are going to be used for the classification are normalized.

In the other hand, we do not jet know which one of the classifier algorithms is better for this problem, so we decided to use both of them and then make a decision based on the results we obtain.

Fist we used KNN to classified the data and we obtain the confusion matrix that we can see at 2. We can tell that the matrix it's not what we expected and that is because it's ACA it's 0.19 what means that the model its only classifying the 20 percent of the images correctly, this can happen because KNN it's the easiest way of classify and can have problems because you have to pick a number of clusters that not necessarily it's the best.

3. Final copy

You must include your signed IEEE copyright release form when you submit your finished paper. We MUST have this form before your paper can be published in the proceed-

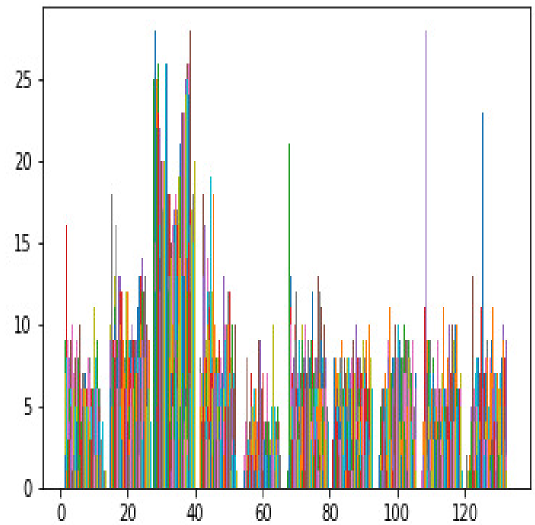

Figure 1. Histogram without normalizing with K= 135

	0	1	2	3	4	5	6	7	8	9
0	0.524378	0.0297741	0.0145349	0.0472441	0.0850851	0.0288154	0.00970874	0.034965	0.199024	0.0254842
1	0.0666667	0.178645	0.0135659	0.0787402	0.126126	0.0565635	0.106796	0.0879121	0.0770732	0.186544
2	0.334328	0.0821355	0.0203488	0.0738189	0.122122	0.0576307	0.0446602	0.04995	0.171707	0.0733945
3	0.126368	0.110883	0.0135659	0.135827	0.14014	0.072572	0.0747573	0.0769231	0.134634	0.131498
4	0.101493	0.113963	0.0145349	0.0994094	0.212212	0.0832444	0.061165	0.0959041	0.130732	0.088685
5	0.103483	0.106776	0.0174419	0.0895669	0.146146	0.104589	0.0737864	0.0599401	0.109268	0.130479
6	0.0726368	0.156057	0.0164729	0.0807087	0.125125	0.0704376	0.140777	0.0829171	0.0926829	0.195719
7	0.0567164	0.145791	0.0145349	0.0974409	0.12012	0.0747065	0.0825243	0.117882	0.100488	0.195719
8	0.327363	0.0420945	0.0155039	0.0679134	0.122122	0.036286	0.0300971	0.041958	0.298537	0.0356779
9	0.0597015	0.150924	0.00581395	0.0846457	0.122122	0.0469584	0.0941748	0.0869131	0.0731707	0.261978

Figure 2. Confusion matrix for KNN

ings.

Please direct any questions to the production editor in charge of these proceedings at the IEEE Computer Society Press: Phone (714) 821-8380, or Fax (714) 761-1784.

References

[1] D. Charalampidis. Texture synthesis: Textons revisited. *IEEE Explore*, 15(1):777 – 787, 2006. 1

[2] J. V. J.A.K. Suykens. Least squares support vector machine classifiers. *Katholieke Universiteit Leuven*, (1):293–300, 1999. 1

[3] B. Julesz. ”textons, the elements of texture perception, and their interactions. *Nature*, 290(1):91–97, 1981. 1

[4] Krizhevsky.A. The cifar-10 dataset. último acceso 28 Febrero 2019. 1