Eviris Prize in Machine Learning, 1st phase

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1 Introduction

In this report, we will create a dataset for fruits images, in the context of Eviris Machine Learning Prize, In the following report, We are going to demonstrate the method of the obtainging, the processing and the construction of the information.

2 Images Obtaining, Dataset Organizing

According to the restriction of using copyrighted images, Web scrapping was not an option, so We used some free datasets which contains fruits images but with different sizes and characteristics, which is imposing a new challenge to make it all uniform. One of the concerns was dividing the images into singular objects and multiple objects, as one of the future requirments of the dataset is the ability to recognize a fruit object in singular state as well as in a group of many fruits, not necessarily from the same class. The dataset has also been divided into classes, mainly the following:

- Apple-Golden-Delicious
- Apple-Red-Delicious
- Banana
- Lime
- Apple-Granny-Smith
- Apple-Royal-Gala
- Kiwi
- Orange
- Apple-Pink-Lady
- Avocado
- Lemon
- Red-Grapefruit
- Tomato
- Dates

The images were distribuited as the following:

	Single	Multiple
Train	4443	566
Test	4443	566

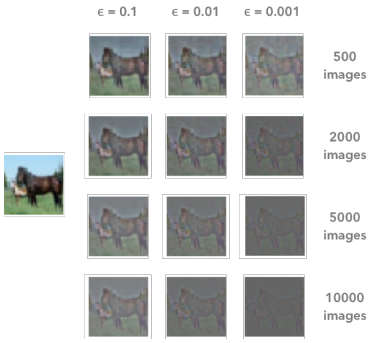
How the division was made?
the train/test ratio is 50%, the test images are choosen in a way that it has the same characteristics of the train images, like the view angle, the hue and saturation.
Each image is 100×100 pixels, some of them has background removed, especially in the single part, and the rest has kept the noisy background.

3 Pre-processing

Training a convolutional neural network on raw images will probably lead to bad classification performances [(Pal Sudeep, 2016)]. The preprocessing is also important to speed up training. We studied some preprocessing techniques that can be applied to any kind of data like mean normalization, standardisation and whitening, then we used a special kind of whitening called Zero Component Analysis (ZCA), which was explained the same paper [(Pal Sudeep, 2016)], and uses

$$X_{ZCA} = U.diag(\frac{1}{\sqrt{diag(S) + \epsilon}}).U^T.X$$

Where X is the array of the images in one class of the dataset, U, S are the single vectors of the decompostion of the covariance matrix of X after normalisation,ϵ is a hyperparameter used to adjust the whitening degree as shown in the following image.



Source: https://medium.freecodecamp.org/

We have implemented ZCA in python, and we run it over all the images, the dataset contains both the original and preprocessed datasets, which could help for future studies to compare the behavior of a model while training using preprocessed or original images.

4 Dateset Link

Please find the dataset on this link: https://github.com/MustafaKhalil-IST/eviris-dataset-group7

5 References

1. Horea Muresan, Mihai Oltean, Fruit recognition from images using deep learning, Acta Univ. Sapientiae, Informatica Vol 10, Issue 1, pp. 26-42, 2018.
2. Klasson, Marcus and Zhang, Cheng and Kjellstr, A Hierarchical Grocery Store Image Dataset with Visual and Semantic Labels, IEEE Winter Conference on Applications of Computer Vision (WACV), 2019.
3. Kuntal Kumar Pal, K. S. Sudeep, Preprocessing for image classification by convolutional neural networks, IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), 2016