Drexel University

CS499I

Advanced Neural Networks

Facial Recognition With Artificial Neural Networks

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1   Datasets

Yale Faces Database   This dataset contains 165 grayscale images in GIF format of 15 individuals with 11 images per person. There is one image per each of the following configurations: center-light, w/glasses, happy, left-light, w/no glasses, normal, right-light, sad, sleepy, surprised, and wink.

2   Testing Parameters

The following variants are tested for accuracy:

1. With and without a bias node at the input layer

2. With and without a bias node at the hidden layer

3. With and without standardizing features

4. With and without applying PCA to reduce the number of features to 95%

5. With and without applying LDA to maximize data separability

Empirical data was generated to optimize the following parameters:

1. Image size

2. Hidden layer size

3. Termination criteria

3   Baseline Accuracy

The baseline accuracy was created using the negative form of all variants with the exception of data standardization. Initial parameters are listed below:

1. Input layer bias node: N

2. Hidden layer bias node: N

3. Standardization of features: Y

4. PCA application: N

5. LDA application: N

6. Image size: 40x40

7. Hidden layer size: 20

8. Termination criteria: 1000 iterations

Accuracy	0.800000
Testing Error	0.200000

Table 1: ANN Testing Error

Accuracy	0.940639
Testing Error	0.059361

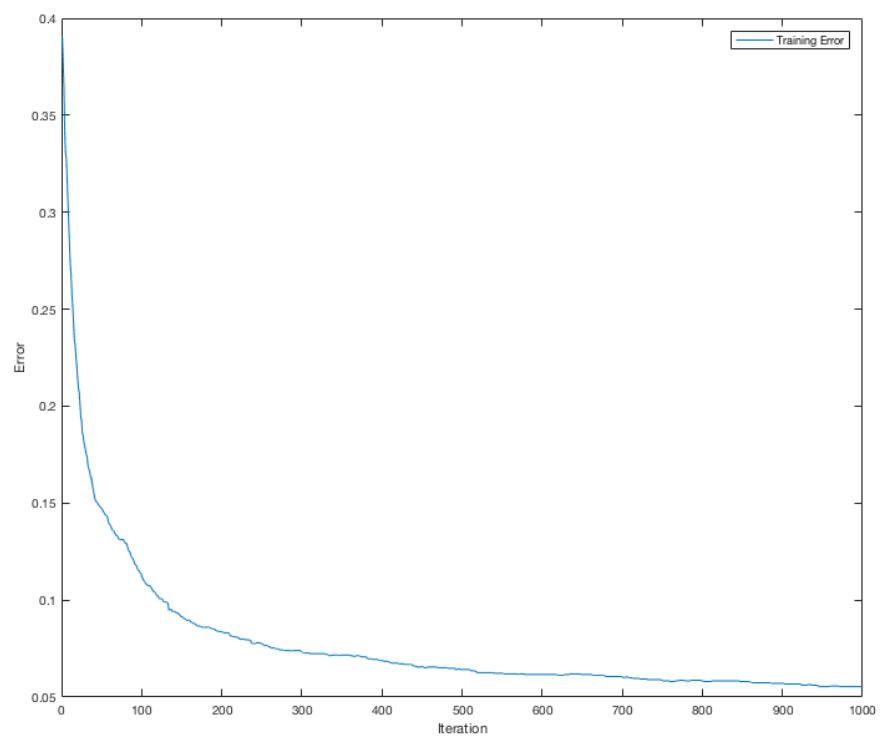Table 2: ANN Testing Error

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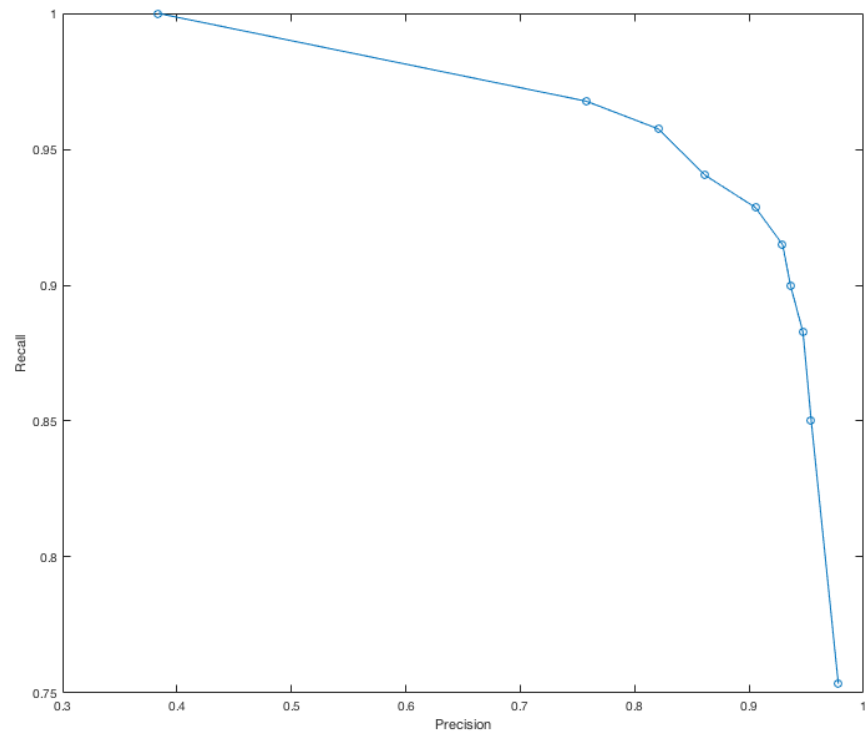Figure 1: Training Error for ANN

5 The Precision-Recall Tradeoff

Figure 2: PR-Graph for ANN

6 Multi-Class Artificial Neural Networks

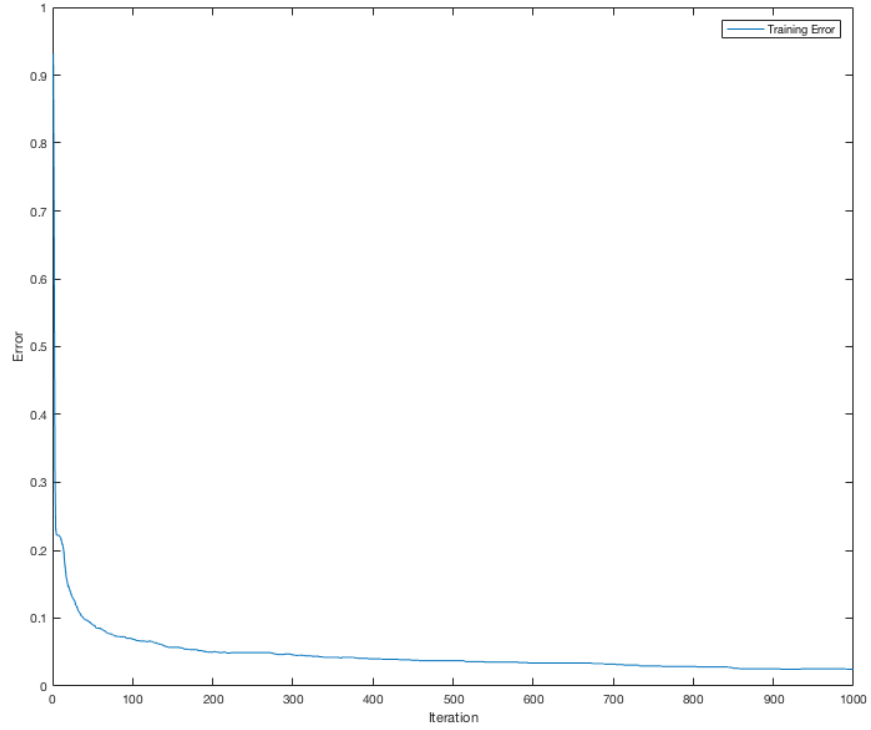| Accuracy	0.956215
Testing Error	0.043785

Table 3: ANN Testing Error

Figure 3: Training Error for Multi-Class ANN