

BLG454E Learning From Data

Homework 3 Report

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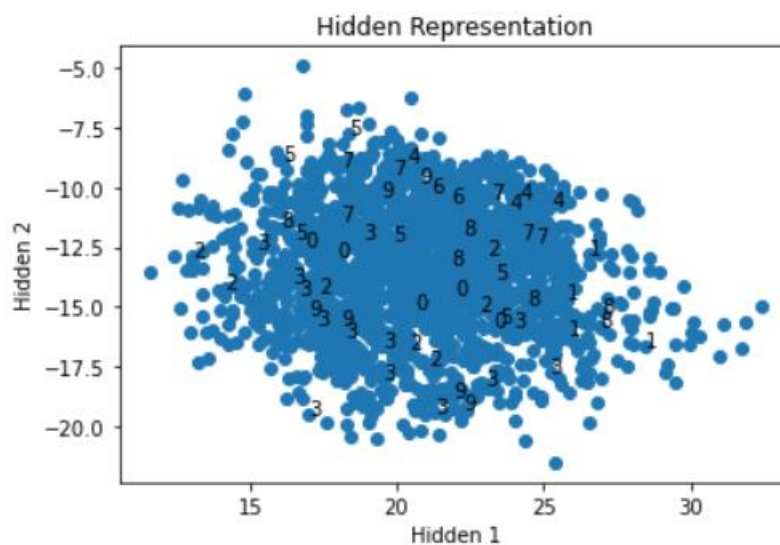
In this homework, I implemented a generic artificial neural network and layer classes, and created an autoencoder instance by giving input samples also as labels. It behaves as a dimension reducer, with hidden layer's output becoming the reduced vector.

Optdigits dataset is used, dimension for each input sample is 64, and there is a label indicating the digit of the sample. Reduced vectors (with dimension 2) are plotted above with their digit labels. It can be seen that same digits are close in the space, implying that our autoencoder works as expected. I did not use any activation function in the hidden layer, since this gave the best results among my trials.

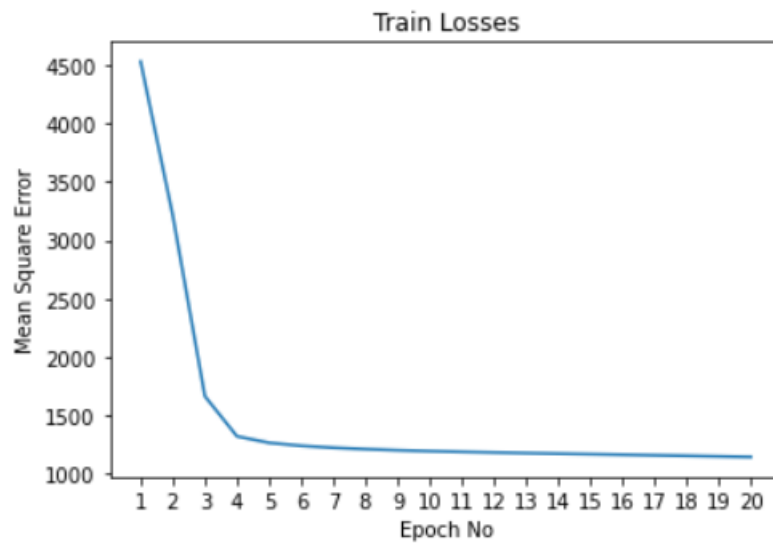
I utilized an epoch approach, since going through the entire dataset for many times improves the accuracy drastically. I gave a large number (20) to be sure that it converged and yielded the best results. I also set the batch size to 32, since it is usually the best number to specify. Lastly, learning rate is specifically set to $1e-06$ to avoid exploding gradient and non-convergence (underfit) problems.

Plots

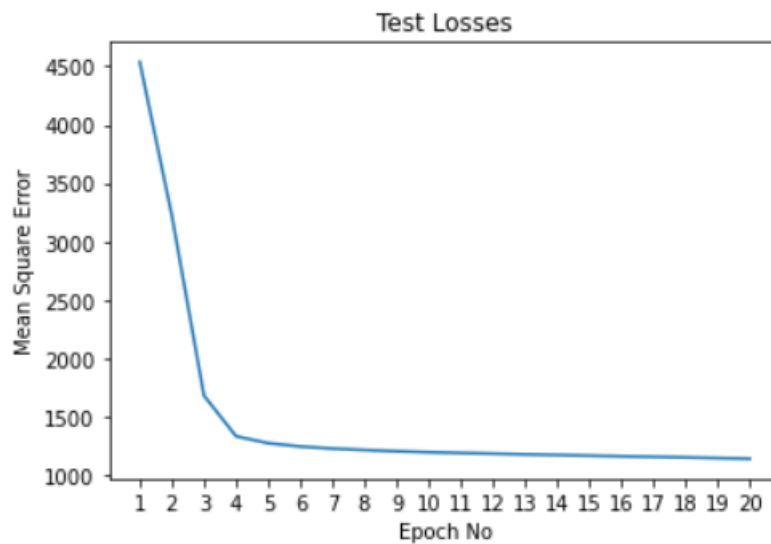
1) Reduced Vector Plot:



2) Train Loss Plot for Epochs:



3) Test Loss Plot for Epochs:



Train and test losses (mean square errors) turned out to be similar. This is because samples' values are not so high (in the range 0-16) for both train and test datasets, which does not create a huge difference.