

CSCI5525 Assignment 3 Answer

Daihui DOU dou00005@umn.edu 5514178

1 Problem 2

Results:

```
Average loss epoch 0: 1.2883302948691628
Average loss epoch 1: 0.732571166851026
Average loss epoch 2: 0.6003139899188267
Average loss epoch 3: 0.536531517625133
Average loss epoch 4: 0.4975709434433695
Average loss epoch 5: 0.4714735954096823
Average loss epoch 6: 0.4509857116323529
Average loss epoch 7: 0.4356596155183299
Average loss epoch 8: 0.4238787660231957
Average loss epoch 9: 0.412688941006616
Average loss epoch 10: 0.4046130580849303
Average loss epoch 11: 0.3973250912202822
Average loss epoch 12: 0.38957714860811654
Average loss epoch 13: 0.3847493664090172
Average loss epoch 14: 0.3785376701599512
Average loss epoch 15: 0.3753938475897262
Average loss epoch 16: 0.36951429349975984
Average loss epoch 17: 0.3666492967686175
Average loss epoch 18: 0.36400412721233766
Average loss epoch 19: 0.35791614675994243
Average loss epoch 20: 0.3585862871997562
Average loss epoch 21: 0.3534841573599613
Average loss epoch 22: 0.3503489746844574
Average loss epoch 23: 0.35051122078528774
Average loss epoch 24: 0.3445492753615746
Total time: 11.89512825012207 seconds
Optimization Finished!
Accuracy 0.9097
ddou@ddou-LENOVO-Y50-70:~/Desktop/CSCI5525/hw/CSCI5525_hw3$
```

2 Problem 3

Results:

```
Average loss at step 160: 1685.1
Average loss at step 170: 1509.5
Average loss at step 180: 1336.7
Average loss at step 190: 1210.3
Average loss at step 200: 1188.4
Average loss at step 210: 1130.3
Average loss at step 220: 945.4
Average loss at step 230: 980.3
Average loss at step 240: 989.7
Average loss at step 250: 934.7
Average loss at step 260: 926.4
Average loss at step 270: 1070.4
Average loss at step 280: 991.1
Average loss at step 290: 830.4
Average loss at step 300: 955.2
Average loss at step 310: 803.5
Average loss at step 320: 966.8
Average loss at step 330: 859.0
Average loss at step 340: 719.4
Average loss at step 350: 801.2
Average loss at step 360: 857.6
Average loss at step 370: 674.0
Average loss at step 380: 670.3
Average loss at step 390: 635.8
Average loss at step 400: 738.0
Average loss at step 410: 730.7
Average loss at step 420: 688.1
Optimization Finished!
Total time: 125.94058847427368 seconds
Accuracy 0.9221
ddou@ddou-LENOVO-Y50-70:~/Desktop/CSCI5525/hw/CSCI5525_hw3$
```

3 Problem 4

Task 1:

In task 1, first I do linear transformation on each row of an image to change the image from 28*28 dimensions to 28*128 dimensions.

Then the data are forwarded to 1-layer lstm with hidden units of 128.

The last output of size 1*128 of lstm is then transformed to 1*10 logits of classes.

The loss is calculated using softmax cross entropy.

AdamOptimizer is used for optimization.

Predictions are made by choosing the maximum logit after using softmax.

After 20 epochs, the test accuracy is 0.9803.

```
Average loss at step 8320: 0.0
Average loss at step 8330: 0.0
Average loss at step 8340: 0.0
Average loss at step 8350: 0.0
Average loss at step 8360: 0.0
Average loss at step 8370: 0.0
Average loss at step 8380: 0.0
Average loss at step 8390: 0.0
Average loss at step 8400: 0.0
Average loss at step 8410: 0.0
Average loss at step 8420: 0.0
Average loss at step 8430: 0.0
Average loss at step 8440: 0.0
Average loss at step 8450: 0.0
Average loss at step 8460: 0.0
Average loss at step 8470: 0.0
Average loss at step 8480: 0.0
Average loss at step 8490: 0.0
Average loss at step 8500: 0.0
Average loss at step 8510: 0.0
Average loss at step 8520: 0.0
Average loss at step 8530: 0.0
Average loss at step 8540: 0.0
Average loss at step 8550: 0.0
Average loss at step 8560: 0.0
Average loss at step 8570: 0.0
Average loss at step 8580: 0.0
Optimization Finished!
Total time: 691.5682291984558 seconds
Accuracy 0.9803
```

4 Problem 5

For problem 5, I already implemented in Problem 4 Task 1. :)