One Page Summer Internship Report

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TOPIC: IMPROVING THE WAY NEURAL NETWORKS LEARN.

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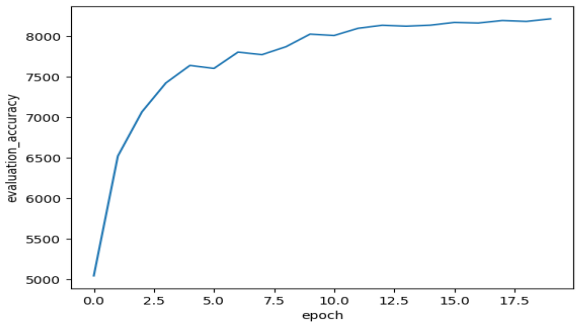
HANDWRITTEN DIGIT RECOGNITION USING MNIST DATA SET

Considering the training dataset of 1000 images, 784 input neurons, 30 hidden neurons and 10 output neurons, 20 epochs and a mini-batch size of 10, learning rate of 0.5, regularization parameter of 0.1, a graph between Epoch and Evaluation Accuracy is plotted as follows. This graph shows how the evaluation data accuracy improves with increasing epochs.



Implementation of Neural Nets in Branch Predictions

Using the concept of Machine Learning and Neural Networks, a machine is made to predict whether it has to take a particular branching instruction in a program or not.

As is seen from the Results, the First Result shows the accuracy when implemented using the 2-bit Saturating Counter Algorithm, i.e., without learning anything.

The second, third, fourth and fifth results show the prediction accuracy on the two Datasets, namely, Dataset1 and Dataset2, when implemented using neural network, i.e., the neural network predicts whether the branch is to be taken or not based on its learning of weights and biases corresponding to the input Perceptrons. It is seen from the Results that the Prediction Accuracy of the Neural Network increases as the Number of Perceptrons or the global_history_register size is increased from 4 to 8 then to 16, and so on, thus making more accurate branching predictions. Hence this shows that the Neural Network is learning better.

Prediction _Approach	Dataset1 accuracy	Dataset2 accuracy
2-bit Saturating Counter	0.96754	0.89850
Perceptron (GBH_bits 4)	0.97530	0.91077
Perceptron (GBH_bits 8)	0.98125	0.91216
Perceptron (GBH_bits 16)	0.98454	0.91225
Perceptron (GBH_bits 24)	0.98487	0.91232
Perceptron (GBH_bits 26)	0.98480	0.91229