Performance of Classifiers with FCM Segmentation

Ms. S. Keerthi

Department of Computer Science, Sri Venkateswara University, Tirupati

Abstract— *In this work Two algorithms namely SVM and deep autoencoder technique have been proposed. Texture based features are computed using GLCM method for the LL sub band obtained using DWT. This sub band contains the approximate original image. Texture features, namely, Angular Second Moment (ASM), contrast, correlation, variance, inverse different moment, sum average, sum variance, sum entropy, entropy, difference variance, difference entropy, information measure of correlation, and maximal correlation coefficients have been used for classification. Performance of Classifiers is verified.*

I. INTRODUCTION

1.1 Deep Autoencoder Technique

The classification process is done by using the deep learning based autoencoder deep neural network (DNN) classifier. In this research, the automated encoder can be a suitable solution for the proper selection classification process of the DNN when there is no prior knowledge of the distribution data. Deep autoencoder usually operates as a DNN based classification task. Basically, in a deep autoencoder technique, the input data is compressed into an encoded format data in the hidden layer with help of encoding. Basically, the transformed model is used for training the classifier. Deep autoencoder DNN usually operates as FFN and is an unsupervised pre-training technique with greedy layer-wise training. In DNN, data flow is obtained from the input layer to the output layer without any looping function. The main benefit of the deep autoencoder DNN Classifier is that the likelihood of lost value is too low. An automatic encoder is a coding structure composed of a multilayer neural network as shown in Figure 1.

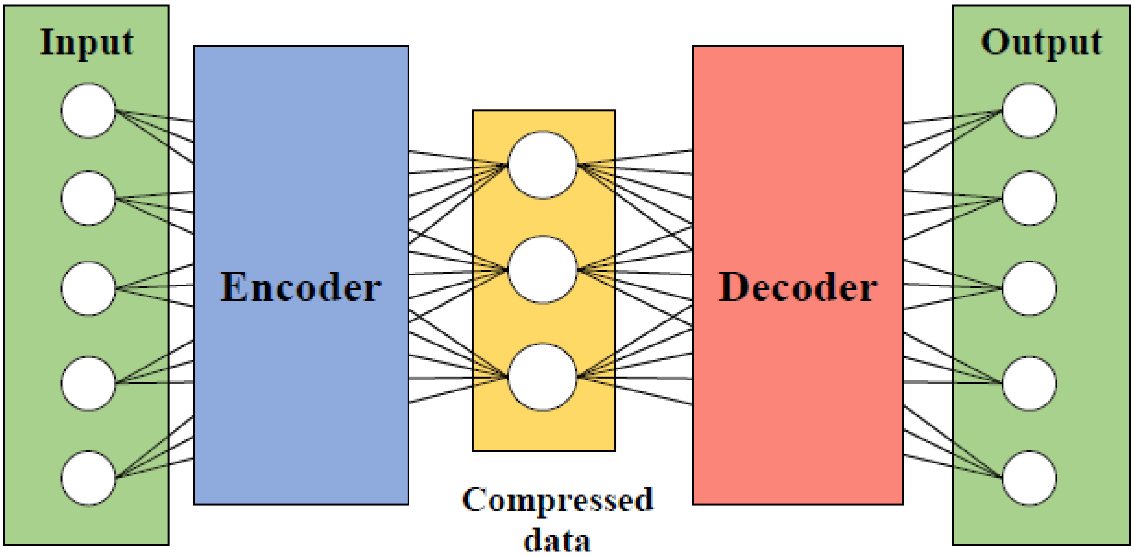

FIGURE 1: Deep Automatic Encoder

1.2 Support Vector Machine

Support vector machine is a binary classifier that classifies the input data points into two classes by constructing a hyperplane in a high dimensional space. The hyperplane is used for classification. The algorithm defines its objective function as to maximize the margin of the hyperplane so as to achieve a under separation between the concern classes. This concept of the classifier reduces the classification error. The algorithm can handle both linear and non-linear data. As for as non-linear dataset is consider the algorithms transforms the nonlinear data into linear data using different linear ,kernel functions, namely, polynomial kernel, sigmoid kernel and RBF kernel.

II. METHODOLOGY

The proposed system is tested using Matlab. To determine the effectiveness of the proposed methodology, experiments have been conducted with the apple dataset. The performance of the classification techniques is studied with different evaluation measures, namely, accuracy (AC), sensitivity (SE), specificity (SP) and precision (P).

III. EVALUATION METRICS

3.1 Sensitivity

Sensitivity is expressed as the sum of true positive divided by true positive and false negative.

$$SE = \frac{TP}{TP + FN}$$

Where, TP defines True Positive and FN represents False Negative.

3.2 Accuracy

In term accuracy the term accuracy. It is the ratio of number of correct predictions to the total number of input samples.

$$AC = \frac{TP + TN}{TP + FP + TN + FN}$$

Where, TN defines True Negative, FP describes False Positive and TN represents True Negative.

3.3 Precision

It is the number of correct positive results divided by the number of positive results predicted by the classifier.

$$P = \frac{TP}{TP + FP}$$

3.4 Specificity

Sensitivity is the proportion of actual positives which are correctly identified as positives by the classifier.

$$SP = \frac{TN}{TN + FP}$$

As for the classification, there are four assessment criteria, with sensitivity (SE), specificity (SP), accuracy (AC) and Precision (P).

IV. EXPERIMENTATION

The extracted features are given as input for classification. Two classifiers namely Support Vector Machine and deep learning based deep autoencoder techniques are used. The performance obtained using SVM and deep autoencoder techniques with FCM segmentation on the datasets are given in Table 1.

TABLE 1
PERFORMANCE OF FCM SEGMENTATION WITH DIFFERENT CLASSIFIERS FOR APPLE DATASET

Technique	Accuracy (%)	Sensitivity (%)	Specificity (%)	Precision (%)
SVM Classification	70	70	70	72
Autoencoder technique	80	80	80	80

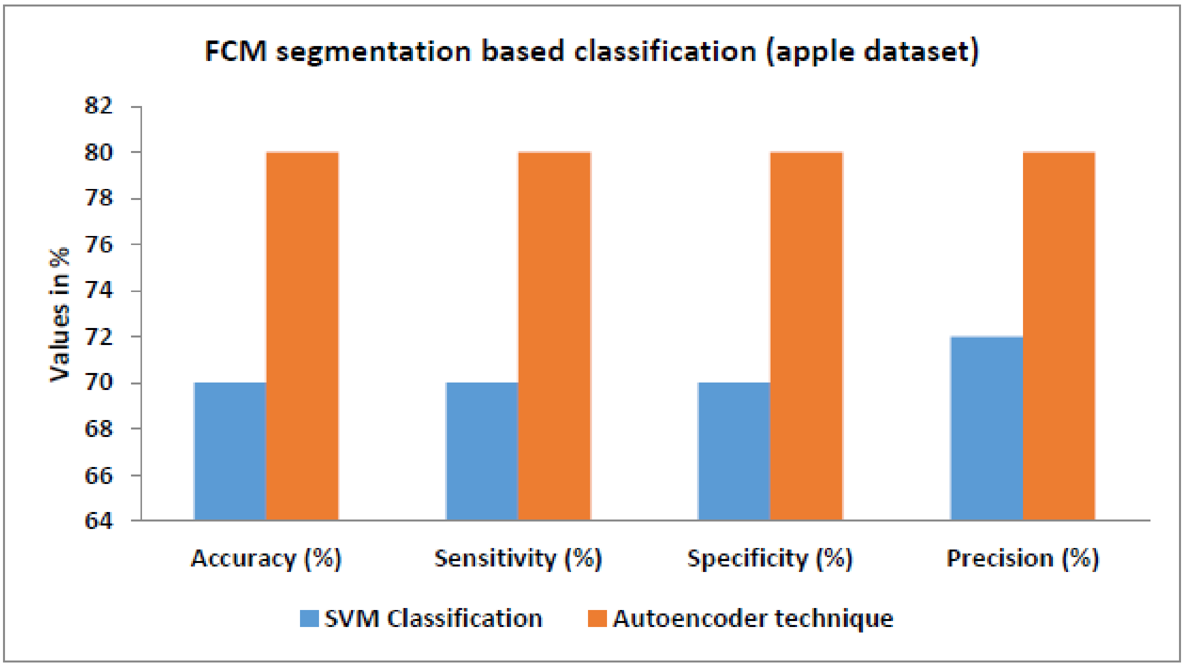

FIGURE 2: Performance of Different Classifiers with FCM Segmentation on Apple Dataset

From the Figure it is clearly stated that the deep autoencoder technique achieved better performance than SVM on apple dataset in terms of AC, SE, SP and P. For instance, deep autoencoder technique achieved 80% of all parameters, where SVM achieved 70% of all parameters.

V. CONCLUSION

This chapter describes the performance of classifiers in the extracted texture-based features using SVM and deep autoencoder technique. The performance of algorithms is analysed using different metrics, namely, accuracy, sensitivity, specificity and precision. From experimental results, the deep autoencoder technique is found to outperformed the SVM.

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