Group Task 2.c, CNN on MNIST

2.1 Optimize learning rate
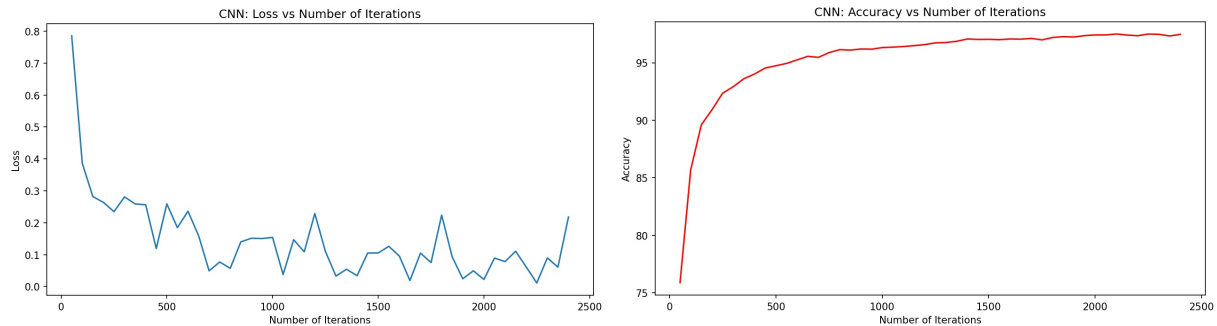

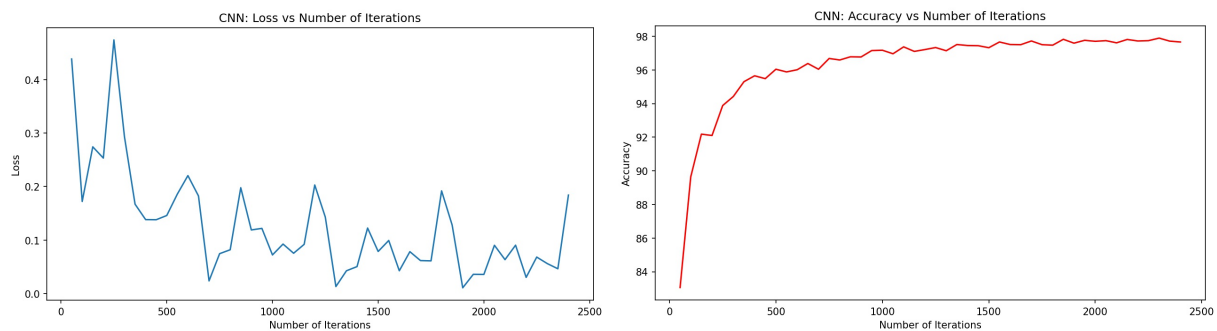**Figure 1.** Loss function and Accuracy at learning rate of 0.001

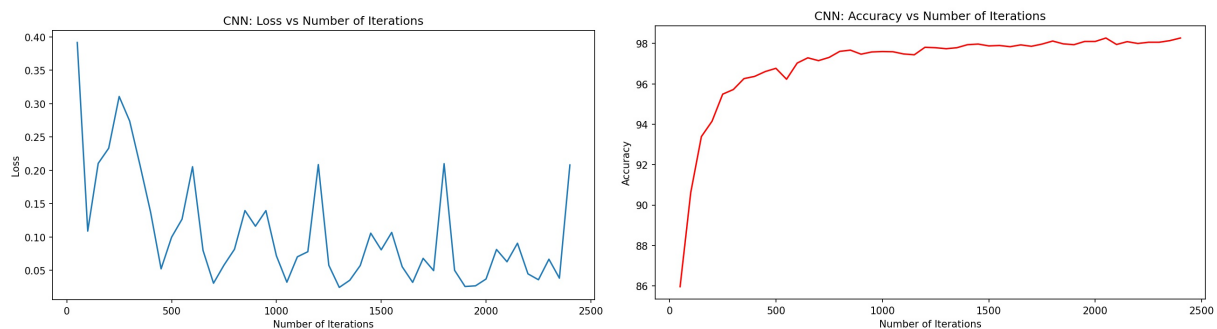**Figure 2.** Loss function and Accuracy at learning rate of 0.002

Figure 3. Loss function and Accuracy at learning rate of 0.003

As you can see on these plots, the loss function gets smaller, if we increase the learning rate from 0.001 to 0.002, but it doesn't get any better if we increase it even more to 0.005.

The accuracy is relatively constant with respect to the learning rate, however, it tends to be more stable for smaller learning rates, which makes intuitively sense, as too high learning rates can result in overshooting the goal.

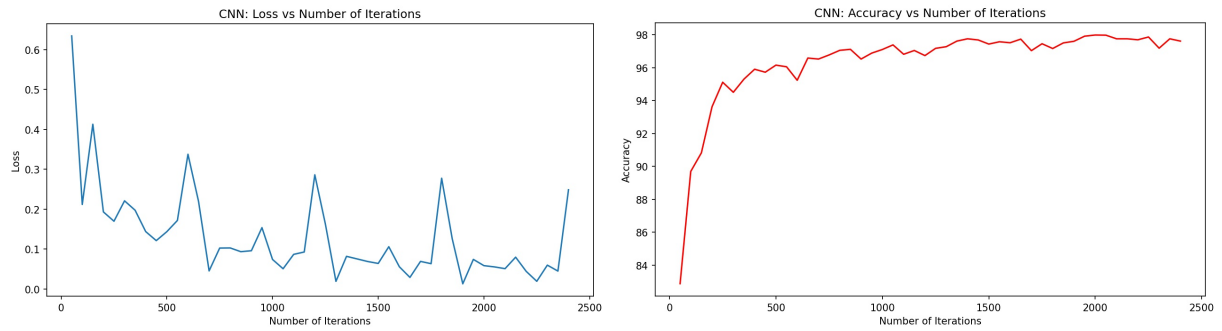Regarding these results, a learning rate of 0.002 or 0.003 seems optimal.

Figure 4. Loss function and Accuracy at learning rate of 0.005

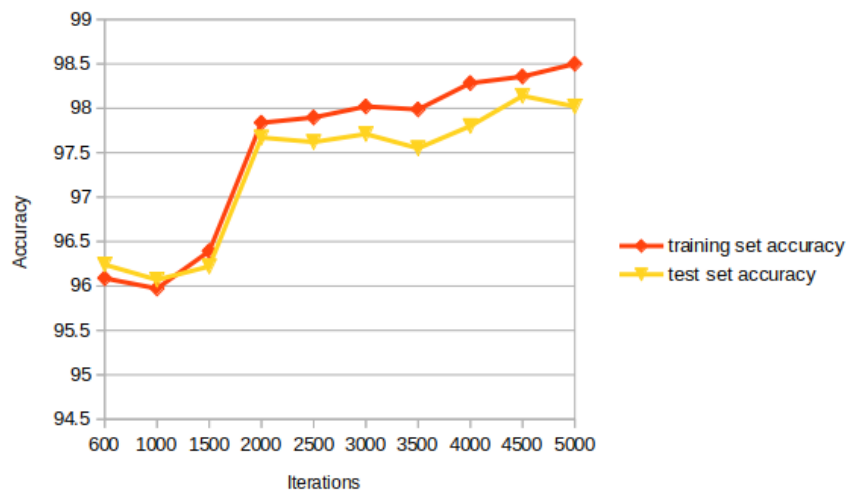# 3   Optimize number of training iterations

Figure 5. Accuracy on training set and test set depending on number of iterations

As one can see, the accuracy of both the training set and the test set increase with the number of iterations. However, we also see that the accuracy does not increase significantly after more than 2000 iterations. As it takes more time to train the model with more iterations, we conclude that the optimal amount of iterations is around 2000. The tests for the previous task were all done with 2500 iterations.