Machine Learning (BITS F464)

Assignment 2 (Artificial Neural Networks)

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Introduction:

We are using the Backpropagation algorithm to train the data and calculate the output of the testing data.

Pseudo Code:(source:Wiki)

initialize network weights (often small random values)
do
  forEach training example named ex
    prediction = neural-net-output(network, ex) *// forward pass*
    actual = teacher-output(ex)
    compute error (prediction - actual) at the output units
    compute {\displaystyle \Delta w_{h}} for all weights from hidden layer to output layer *// backward pass*
    compute {\displaystyle \Delta w_{i}} for all weights from input layer to hidden layer *// backward pass continued*
    update network weights *// input layer not modified by error estimate*
  until all examples classified correctly or another stopping criterion satisfied
  return the network

1. Sunglasses Recognizer

Network Structure

No. of layers = 3
Units in layer one: 960
Units in hidden layer: 1
Units in the third layer: 1

Parameters used and Accuracy achieved:

Learn Rate	Moment	Maximum Iterations	Minimum Error	Accuracy: Train Data	Accuracy: Test data 1	Accuracy: Test data 2
0.3	0.3	10	0.01	94.10%	73.52%	67.30%
0.3	0.3	50	0.01	98.90%	**97.05%**	94.23%
0.3	0.3	100	0.01	99.95%	97.05%	**98.07%**
0.3	0.3	500	0.01	**99.99%**	97.05%	96.15% (overfitting)
0.3	0.3	1000	0.01	99.98%	97.05%	98.07%

Maximum Accuracy :

Train data - **99.99%**
Test data 1 - **97.05%**
Test data 2 - **98.07%**

2. Face Recognizer

Network Structure

No. of layers = 3
Units in layer one: 960
Units in hidden layer: 20
Units in the third layer: 20

Parameters used and Accuracy achieved:

Learn Rate	Moment	Maximum Iterations	Minimum Error	Accuracy: Train Data	Accuracy: Test data 1	Accuracy: Test data 2
0.3	0.3	10	0.01	67.03%	19.44%	19.99%
0.3	0.3	50	0.01	94.51%	91.66%	82.50%
0.3	0.3	100	0.01	99.40%	91.66%	92.50%
0.3	0.3	500	0.01	99.93%	94.44%	**95.00%**
0.3	0.3	1000	0.01	99.95%	**97.22%**	92.50% (overfitting)
0.3	0.3	10000	0.01	**99.99%**	97.22%	92.50%

Maximum Accuracy :

Train data - **99.99%**
Test data 1 - **97.22%**
Test data 2 - **95.00%**

3. Pose Recognizer

Network Structure

No. of layers = 3
Units in layer one: 960
Units in hidden layer: 6
Units in the third layer: 4

Parameters used and Accuracy achieved:

Learn Rate	Moment	Maximum Iterations	Minimum Error	Accuracy: Train Data	Accuracy: Test data 1	Accuracy: Test data 2
0.3	0.3	10	0.01	70.57%	84.17%	86.05%
0.3	0.3	50	0.01	97.16%	88.48**%**	92.30%
0.3	0.3	100	0.01	98.90%	88.48%	**92.30%**
0.3	0.3	500	0.01	**99.98%**	**89.92%**	90.86% (overfitting)
0.3	0.3	1000	0.01	99.98%	88.84% (overfitting)	91.82%

Maximum Accuracy :

Train data - **99.98%**
Test data 1 - **89.92%**
Test data 2 - **92.30%**