**Face recognition:** The Yale B Face dataset was used in all experimental recordings for face recognition. The dataset was divided into a 7:3 ratio of training and testing data for 15 different subjects. Different parameters for Local Binary Pattern function and Histogram calculation function were used and accuracy of model to correctly recognize face was calculated.

Note:

Accuracy : The ratio of number of faces predicted correctly to total faces predicted.

Time: First value is time taken to train the model with 70 images, second value is time taken to predict the label of one image

1. **Inclusion of Histogram Equalization in pre processing**:

|  |  |  |
| --- | --- | --- |
|  | Without Histogram Equalization | With Histogram Equalization |
| Accuracy, Time | 86%, (4.26s, 1.16s) | 90%, (4.48s, 1.19s) |

\*Using Extended (8,1) and Chi-square

The inclusion of histogram equalization is justified with an increase in accuracy and minimal time cost.

1. **Type of Local Binary Pattern extracted:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Original LBP | Extended LBP | | | |
| 8 neighbours, 1 radius | 8 neighbours, 2 radius | 16 neighbours, 1 radius | 16 neighbours, 2 radius |
| Accuracy, Time | 86.66%, (10.31s, 1.55s) | 90%, (4.48s, 1.19s) | 86%, (4.39s, 1.26s) | 83.33%, (4.49s, 1.15s) | 90%, (4.46s, 1.27s) |

\*Using Chi-square and HE

Circular LBP clearly gives a better result than Original LBP. The combinations of 8 neighbours, 1 unit radius and 16 neighbours, 2 units radius proved to be most accurate with this dataset.

1. **Size of grids while calculating Spatial Histogram:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Size | 4x4 | 6x6 | 8x8 | 12x12 |
| Accuracy, Time | 76%, (3.29s, 0.44s) | 80%, (3.86s, 0.73s) | 90%, (4.48s, 1.19s) | 83%, (6.41s, 3.09s) |

\*Using Extended (8,1), HE and Chi-square

The accuracy of the model increases initially with bigger grid size and the decreases after one point. For 50x50 dimension images, 8x8 grid size proves to be most accurate

1. **Distance Metric used to compare histograms:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Metric | Euclidean | Chi-Square | Cosine Distance | Normalized Correlation |
| Accuracy, Time | 63.33%, (4.48s, 1.78s) | 90%, (4.48s, 1.19s) | 80%, (4.48s, 2.17s) | 80%, (4.48s, 2.18s) |

\*Using Extended (8,1) LBP and HE

Chi-Square proved to be the best metric when it comes to differentiating histograms of LBP facial images.