清華大學

Tsinghua University

Deep Learning Course

Homework 1

-

MNIST Digits Classification with CNN

André Cavalheiro - 2019403065

For this assignment we were supposed to build a convolutional neural network. For that I have tried to implement the required functions in the provided code, but unfortunately without success. I was able to produce a loss graph which is displayed in figure 1 for the softmax loss and in figure 2 for the Euclidean loss. The first one appears to be just white noise, clearly showing the randomness of the results and the lack of convergence of my model, while the second is although also pretty random.

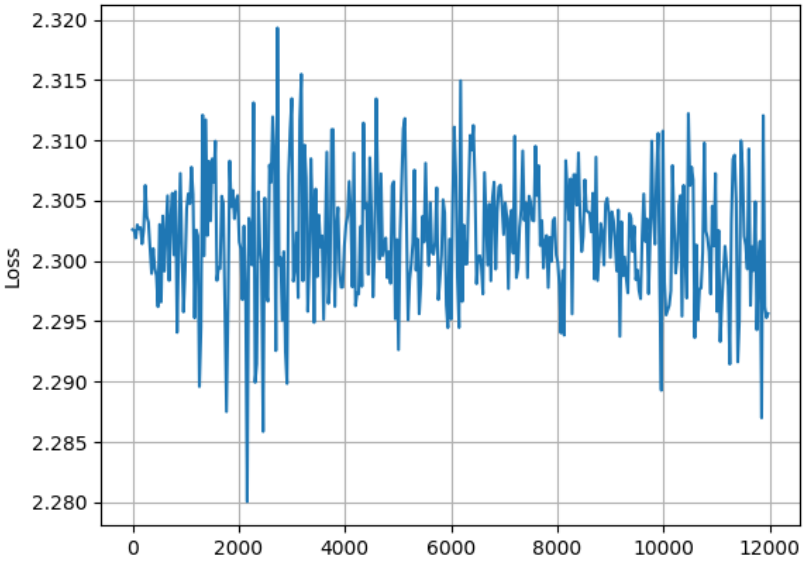


FIGURE 1

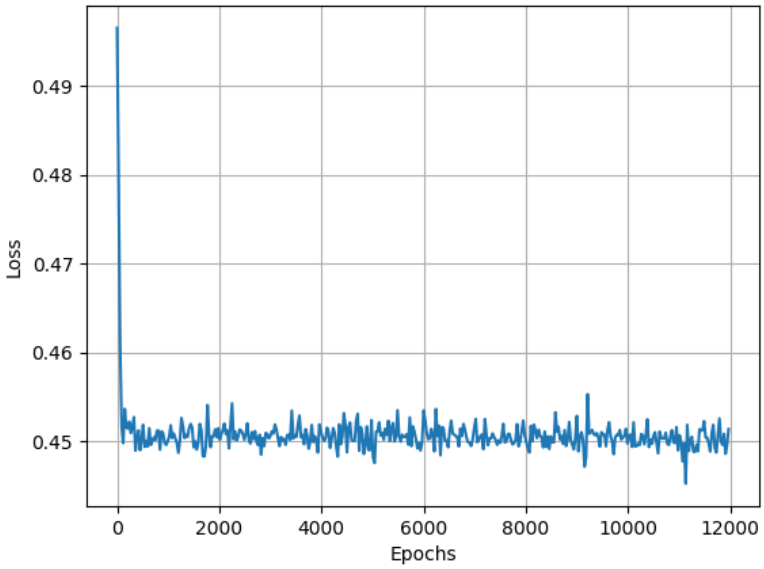


FIGURE 2

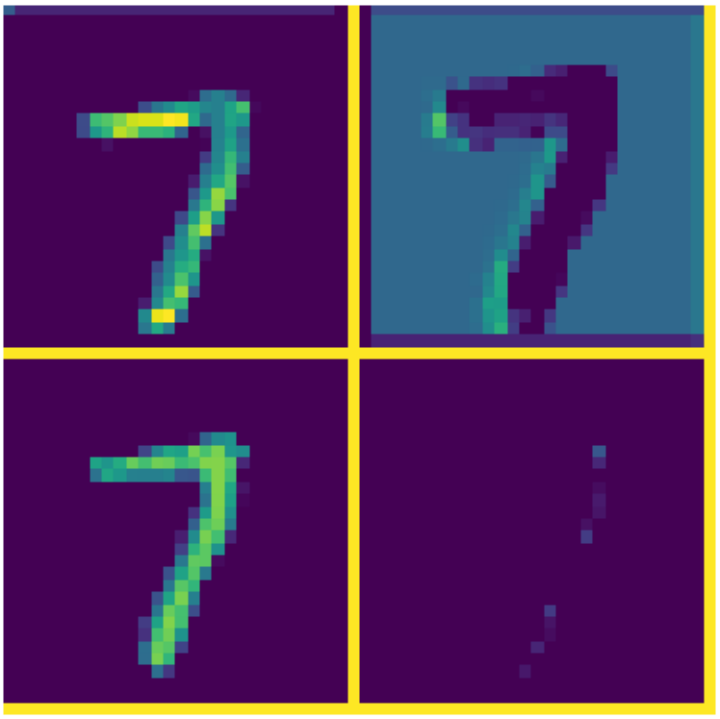
I looked over my code several times, while also checking the information in the slides but some small bug must be passing by me since I cannot exactly figure out what's wrong. I've also tried to compare to verify the correctness of my functions using pytorch models, and I ended up at the conclusion that probably only my

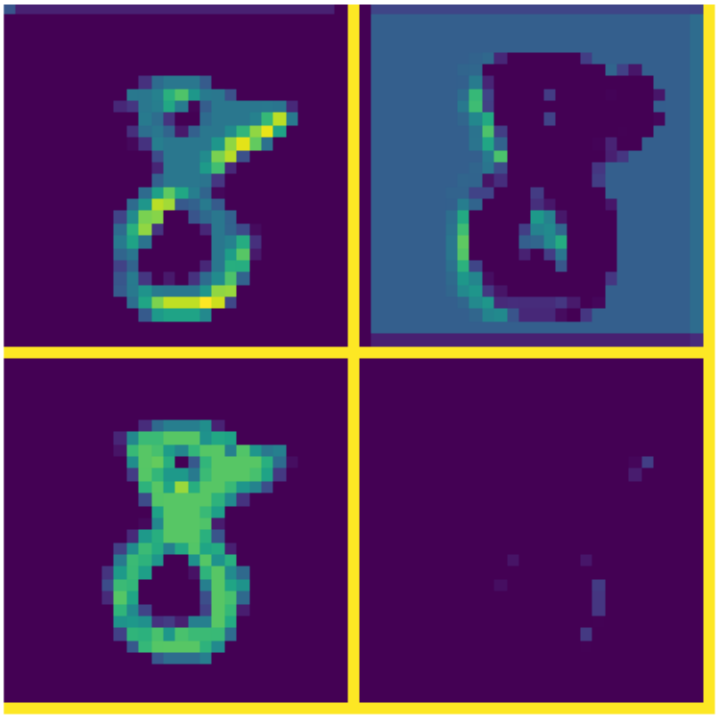
conv2d_backward is calculating the weights wrong, especially by the fact that my grad_w displays equal values across its columns. I'm pretty sure the entire forward part of the program is working nicely though.

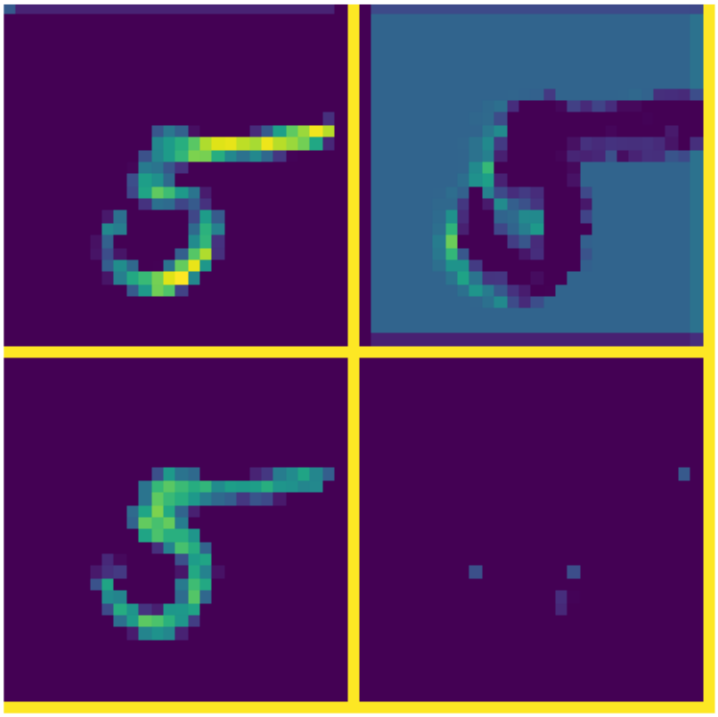
I was also able to represent the images after the first RELU layer, while the matrix is still humanly understandable as the digits, which I display in annex 1 for the SoftMax loss and in annex 2 for the Euclidean loss.

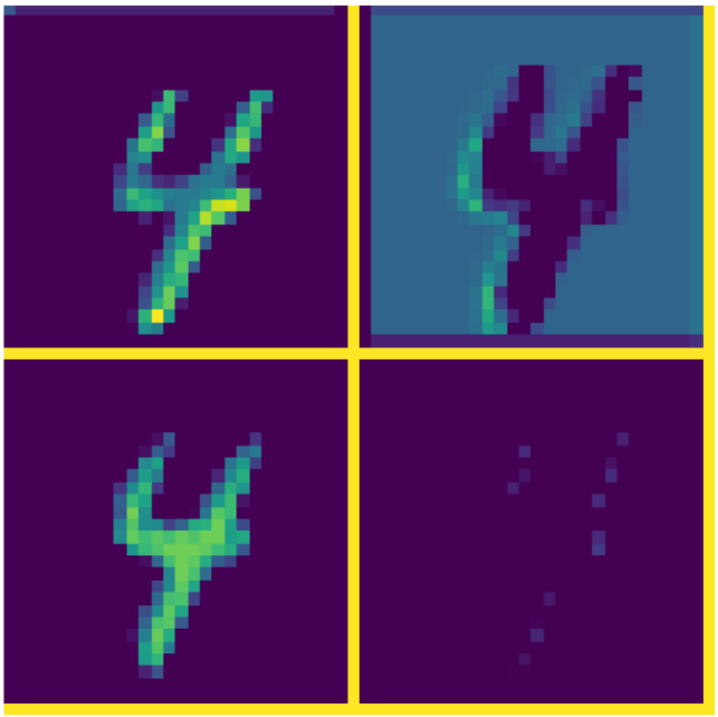
For much of my disappointment, I was not able to find the bug, and therefore no conclusions were possible.

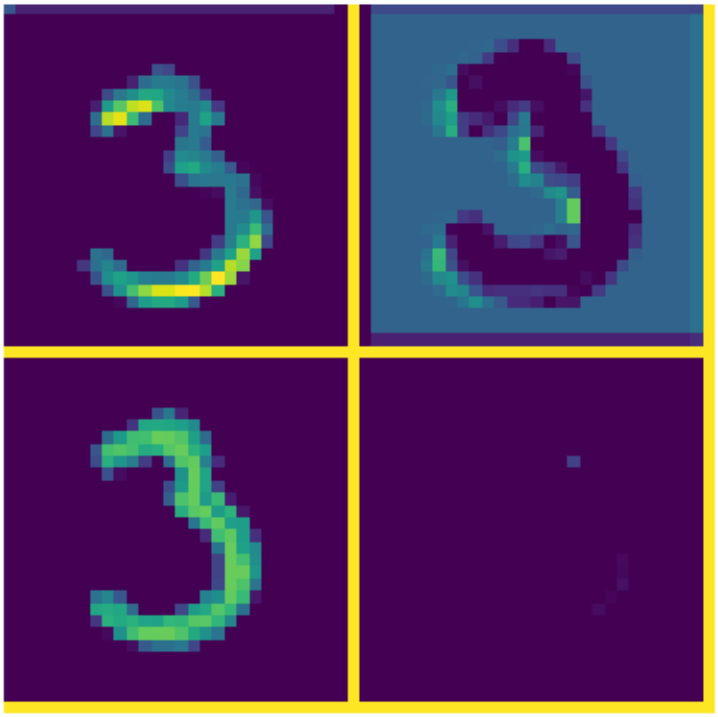
ANNEX 1

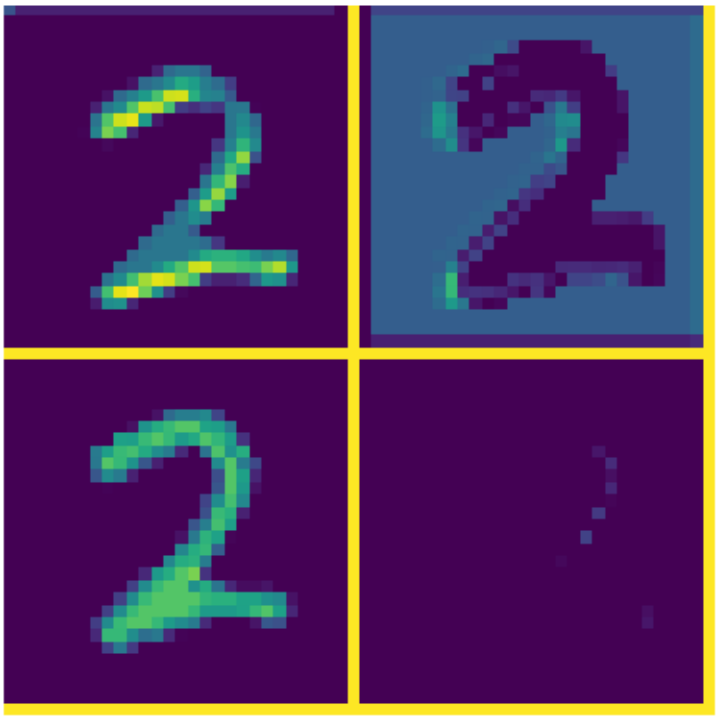


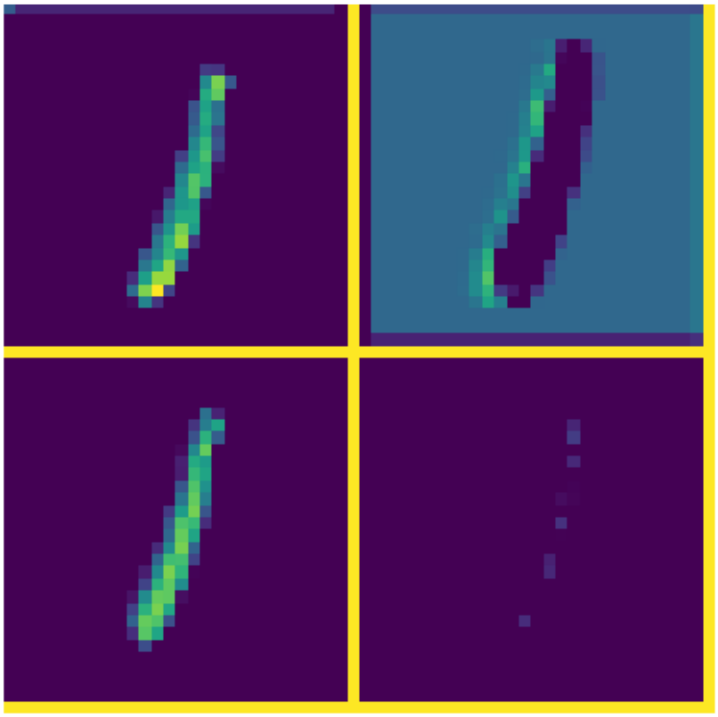


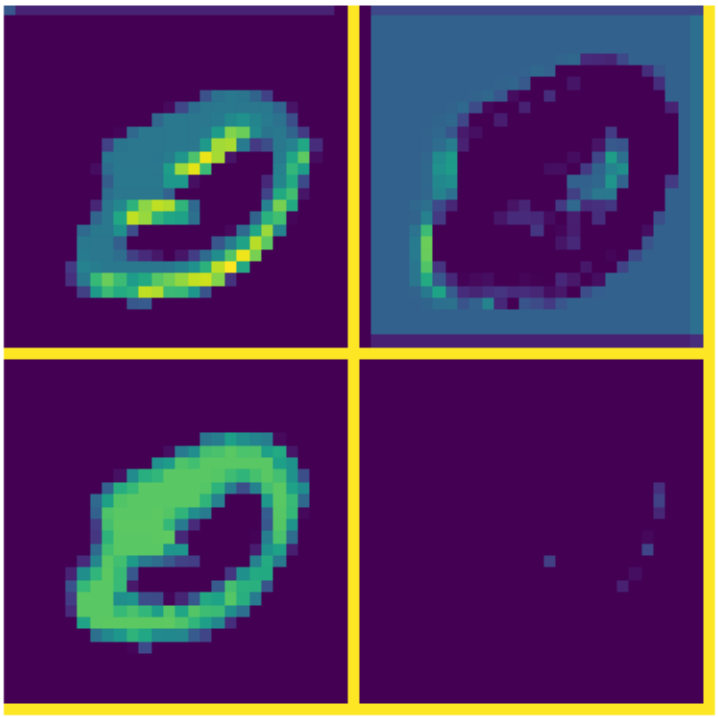


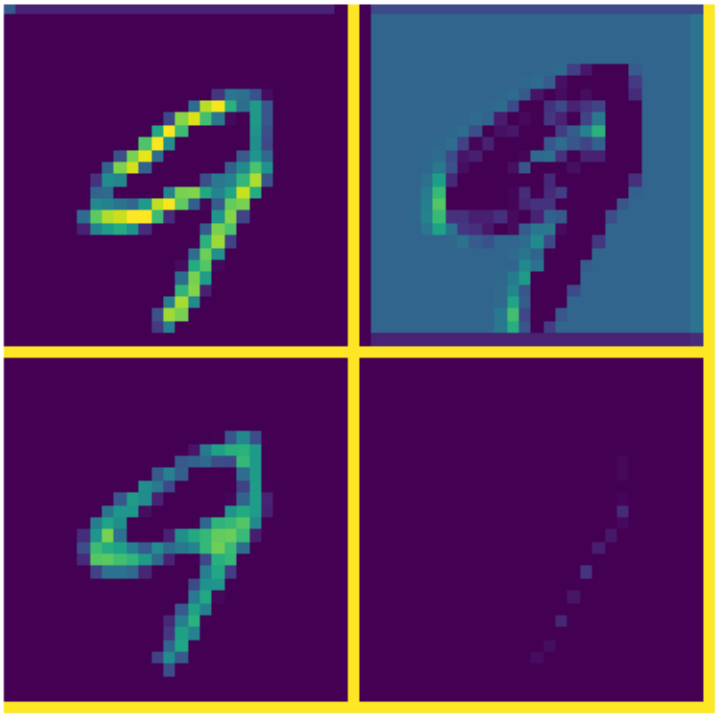












ANNEX 2