INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
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EE 5024: Machine Learning For Image Processing (Jan-Jun 2020)
Programming Assignment 3

Aim

- To develop Histogram of Oriented Gradients (HOG) descriptor based Human and non-human classification.
- Do dimensionality reduction to the HOG features using :
  - Principal Component Analysis (PCA)
  - Fischer Linear Discriminant (FLD)
- Finally classify the images as human and non-human from the reduced dimensional data using bayesian classification.

Algorithm Overview

1. Dataset consists of human and horse classes.
2. Reshape the images in the datset uploaded to 256 x 256 and divide the images into 16 x 16 blocks.
3. Get the 9 bin HOG Descriptor (consider magnitude while binning) for all the blocks such that final HOG feature vector dimension will be 2304 x 1.
4. Visualize HoG and report one result per class using inbuilt function (extractHOGFeatures command (MATLAB command)).
5. Applying PCA:
   - Select top k eigen values such that 95% energy is retained.
   - Note down the reduced dimension of HOG feature vector dimension.
6. Applying FLD:
   - Apply FLD to the HOG feature vector such that it's reduced to one dimension.
   - Plot the magnitude of data points with different colors for both classes.
7. Apply bayesian classification seperately for data points from PCA and FLD.
8. Plot confusion matrix for the above and calculate the accuracy.

Confusion Matrix :	Predicted as Class 1	Predicted as Class 2
Test data point belong to Class 1	TP	FP
Test data point belong to Class 2	FP	TP

TP : True Positive
FP : False Positive

Figure 1: Confusion matrix