IE 534 - Homework 2

Jacob Heglund - jheglun2

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1 Instructions

HW2: Implement and train a convolution neural network from scratch in Python for the MNIST dataset (no PyTorch). You should write your own code for convolutions (e.g., do not use SciPy's convolution function). The convolution network should have a single hidden layer with multiple channels. It should achieve at least 94 percent accuracy on the Test Set. For full credit, submit via Compass (1) the code and (2) a paragraph (in a PDF document) which states the Test Accuracy and briefly describes the implementation. Due September 14 at 5:00 PM.

2 Implementation

The submitted code utilizes a convolutional neural network to learn how to recognize handwritten digits. A 3x3 convolutional filter was used during my tests, but the code supports the general nxm filter. The code also supports the use of multiple channels in the convolution layer. The "cnnForward" function calculates the output of the neural network, and the "cnnBackward" function calculates the gradients to update the parameters $\theta \in K, W, b$ During each epoch of training, the data is fed into the neural network in a random order for stochastic gradient descent, and the network performance is tested on the test data.

The network does not learn from data. I couldn't debug my implementation of the backprop algorithm, and as such, the testing accuracy after 1 epoch remained at around 10 percent. Each epoch also takes around 40 minutes, so I didn't have time to run more epochs.