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MSDS – A

Assignment no.2 (pdf Report)

What features did you use and why?

Ans: I used hand crafted features some of them are:

There are many algorithms for features extraction, like SURF, SIFT, HOG, vertical/horizontal prewit, corner harris and much more. But we are bound to use only hand-crafted features, so for that purpose I stained some of the feature algorithms.

• I tried Vertical/Horizontal prewit, it is good at speeding up the training, but its accuracy is not good.

• I tried corner harris but also it was not giving me the best accuracy, and I wasn't satisfied

• HOG is much optimized, good at speeding up the training, also its accuracy is better from all of the others, and I was satisfied from using it. it is the simplified representation of the image that contains only the most important information about the image. The HOG feature descriptor counts the occurrences of gradient orientation in localized portions of an image.

The HOG descriptor focuses on the structure or the shape of an object. Now you might ask, how is this different from the edge features we extract for images? In the case of edge features, we only identify if the pixel is an edge or not. HOG is able to provide the edge direction as well. This is done by extracting the gradient and orientation (or you can say magnitude and direction) of the edges

Additionally, these orientations are calculated in 'localized' portions. This means that the complete image is broken down into smaller regions and for each region, the gradients and orientation are calculated. We will discuss this in much more detail in the upcoming sections

Finally, the HOG would generate a Histogram for each of these regions separately. The histograms are created using the gradients and orientations of the pixel values, hence the name 'Histogram of Oriented Gradients'. I followed this link for HOG feature extraction for fashion MNIST data.

https://www.researchgate.net/publication/332035279_Fashion-MNIST_classification_based_on_HOG_feature_descriptor_using_SVM

What classification techniques did you try?

It tried kernelized SVM but it was taking a very much time. It literally took 45 min to run, and end up giving 81% accuracy. KNN was fast as compare to others, so I adopt this classifier.

Furthermore, I tried Random Forest and MLP Classifier, they both were giving almost same accuracies and they were optimized and also, they were fast. I picked up the SVM because of good accuracy. These the results:

```
"D:\FAST 1st sem\bigdata\PROJECT\Projects\venv\Scripts\python.exe" "D:/FAST 1st sem/ml/Assignment2/readdata.py"
Training Accuracy for 5 fold cross validation on 9 NN classifier with HOG Feature Extraction:  0.804
Training Accuracy for 5 fold cross validation on Random Forest classifier with HOG Feature Extraction:  0.7930833333333334
Training Accuracy for 5 fold cross validation on RBF Kernelized SVM classifier with HOG Feature Extraction:  0.8113333333333334
Training Accuracy for 5 fold cross validation on SGD classifier with HOG Feature Extraction:  0.7859166666666666
Training Accuracy for 5 fold cross validation on MLP classifier with HOG Feature Extraction:  0.7909166666666666

Process finished with exit code 0
```

Which of the methods (and for what hyperparameters) showed best cross validation?

By using the benchmarking of the researcher, I used the parameters for my classifiers, I tuned my hyperparameters using that benchmarking and I used 5 fold cross validation accuracy. The link is below:

http://fashion-mnist.s3-website.eu-central-1.amazonaws.com/#

What test accuracy are you expecting?

I expect to have accuracy in between 75 to 80 because the feature extraction technique I used is good and most of the researchers having the range of 75 to 80 percent accuracy for unseen data by using these parameters. I also visualized the test examples and compared them with the predictions so most of them were true positive.