ML Assignment-3

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Problem-1

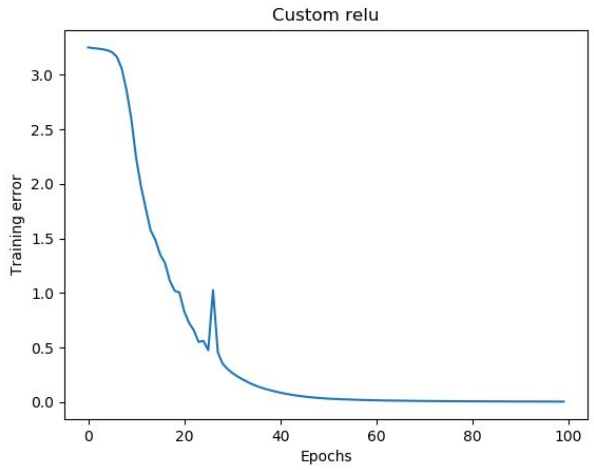
Custom MLP classifier

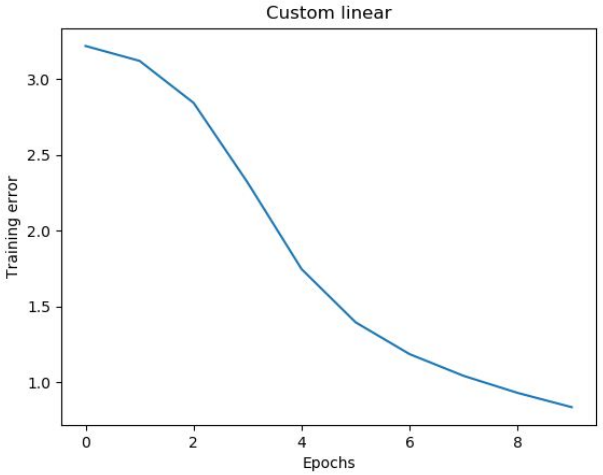
Please refer the files for code and weight files.

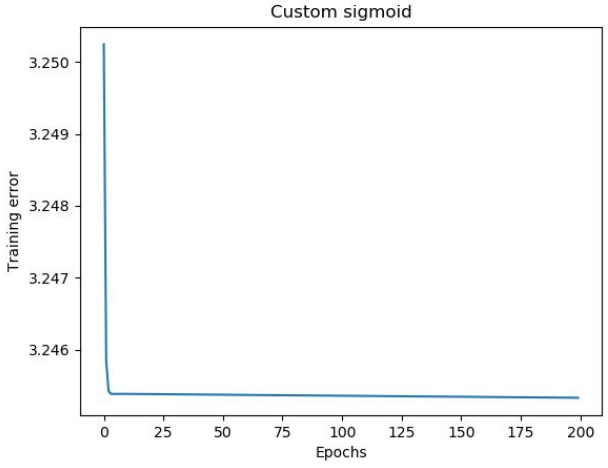
Accuracy on test set:

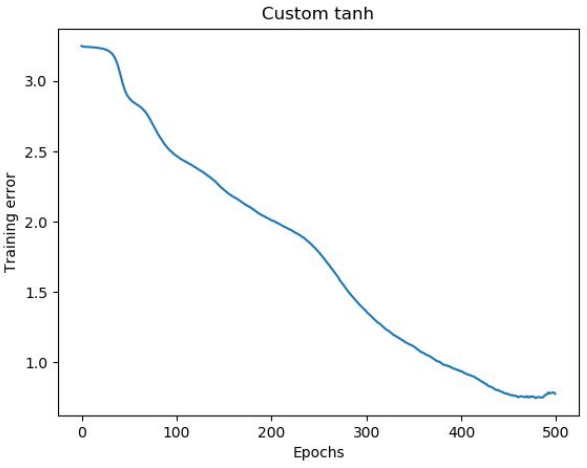
1. Relu: 87.4%
2. Sigmoid: 12.6%
3. Linear: 81.9%
4. Tanh: 71.7%

Plots:









Sklearn's MLP classifier

Check related files for code.

Accuracy on test set:

1. Relu: 75.5%
2. Sigmoid: 29%
3. Linear: 83.1%
4. Tanh: 80%

Comments

In relu, my implementation seem to have a better accuracy than sklearn's implementation. In other cases, sklearn's accuracy outperform my accuracies. One point to note is that in case of sigmoid, the accuracy is pretty low. This might be possible because when using the sigmoid activation function, the classifier must not have converged during training.

Problem-2

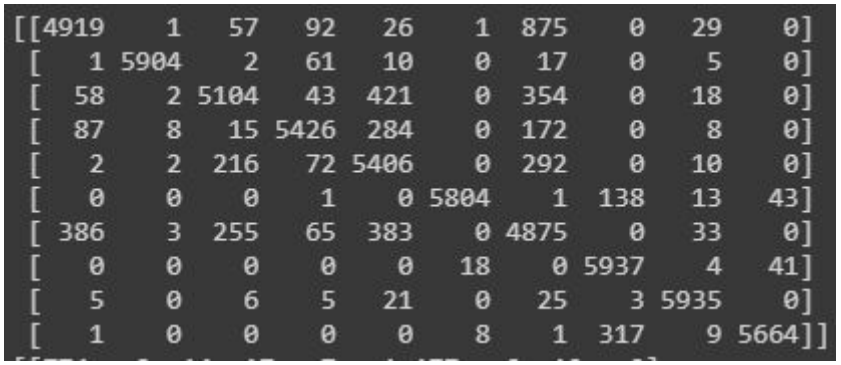
I have referred my the code for this problem from
https://pytorch.org/tutorials/beginner/blitz/cifar10_tutorial.html#define-a-convolutional-neural-network

Accuracy of the model on the test set is 89%

Loss per epoch is:

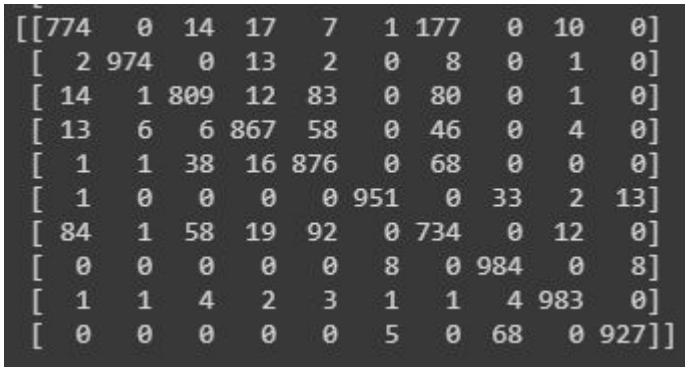
Epoch	Loss
1	1.012
2	0.433
3	0.373
4	0.326
5	0.300
6	0.284
7	0.276
8	0.249
9	0.249
10	0.242

Confusion matrix on training:



```
[[4919    1   57   92   26    1  875    0   29    0]
 [   1 5904    2   61   10    0   17    0    5    0]
 [  58    2 5104   43  421    0  354    0   18    0]
 [  87    8   15 5426  284    0  172    0    8    0]
 [   2    2  216   72 5406    0  292    0   10    0]
 [   0    0    0    1    0 5804    1  138   13   43]
 [ 386    3  255   65  383    0 4875    0   33    0]
 [   0    0    0    0    0   18    0 5937    4   41]
 [   5    0    6    5   21    0   25    3 5935    0]
 [   1    0    0    0    0    8    1  317    9 5664]]
```

Confusion matrix on testing:



```
[[774   0  14  17   7   1 177   0  10   0]
 [  2 974   0  13   2   0   8   0   1   0]
 [ 14   1 809  12  83   0  80   0   1   0]
 [ 13   6   6 867  58   0  46   0   4   0]
 [  1   1  38  16 876   0  68   0   0   0]
 [  1   0   0   0   0 951   0  33   2  13]
 [ 84   1  58  19  92   0 734   0  12   0]
 [  0   0   0   0   0   8   0 984   0   8]
 [  1   1   4   2   3   1   1   4 983   0]
 [  0   0   0   0   0   5   0  68   0 927]]
```

CNN+SVM

Accuracy: 7.75%

Comments

As reported, the accuracy using only CNN is 89%. The loss is steadily decreasing over 10 epochs, after which it reaches a good enough point. In the confusion matrix too, there is a huge number of correct classifications over incorrect classifications (the diagonal entries).