CSE 5526 - Introduction to Neural Networks
Programming Assignment #1

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A 2-layer perceptron with backpropagation was implemented for the odd parity problem. Learning rate values ranging from 0.05 to 0.5 in increments of 0.05 were used and an alpha value of 0.9. The following are the results got by using the following weight vectors :-

Weight vector of the hidden layer neurons :-

[[-0.25319573, 1.74377211, 1.44500589, 0.54399743, 0.12785769],
[1.72207905, 1.14686209, 0.99662104, 1.68118961, -0.8927832],
[-0.83097461, -0.09198941, 0.68408733, 0.5605566 , 1.3274079],
[0.61897873, -0.42775785, -0.27232791, 0.11333034, 0.51092689]]

And,
Weight vector of the output layer neuron:-
[-0.67737842, -0.41639604, 1.72141107, 1.46240335, 0.28432497]

Learning rate VS Epochs without momentum

Learning rate = 0.05 Epochs = 1012933

Learning rate = 0.1 Epochs = 10798

Learning rate = 0.15 Epochs = 7572

Learning rate = 0.2 Epochs = 9561

Learning rate = 0.25 Epochs = 197116

Learning rate = 0.3 Epochs = 202718

Learning rate = 0.35 Epochs = 212799

Learning rate = 0.4 Epochs = 171495

Learning rate = 0.45 Epochs = 157024

Learning rate = 0.5 Epochs = 3699

Learning rate VS Epochs after including momentum

Learning rate = 0.05 Epochs = 12040

Learning rate = 0.1 Epochs = 6284

Learning rate = 0.15 Epochs = 54922

Learning rate = 0.2 Epochs = 167066

Learning rate = 0.25 Epochs = 173303

Learning rate = 0.3 Epochs = 262072

Learning rate = 0.35 Epochs = 191364

Learning rate = 0.4 Epochs = 172335

Learning rate = 0.45 Epochs = 84139

Learning rate = 0.5 Epochs = 9411

INFERENCES:

1. It's clear that the number of epochs that the perceptrons took to converge using momentum is lesser than the number of epochs completed without using momentum.

2. The best learning rate = 0.5 as it has the lowest epoch values with and without momentum.