

BITS F464: MACHINE LEARNING

Done by:

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2B: Artificial Neural Network

Model Description

Read the data, standardised the features. One hot encoded the output variable because it consists of 10 classes. Defined the NeuralNetwork class which includes all the necessary functions such as feedforward, backprop, train, calc_loss and predict.

We use Mini Batch Gradient Descent to backprop using the Cross Entropy Loss function. Finally we predict based on which output node has the maximum value to assign a class to the testing point. Train function calls feedforward to get the predictions and then backprop to update the weights according to the error.

Hyperparameters

Number of hidden layers = **2**

Number of units in 1st hidden layer = **30**

Number of units in 2nd hidden layer = **20**

Number of units in output layer = **10**

Hidden layers use **tanh** activation function.

Output layer uses **sigmoid** activation function.

Learning Rate = 0.1

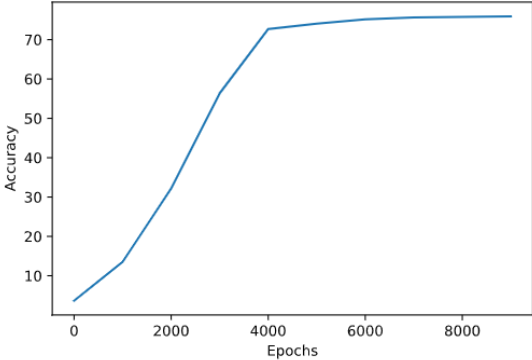
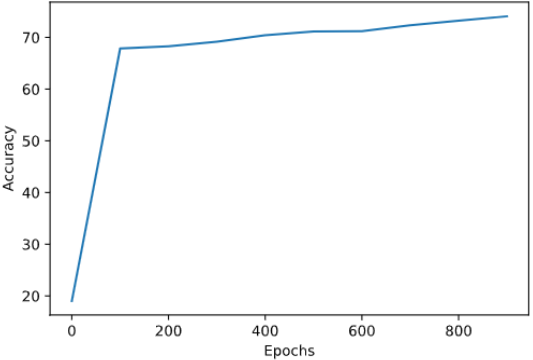
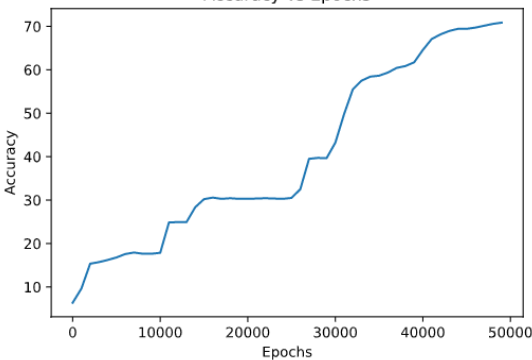
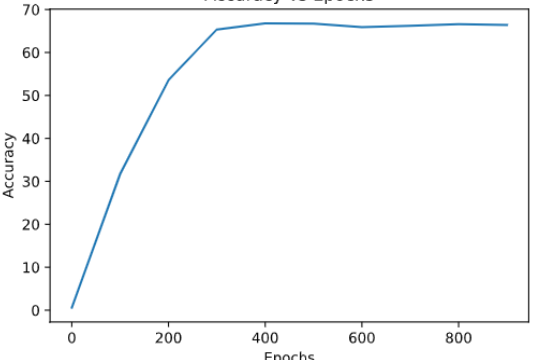
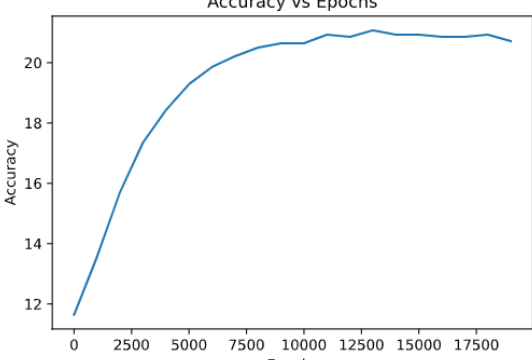
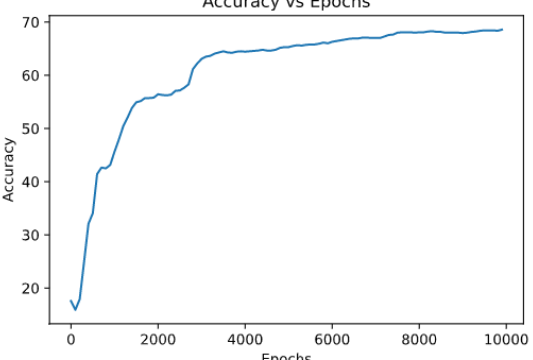
Iterations = 2000

Metrics

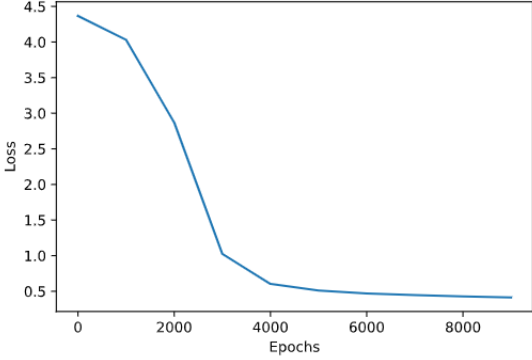
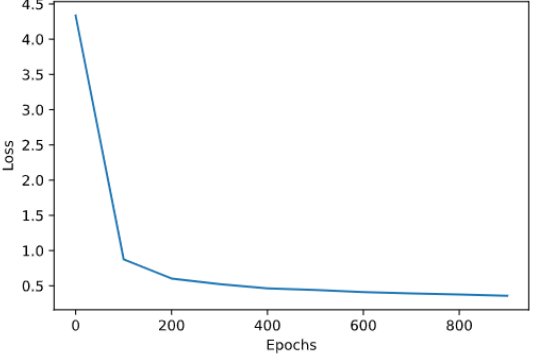
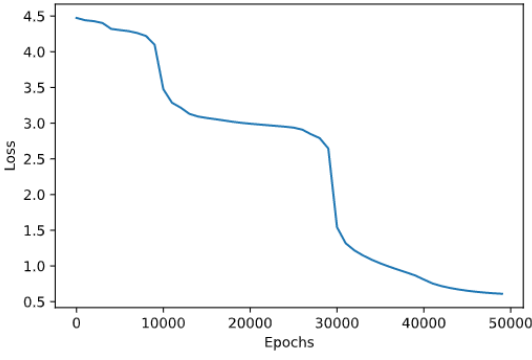
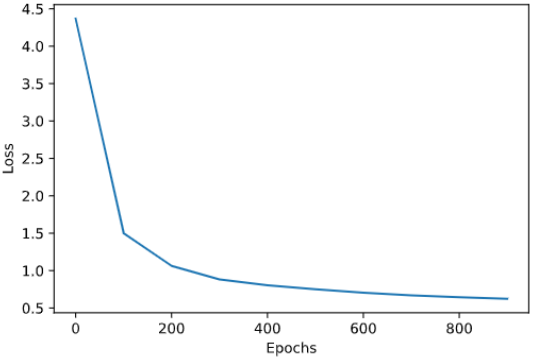
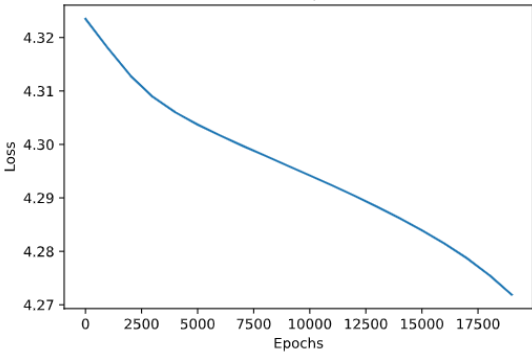
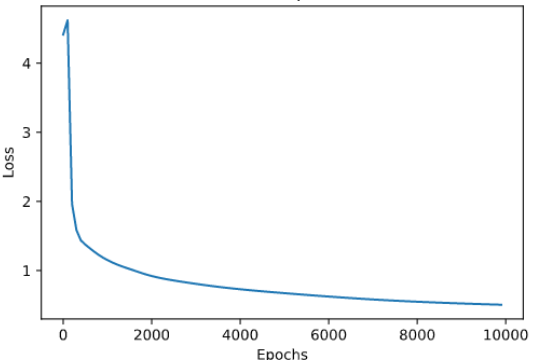
Measure	Model	1 hidden layer		2 hidden layers	
		Train	Test	Train	Test
Loss		0.52255894	0.71423568	0.27202645	0.31595283
Accuracy		75.6428571	70.66666666	75.2857142	73.833333

(Learning Rate = 0.1, Iterations = 2000)

Accuracy Plots

Alpha	1 hidden layer	2 hidden layers
0.1	 <p>Accuracy vs Epochs</p>	 <p>Accuracy vs Epochs</p>
0.01	 <p>Accuracy vs Epochs</p>	 <p>Accuracy vs Epochs</p>
0.001	 <p>Accuracy vs Epochs</p>	 <p>Accuracy vs Epochs</p>

Loss Plots

Alpha	1 hidden layer	2 hidden layers
0.1	 <p>Loss vs Epochs</p>	 <p>Loss vs Epochs</p>
0.01	 <p>Loss vs Epochs</p>	 <p>Loss vs Epochs</p>
0.001	 <p>Loss vs Epochs</p>	 <p>Loss vs Epochs</p>