Assignment 1

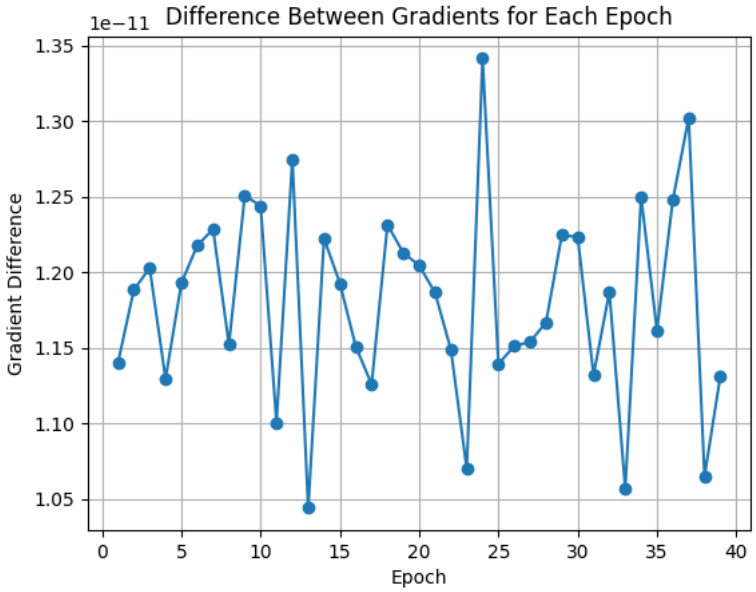
1. Successfully write the functions to compute the gradient analytically

Completed

2. Tests to check against the numerically computed gradient

Calculating for W[0:10, 0:20] the gradient with the provided function "ComputeGradsNumSlow" and comparing with the values I get when calculating W for one epoch.

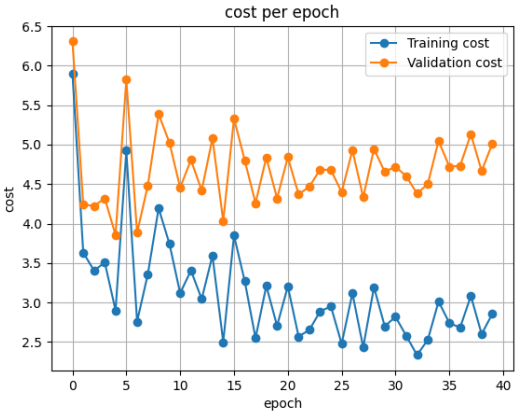
3. Results

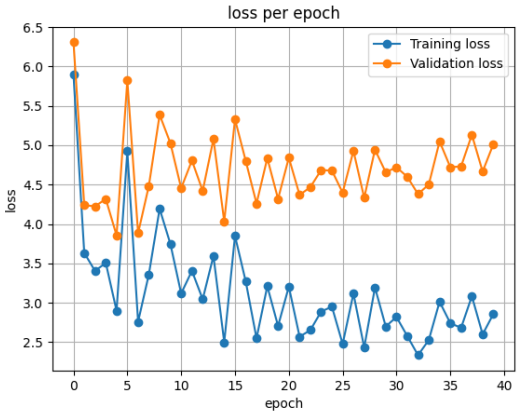


Extremely small deviations between the numerical and analytical gradient.
Comparison between W[0:10, 0:20] of the numerical gradient with the analytical updated W[0:10, 0:20] with lambda=0, n_batch=100, eta=0.001

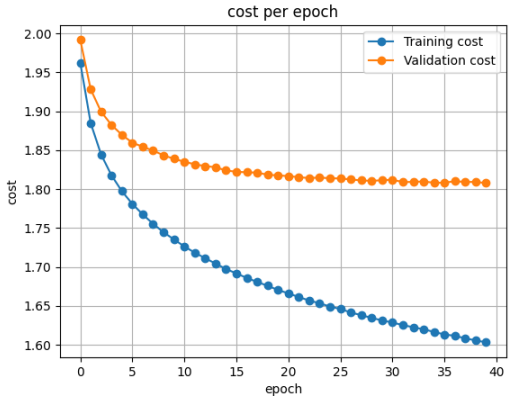
4. Graphs of the loss and the cost function

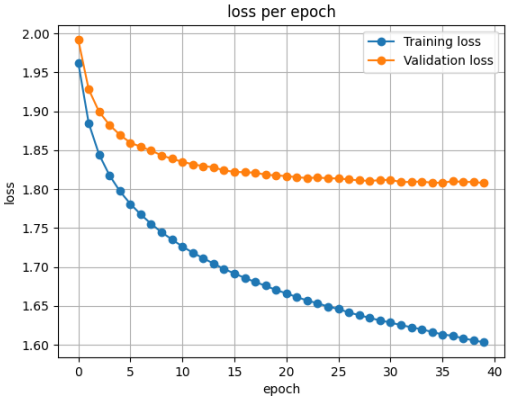
lambda=0, n epochs=40, n batch=100, eta=.1



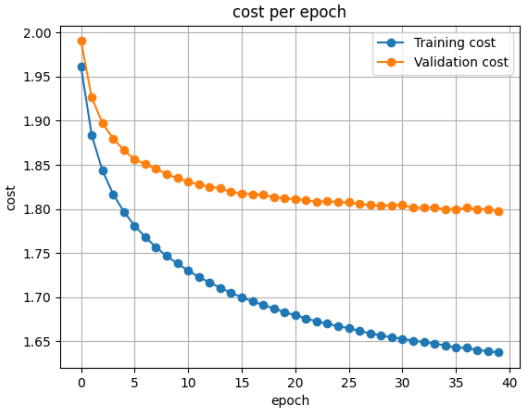


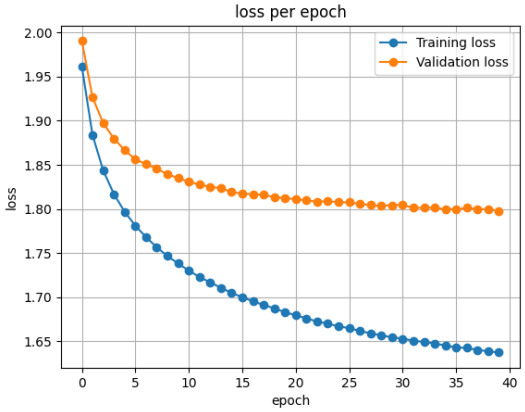
lambda=0, n epochs=40, n batch=100, eta=.001



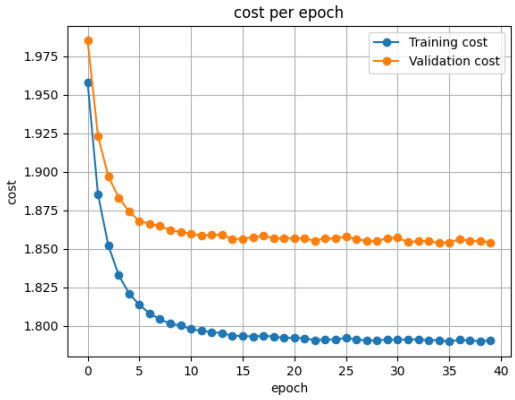


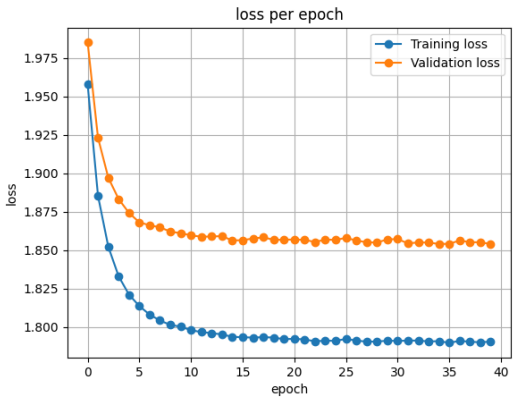
lambda=.1, n epochs=40, n batch=100, eta=.001





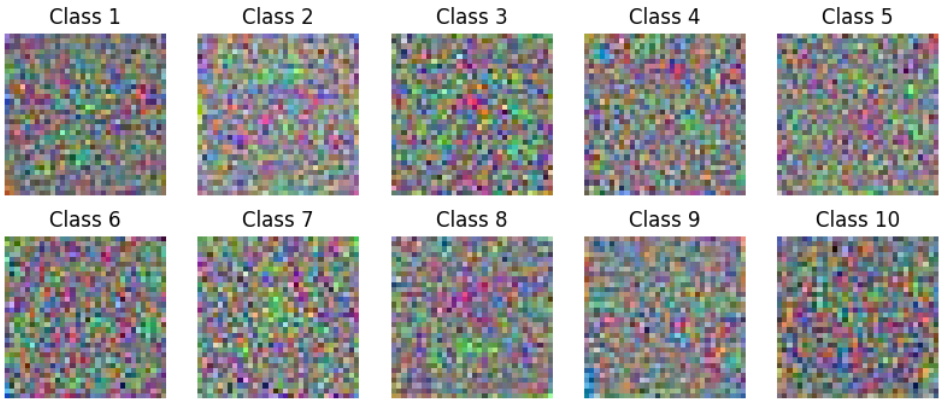
lambda=1, n epochs=40, n batch=100, eta=.001



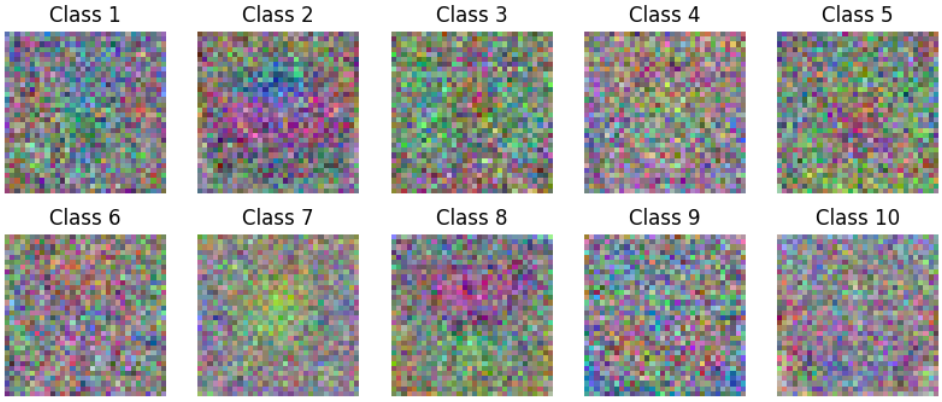


5. Images representing the learnt weight matrix

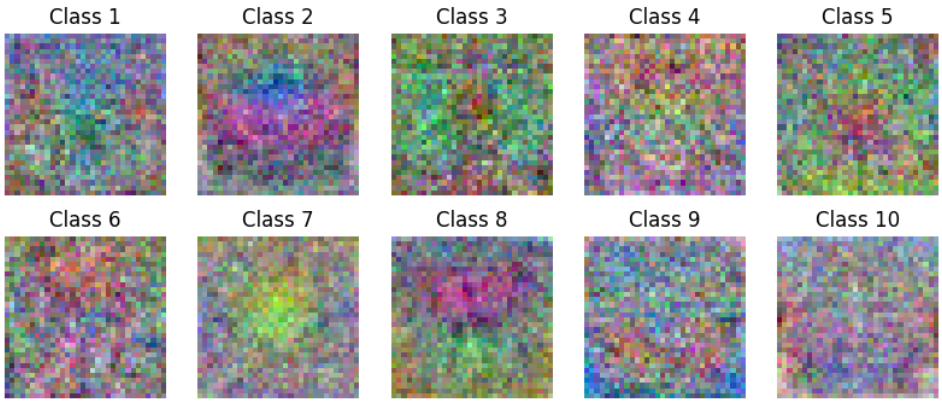
lambda=0, n epochs=40, n batch=100, eta=.1



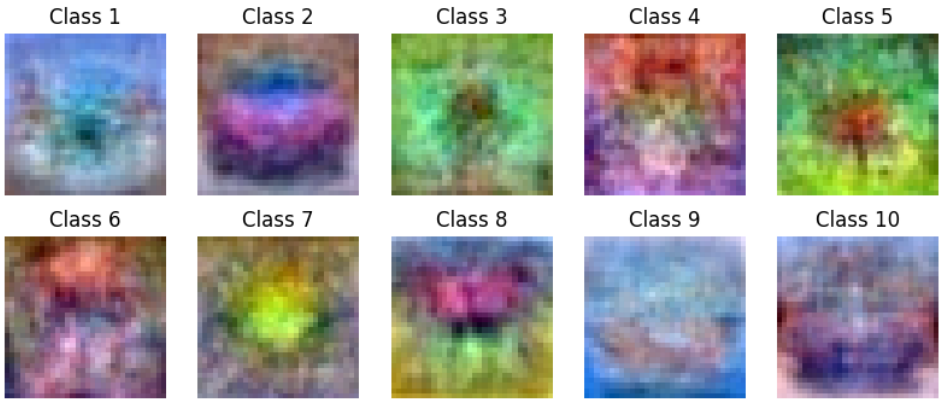
lambda=0, n epochs=40, n batch=100, eta=.001



lambda=.1, n epochs=40, n batch=100, eta=.001



lambda=1, n epochs=40, n batch=100, eta=.001



6. Test accuracy

lambda=0, n epochs=40, n batch=100, eta=.1
Test Accuracy: 0.2484
lambda=0, n epochs=40, n batch=100, eta=.001
Test Accuracy: 0.3769
lambda=.1, n epochs=40, n batch=100, eta=.001
Test Accuracy: 0.3796
lambda=1, n epochs=40, n batch=100, eta=.001
Test Accuracy: 0.3674

7. Effect of increasing the amount of regularization and the importance of the correct learning rate.

A learning rate of 0.001 showed to have a lot better accuracy then with 0.1.
Including a regularization term increased accuracy by a very small margin. However, only when the regularization term was 0.01, if it was 1 accuracy decreased. Also with a regularization term the visualizations of the weights seem slightly more diffuse which could

be an indication that less overfitting is happening and the model tries to use more generalized patterns.