Ahsanullah University of Science and Technology

Department of Computer Science and Engineering

Soft Computing Lab

CSE 4238

Assignment 02

Submitted To

Nibir Chandra Mandal
Lecturer, CSE, AUST

Sanzana Karim Lora
Lecturer, CSE, AUST

Submitted By

Fairuz Nawar

17.01.04.122

September 5, 2021

Contents

1. Experiment 1 :

The given dataset included Images of Bengali Digits and the following Hypermarameters were used for Experiment 1.

Accuracy = 11.14

Hyperparameters	Values
Number of hidden layers	6
Number of nodes in hidden layers	200(for all layers)
iteration	20000
Learning rate	0.01
Batch Size	20
Activation function of hidden layers	RelU
Optimizer and Loss	Adam, Cross Entropy Loss

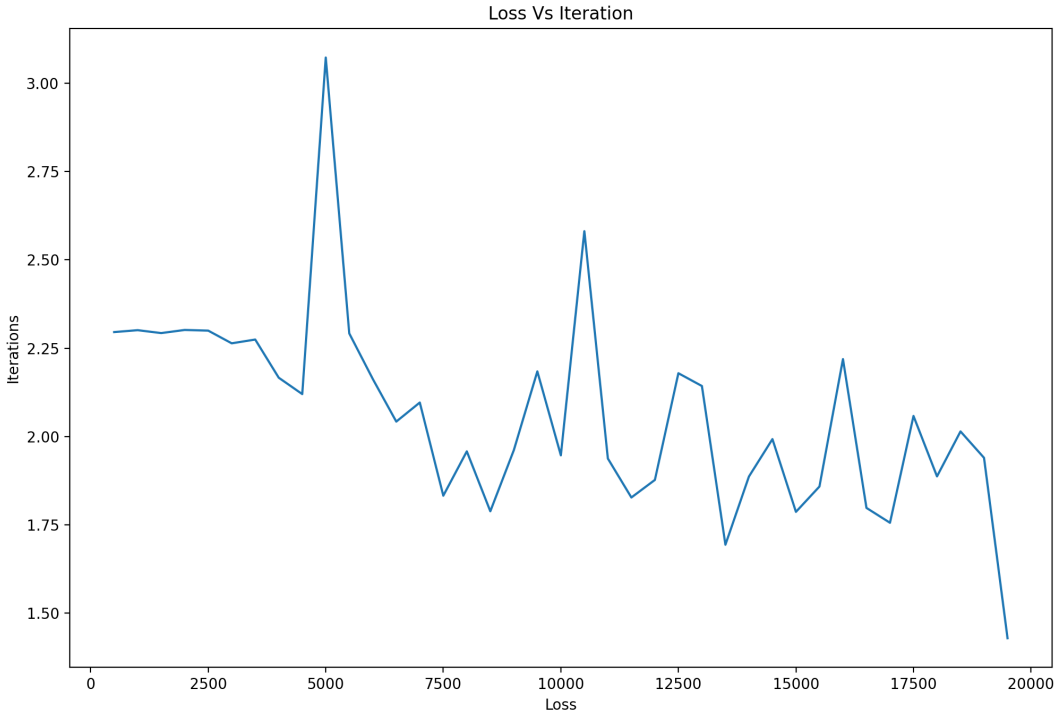


Figure 1: Loss vs Iterations

2. Experiment 2

To tune the hyperparameters, a number of experiments with various combination of the hyperparameters has been performed. Following Table summarizes the efforts.

2.1 Approaches of Tuning

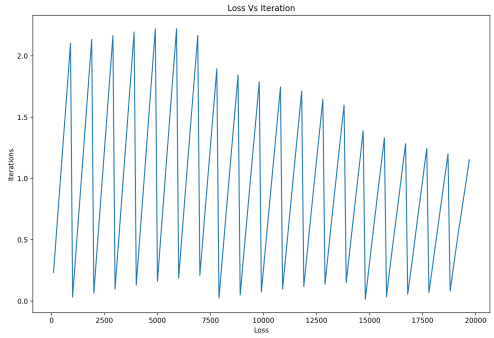
Hyperparameters	Exp 2(a)	Exp 2(b)
Number of hidden layers	6	7
Number of nodes in hidden layers	Half of the previous layer	98
iteration	20000	2500
Learning rate	0.01	0.01
Batch Size	20	200
Activation function of hidden layers	RelU	RelU
Optimizer and Loss	SGD, CrossEntropyLoss	Adam, NLLLoss

Hyperparameters	Exp 2(C)	Exp 2(d)
Number of hidden layers	4	5
Number of nodes in hidden layers	200	Half of the previous layer
iteration	20000	20000
Learning rate	0.01	0.01
Batch Size	200	100
Activation function of hidden layers	RelU	RelU
Optimizer and Loss	Adam, CrossEntropyLoss	Adam, CrossEntropyLoss

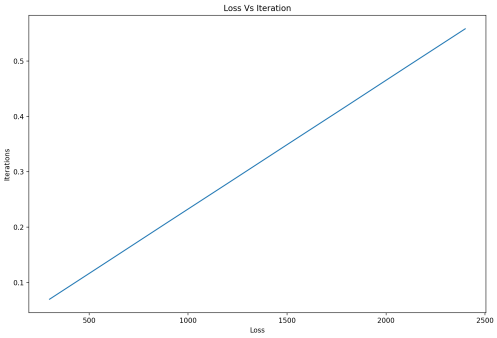
2.2 Result Comparison

Experiments	Accuracy
2(a)	56.14% (Best)
2(b)	10.06%
2(c)	19.02%
2(d)	24.74%

2.3 Loss Vs Iteration Graphs

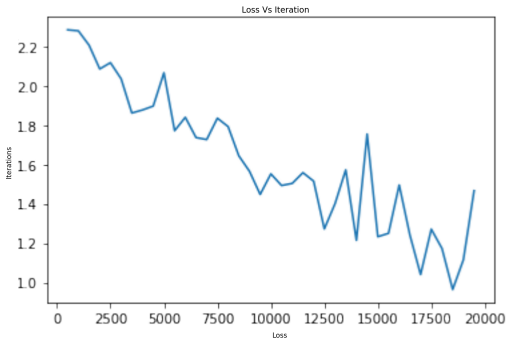


(a)

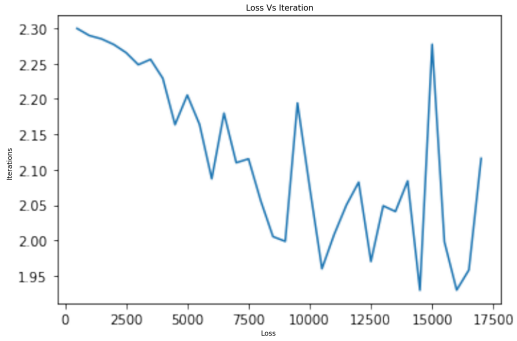


(b)

Figure 2: Loss Vs Iteration (a) Exp 2(a) and (b) Exp 2(b)



(a)



(b)

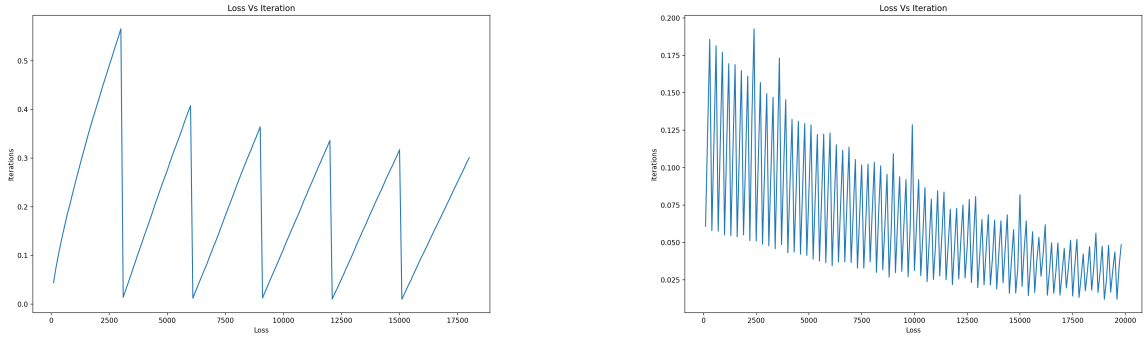
Figure 3: Loss Vs Iteration (a) Exp 2(c) and (b) Exp 2(d)

3. Performance Evaluation

Another dataset was provided for checking the model's performance for both Experiments 1 and 2. The evaluation is summarized below.

Hyperparameters	Exp 1	Exp 2(a)
Number of hidden layers	6	6
Number of nodes in hidden layers	200	Half of the previous layer
iteration	20000	20000
Learning rate	0.01	0.01
Batch Size	20	20
Activation function of hidden layers	RelU	RelU
Optimizer and Loss	Adam, CrossEntropyLoss	SGD, CrossEntropyLoss
Accuracy	83.52%	90.08%

3.1 Loss Vs Iteration Graph

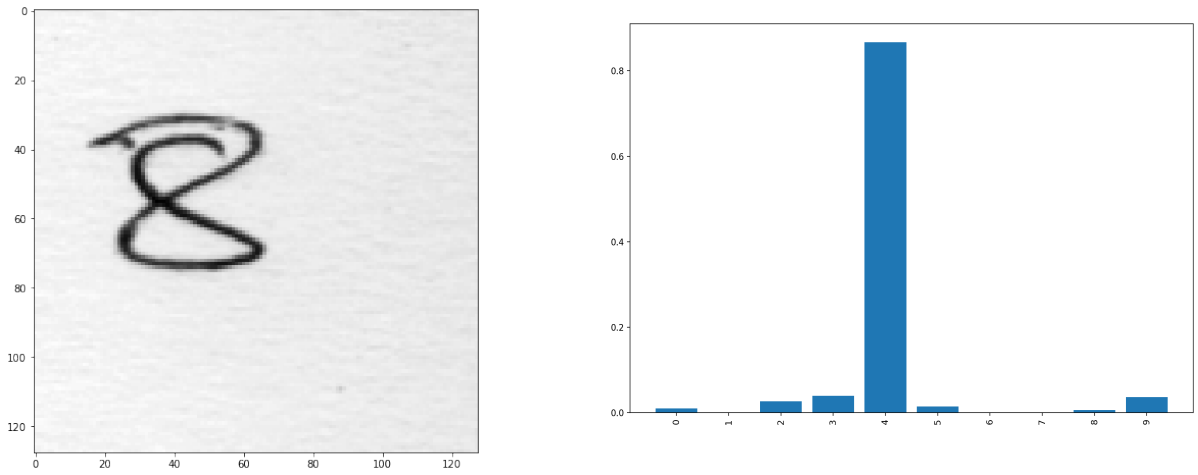


(a) (b)

Figure 4: Loss Vs Iteration (a) Exp 1 and (b) Exp 2(a)

4. Discussion

The accuracy of Dataset 1 and 2 has a visible difference. The reason behind such difference can largely be due to the fact that Dataset 2 was a well processed and 28 by 28 pixel dataset where the higher pixel values represented the pattern that was to be detected by the model. On the other hand, dataset 1 had images 180 x 180 pixels and the data was not well processed. Moreover, The data from dataset 1 had in consistencies. Some digits were smaller in size, some were far off the center, some were even adjacent to the margin, this could have possibly made an impact while recognizing a pattern.
Nonetheless, The model could predict about 60% of the hand written Bengali Digits corretly. Given below is a Random Image from the first dataset along with the output of the model.



(a) (b)

Figure 5: (a) An Input Image and (b) Probability of all classes for Input Image