Exercise 3 Train FashionMNIST

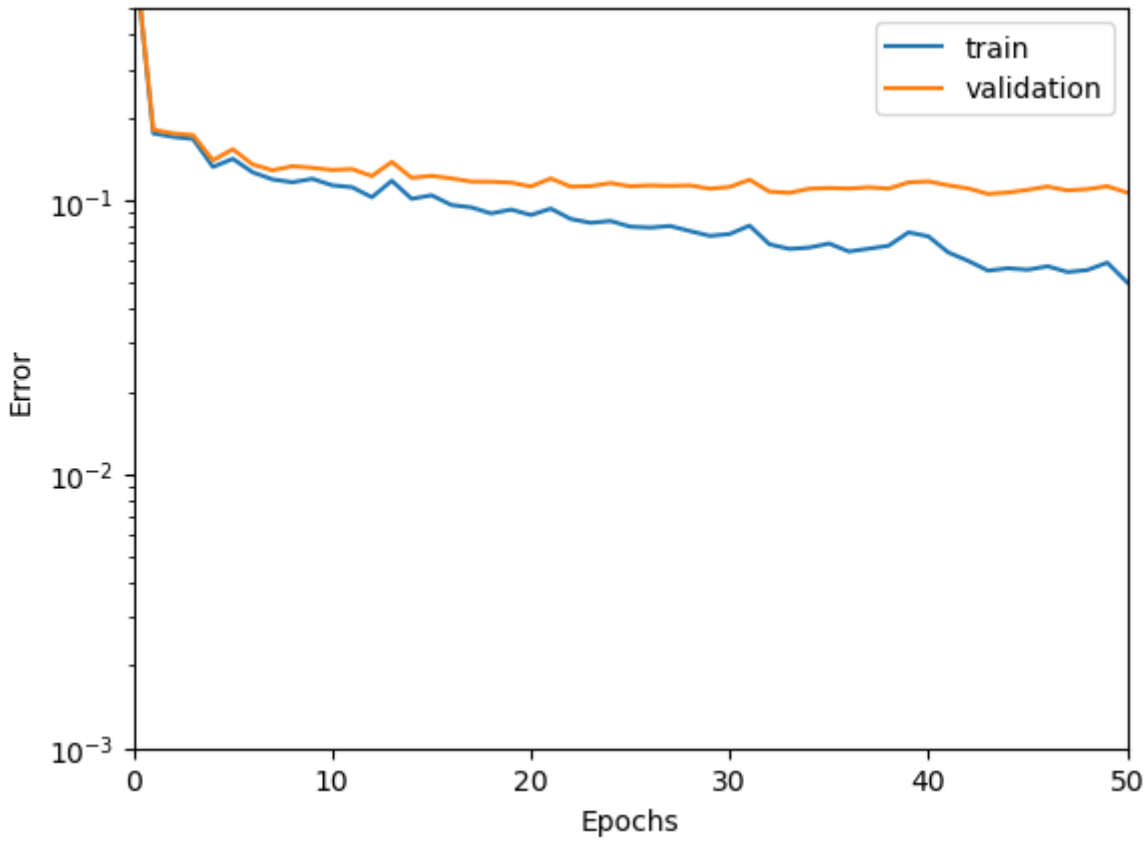
We will run two experiments:

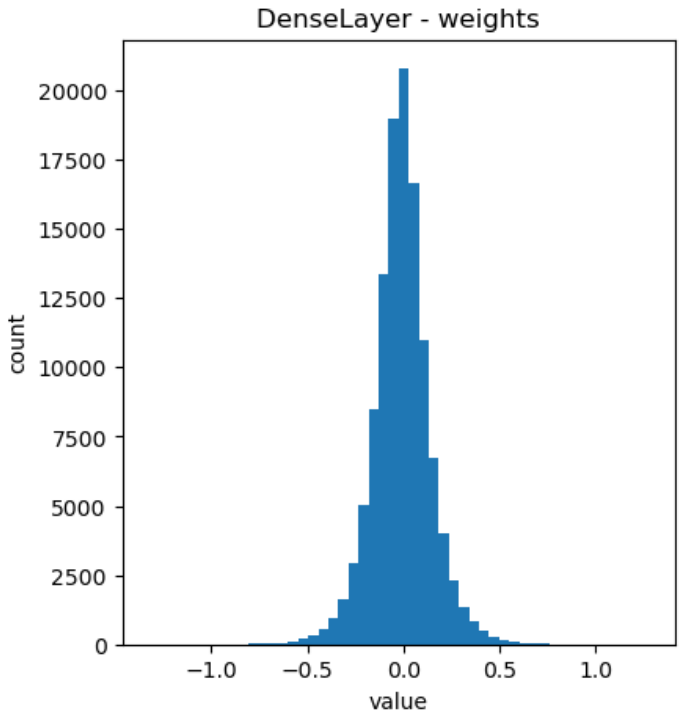
Shallow Network : Single hidden layer layer with 150 units

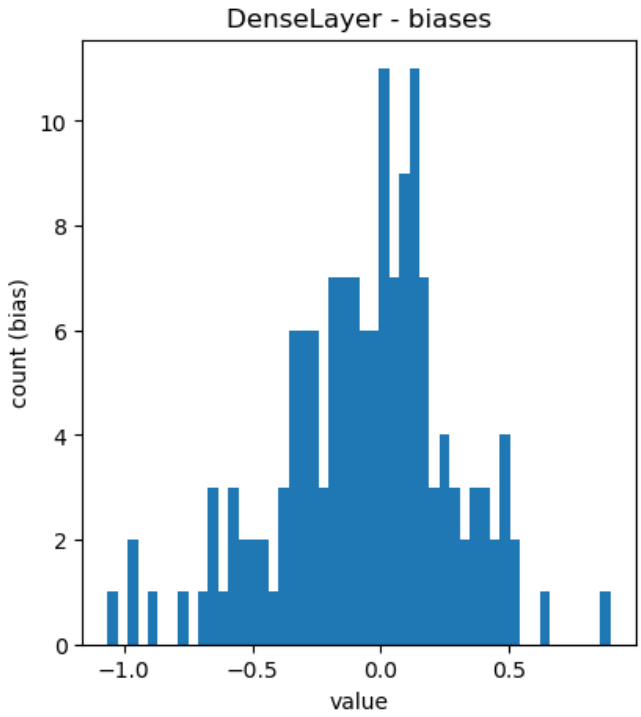
Deeper Network : Three hidden layers with 250, 150, 50 hidden layers.

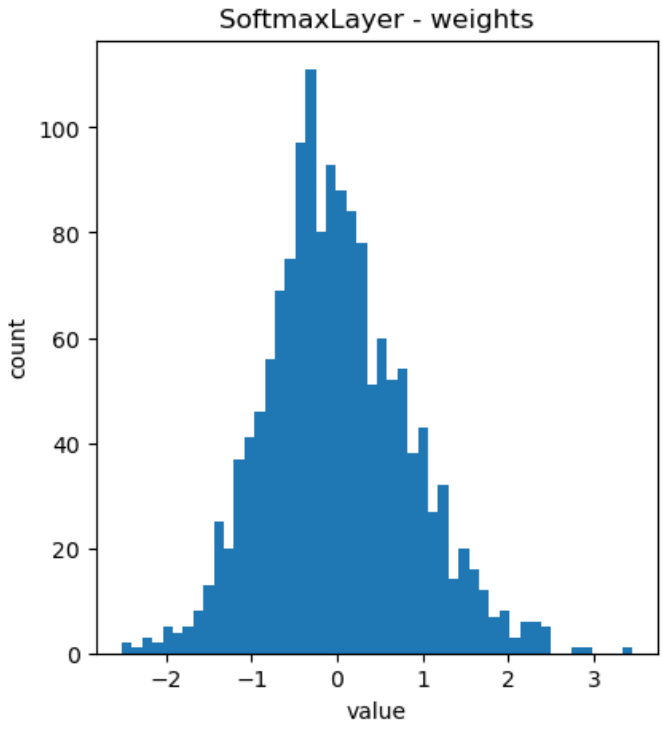
> What are suitable learning rates, batch sizes, number of epochs ? Describe your findings including the achieved test error rates and the learning curves.

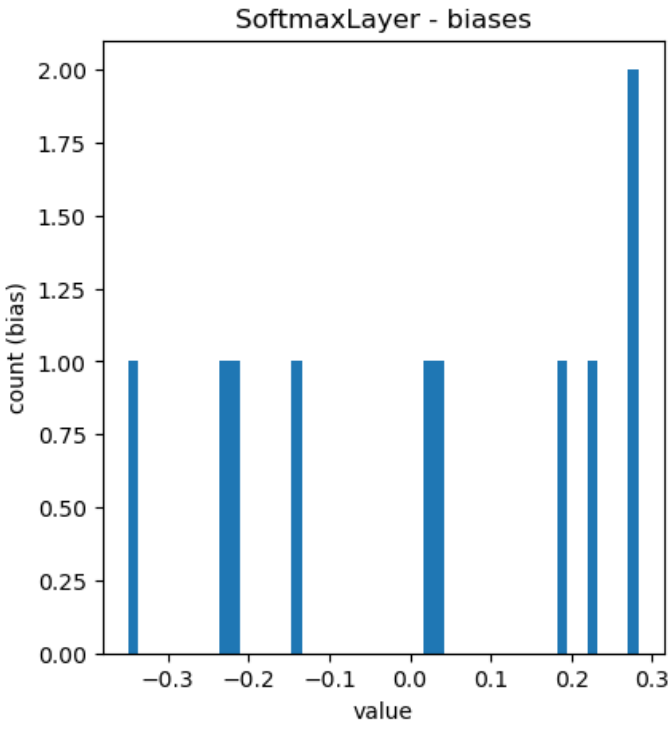
Shallow Network



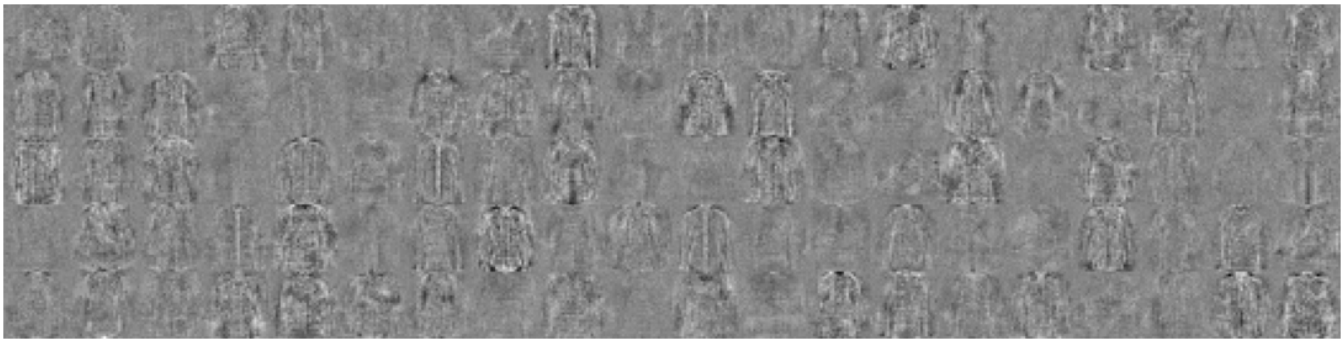




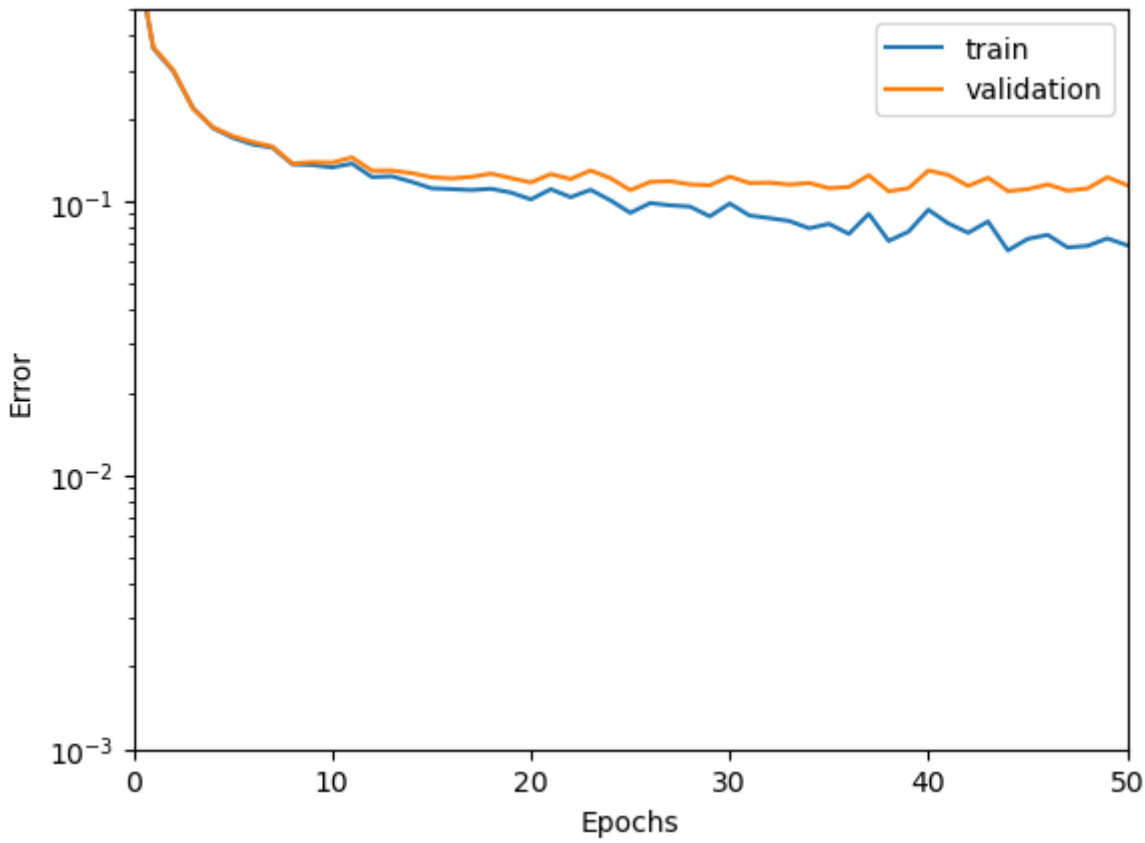


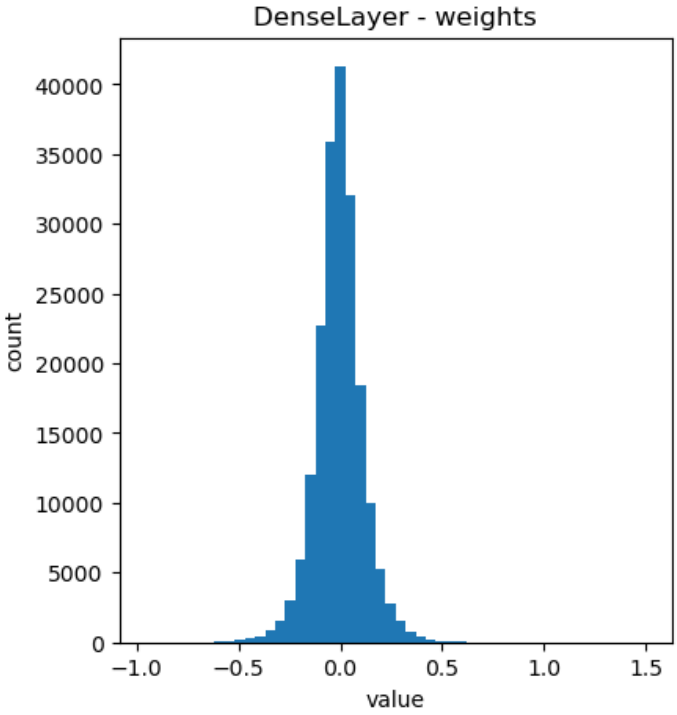


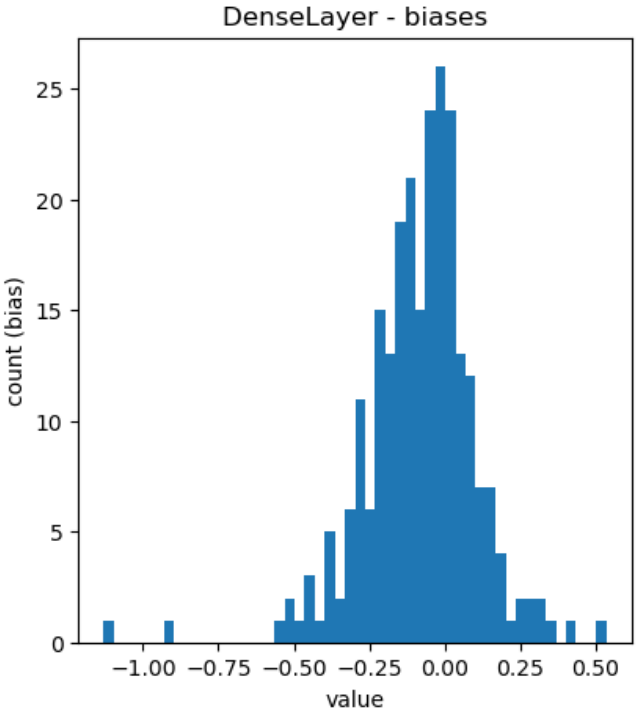
test error rate: 10.84 % out of 14000

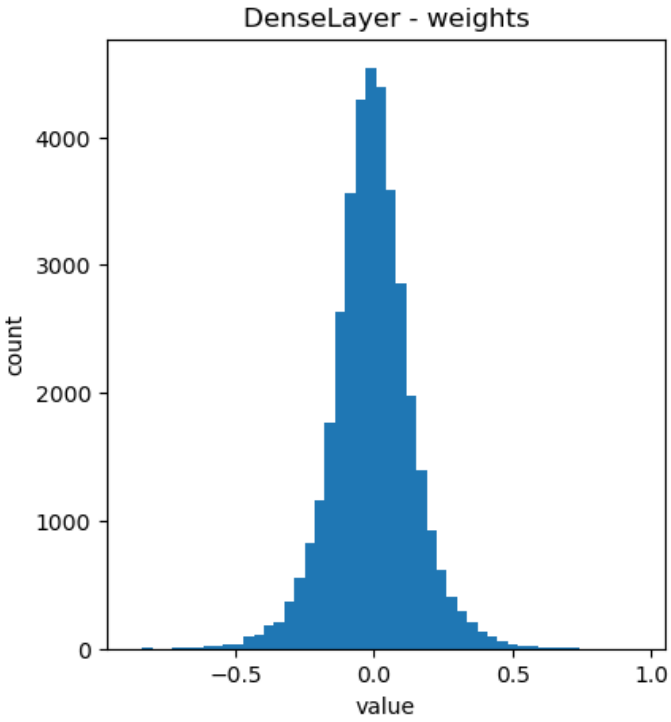


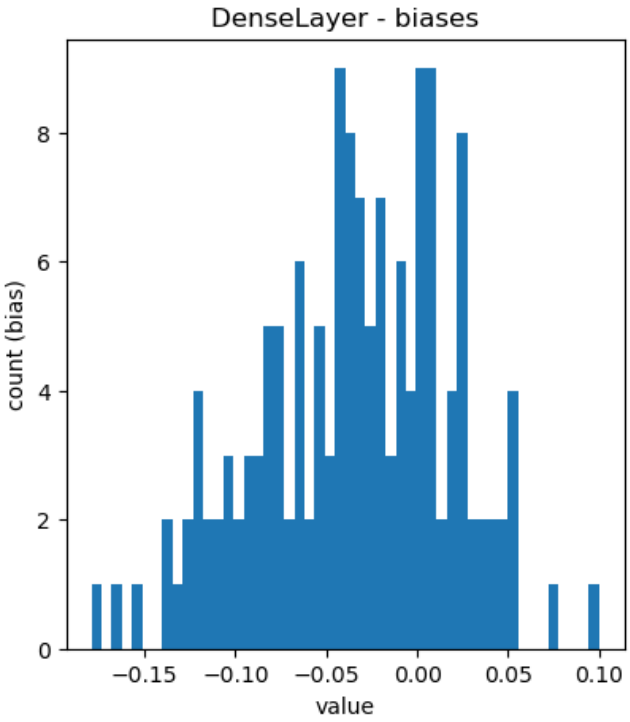
Deeper Network

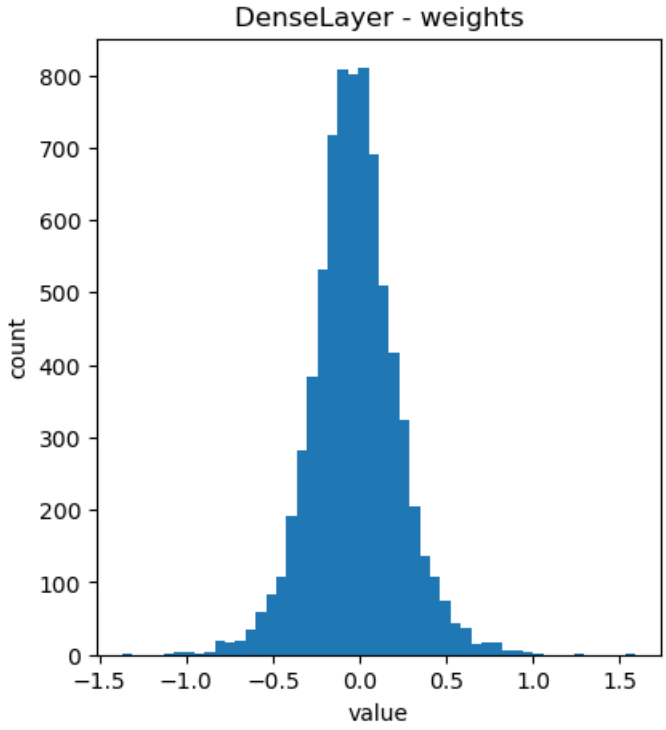


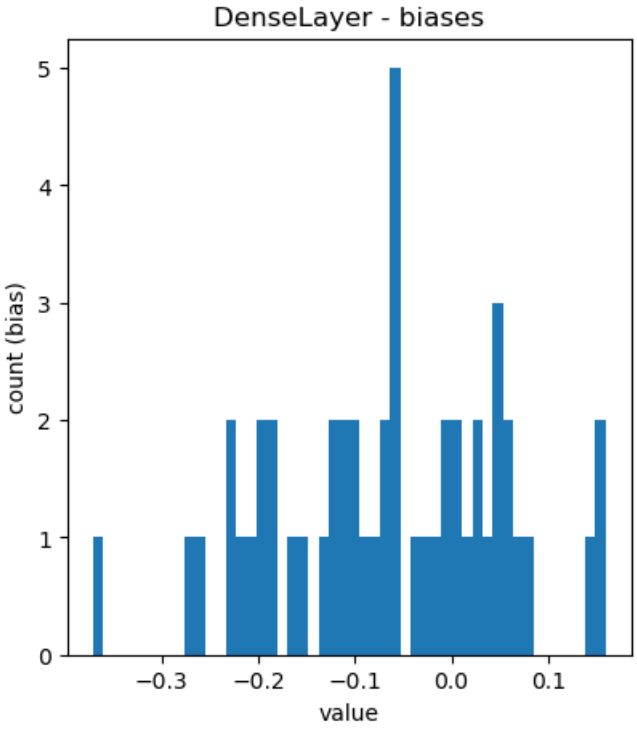

DenseLayer - weights
count
value
0
5000
10000
15000
20000
25000
30000
35000
40000
−1.0
−0.5
0.0
0.5
1.0
1.5

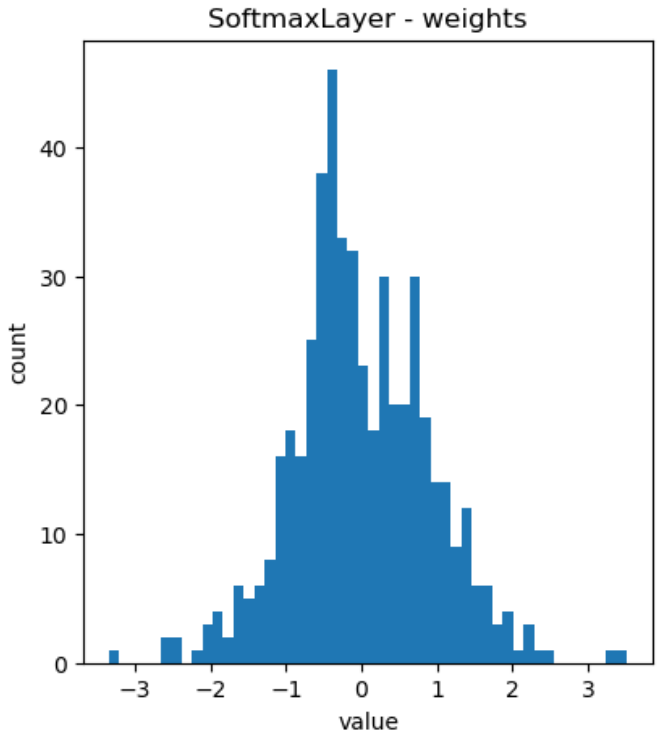

DenseLayer - biases
count (bias)
value
0
5
10
15
20
25
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50

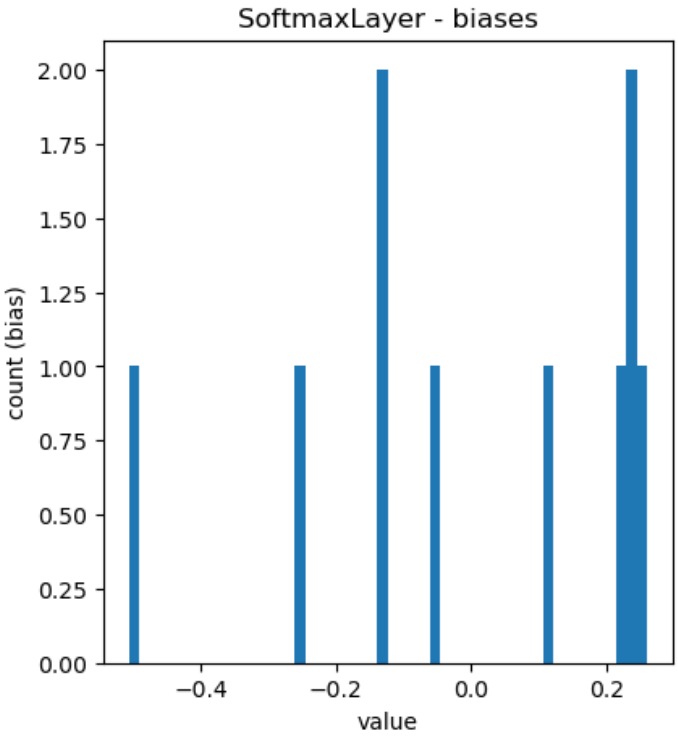

DenseLayer - weights
count
value
0
1000
2000
3000
4000
−0.5
0.0
0.5
1.0

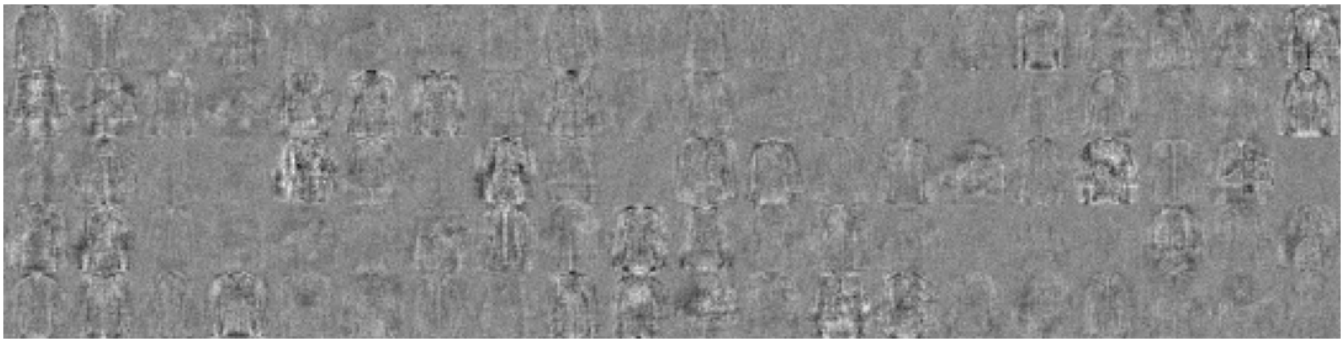

DenseLayer - biases
count (bias)
value
0
2
4
6
8
−0.15
−0.10
−0.05
0.00
0.05
0.10











test error rate: 11.88 % out of 14000

Conclusion

/

We tried to use these parameters for both shallow and deeper networks:

epochs = 50 batchsize = 16 learning_rate = 0.1

We found that the shallow network performed better than the deeper network. The test error rate for the shallow network was 10.84% and for the deeper network was 11.88%. Therefore, a smaller network is able to perform better than a deeper network because the deeper network is more prone to overfitting and the task of classifying images is not complex enough to require a deeper network.