National Institute of Technology Karnataka

EC447 Pattern Recognition and Machine Learning

Report

Neural Networks

Aniket Rege
Roll number- 14EC108

Megha Mantur
Roll number- 14EC131

Prabhanjan Mannari
Roll number- 14EC135

Sheetal Jadhav
Roll number- 14EC222

Rakesh Bandaru
Roll number- 14EC210

Supervisor
Deepu Vijayasenan

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1 Description of the data

1.1 Features and dimension

The features were extracted from the audio files using opensmile tool and emobase configuration. The original feature dimension of 989 was reduced to 1 using Linear Discriminant Analysis

1.2 Training and test samples

	Genuine	Spoofed
Train data	1708	1708
Test data	760	950

2 Description of the Neural Network

- Number of hidden layers - 1
- Number of neurons in the hidden layer - 3
- Activation function used for each neuron - sigmoid
- Number of epochs - 200

3 Selection of Parameters

- Due to the linearly separable nature of the given audio file data set, the choice of number of layers and hidden neurons was not significant, and did not impact measures of accuracy, precision, or recall appreciably. Hence a choice of a single layer with three hidden neurons was made.
- Due to the linear behavior of data, regularization or the addition of non-linearities was not required
- Objective function choice as sigmoid over hyperbolic tangent or relu function gave best results

4 Results

4.1 Confusion Matrix

- Train data

1507	0
1	1508

Accuracy - 0.999668435013
Precision - 0.999336870027
Recall - 1.0

- Test data

873	76
73	688

Accuracy - 0.911695906433
Precision - 0.923566878981
Recall - 0.916754478398

5 Conclusion

We have observed our best results using Artificial Neural Networks (ANN) classifier over a Gaussian Mixture Model (GMM) classifer or a Logistic Regression (LR) based classifer. This was primarily due to the best method implementation (GMM) extracting and using different features for classification than what we were able to extract. Regression was observed to give good results due to the linear separability of the given audio data. Artificial Neural Networks gave better results than regression due its nature of generating its own features in the hidden feature layer, and applying a logistic regression in the classification layer.