Classification of images applied in EAFIT Universirty places, with supervised and unsupervised machine learning approach.

Juan Fernando Rincón Cardeño

Abstract— This document contains the description to the proces of a solution implemented for a classic machine learning problem, classifying images. Being centered around EAFIT university and some of it's iconic places

I. DEFINITION OF THE PROBLEM

The goal was to have a full operating system running on a remote server, where given an image in that remote server, would classify that image actual physical location out of some predefined places, and be capable of showing the result in a web page accesible by a device with internet connection, so the project was mainly divided in 2 stages, one the classify problem and a second one that was the web application and interaction.

II. PROCEDURE FOR THE CLASSIFYING PROBLEM

A. getting the data

The images were recollected by multiple students, ad around 150 images for each place was gathered, making a varied dataset of 1500 images aprox and 150 images for each category

B. Getting the features

Each image was resized, in order to all of them have the same resolution, once that was done, the features chosen were its SIFT (scale-invariant feature transform), done by openCV library, getting the multiple sifts of each images, but that is still too many different values, so we have to shorten them

C. Bag of words

to get fewer and more meaningful features a Bag of words Model was used, for all the features were clustered, by setting the cluster numbers to a medium size (50-300) by the method of kmeans.

when the kmeans had been trained, each image get it's different sift features get transformed to an histogram, where each of it's X values is a different cluster and the number assigned is the amount of sifts that get predicted as that clusted for that image.

D. Support Vector Machine training

When the data is set, it is labeled, so each histogram has its own label, it being it's assigned place, and a SVM model is trained with those values and those labels.

So the process to classify a new image is to get it's sift features, get its histogram by usig the kmeans already trained model, and then predict it in the Support Vector Machine model that has already been trained.

E. Performance

The performance was rated by its presicion rating. the main value that can get changed in the process to get a different perfomance is the number of clusters in the model, so it was the main one that got variation

the one that gave better performance was surprisingly with only 50 clusters, were it got a surprising 70 %, higher that other cluster numbers.

III. WEB APPLICATION

Aftre the problem was trained, the web application part was made, were we would deploy the application into the web.

An account was done in Azure server, to have a virtual machine that would respond to the queris and have a host that would be accesible in the web

Flask framework was chosen because it's simplicity and capabilities. Being the center of that Web Application

In order to get the image in the virtual machine it was done via SFTP, and once the image is in the web, the page automatically makes the new prediction and show it in the page accesible in

http://40.114.112.75:8000/