Assignment 4

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I used the CAFFE framework [1] for my implementation.

1 MNIST Dataset

I trained two CNN architectures on the MNIST dataset (Fig. 1). I get an accuracy of XX on the first architecture and XX on the second architecture. The training progress is shown in Fig. 2. The kernels learned from the first and second convolutional layers are visualized in Fig. 3.

The following are the gradient descent equations:

2 Sunset Dataset

I used the CaffeNet pre-trained network that comes with CAFFE. This is pretty similar to AlexNet, but without the relighting data-augmentation and has a difference in the order of the pooling and normalization layers. The primary tweaks I made to CaffeNet are:

1. Editing the last fully connected layer for the binary classification problem at hand. The initial architecture was for the 1000 class ImageNet database.

2. Lowering the learning rate of the solver, while using a higher multiplier for the weights of the modified layer.

Using a very small number of training iterations, I quickly arrive to an accuracy of about 89% (Fig. 4). After a longer duration of training, the rate stabilizes at $XX\%$

I use the following schemes of

References

[1] Yangqing Jia, Evan Shelhamer, Jeff Donahue, Sergey Karayev, Jonathan Long, Ross Girshick, Sergio Guadarrama, and Trevor Darrell. Caffe: Convolutional architecture for fast feature embedding. *arXiv preprint arXiv:1408.5093*, 2014.

images/mnist_arch1.png

images/mnist_arch2.png

images/mnist_learning1.png

images/mnist_learning2.png

Figure 2: Training loss and testing loss and accuracy versus iterations for the two architectures described above.

images/mnist_kernels11.png

images/mnist_kernels12.png

images/mnist_kernels21.png

images/mnist_kernels22.png

Figure 3: The learned filters for the first and second convolutional layers of the first and second architectures.

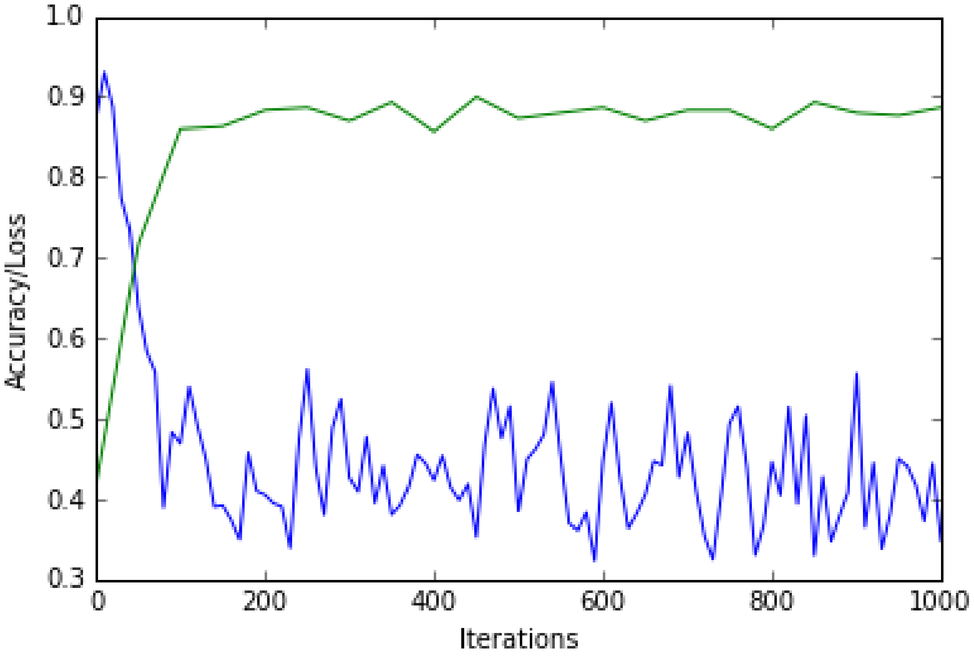

Figure 4: Training loss and testing loss and accuracy versus iterations for the vanilla CaffeNet described above.