
CS771: Introduction to Machine Learning

Assignment 3

Group Name : Perceptron

Method Used : One Vs All

- To solve this problem, we have used One-Vs-All(OVA) method. It becomes prolonged when many classes are involved, though it is highly accurate. In our problem, we do not have many classes (as problems have millions of classes as well), which diminishes the disadvantage of this method.
- OVA method is a heuristic approach to solve multi-classification problems by dividing them into multiple sets of binary classification problems. The binary classifier is trained in one go, and predictions are made by the model which is the most confident about its prediction. The main advantage of this method is that it separates all the classes with good accuracy and provides a robust model.
- We have used logistic regression classifier in our model over many values of hyperparameter C and at last we have trained our model at default C as it was giving the best results.
- We have used Hold-out validation method to divide train and test in 80:20 split.
- We have also used `stratify = y` in `train_test_split` to make sure that the data is divided among all the classes uniformly which will make training non-biased.

Label preprocessing :

- The labels given in `label.txt` was not in an ideal format to train the model using it. Each line gives three labels for an image having three greek characters. Also labels were strings separated by `comma(,)`. For training we wanted label of each greek character in the same order it was in the image ideally in numeric format.
- To achieve this we followed the following procedure :
 - We created a dictionary mapping each greek character to a distinct positive integer.
 - After that we iterated over each line of **label.txt** file to split out the greek characters by **comma(,)**.
 - We then wrote the number corresponding to each character using the dictionary in the same order which was there in `label.txt` in an another file.
 - And used that file as the `label.txt` file.

Image preprocessing :

- The images given were having significant amount of noise in it (like some lines in the background) and each image was having 3 greek characters. We preprocessed each image and segmented it to take out each character as a single image from the given image.
- First of all we cleared the background of the image by taking out pixel of the corner of the image. Then we subtracted that pixel value from the pixel of original image.
- Now to deal with the noisy lines in the background we eroded the image with kernel erosion parameter of (10, 10). We tried a lot of parameters and parameters around (10, 10) was working just fine to remove those lines.
- We then converted the image into gray color space using `cv2.COLOR_BGR2GRAY` function in `opencv`.
- Then we took out each character given in the image using our `splitImages` method. This method is used to find out the first and last column index of each Character; these indices are further used to crop the character image.
- We took each character image(2D array) and deleted the space from all the four sides which decreases the number of feature to work with for model and also increased the accuracy.
- We have then resized each image to (50, 50) pixel format.
- Then we have flatten out the image(2D array) and feed it to the model.

Conclusion : In this assignment we have recognized the greek letters given in a noisy image by pre processing the image using open cv and then feeding the image to the multi classification model.