Soft Computing Assignment 04

Implementation of ANN for XNOR operation.

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1 Artificial Neural Network

The Neural Network consist of 3 layers.The **input layer,hidden layer** and **output layer** .

Number of hidden layer : 1
Number of Neurons in Input layer : 2
Number of Neurons in hidden layer : 2
Number of Neurons in output layer : 2(Binary Data-set)
Bias : Absent
Learning Rate : 0.2
Number of epochs : 50000

2 Activation Function

The Activation function used in the ANN is Sigmoid function. It is given by the following equation:

$$\sigma(z) = \frac{1}{1 + e^{-z}} \tag{1}$$

3 Optimization Function

The Optimization algorithm used in this ANN is Stochastic Gradient descent.The optimization equation is given by:

$$W_{new} = W_{old} - LearningRate * dJ(W) \tag{2}$$

where,

$$dJ(W) = \sigma(z)(1 - \sigma(z)) \tag{3}$$

The weights are modified slowly in order to converge the error to the minimum.Learning Rate is defined such that it controls the convergence.

4 Verification

Artificial Neural Network is used in order to train the network on the given data and then find the weights associated with the network. Later the value of the weights are used in order to get the predicted results.

XNOR Gate

The truth table for the XNOR gate is given as follows:

Input 1	**Input 2**	**Output**
0	0	1
0	1	0
1	0	0
1	1	1

Table 1: OR operation.

From the truth table we understood that gate output is 1 when both the input signal are same.In order to check whether the output is correct or not we find the error between the actual values and predicted value and using optimizer reduce the error to minimum.
Error can be simply written as the difference between the predicted outcome and the actual outcome. Mathematically:

Error = mean(abs(t - y))

where t is the targeted/expected output y is the predicted output.

If the error obtained is 0 then the Model is performing with 100 percent accuracy.

The Accuracy obtained in this case is 100 percent.