

Lab 9: Conclusion

100 Possible Points

5/16/2023

Attempt 1

**IN PROGRESS**

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Be sure to complete Lab 8: Training on the linear dataset (<https://msoe.instructure.com/courses/13814/assignments/161707?wrap=1>) before beginning this lab!

This is the conclusion of the from-scratch deep learning library sequence.

In this lab, you will train your network on Fashion-MNIST and CIFAR-10.

Carefully read the required deliverables at the end of this article so that you can gather the required information while training your classifiers.

Incorporate your instructor's feedback

If you receive feedback from the instructor on the previous week's lab in a timely manner, incorporate that feedback into your derivations and implementation for this week's lab.

Train and test on the Fashion-MNIST dataset

Copy your training and test loops and adapt them to work with Fashion-MNIST. Tune your algorithm to achieve the best performance you can, but at least 50% accuracy on the test set. Save your accuracy and loss on both the training and test sets after each epoch for a plot to be included in the report. See more details under deliverables.

Here is a brief summary of the Fashion-MNIST and CIFAR-10 datasets:

Fashion-MNIST

CIFAR-10

CIFAR-100

Images	28x28 B&W	32x32 color	32x32 color
Classes	10	10	100
Training samples	60k	50k	50k
Testing samples	10k	10k	10k

Refer back to your Lab 4 training as you select parameters for training these networks.

Look for subtle differences between your PyTorch implementation and your library implementation if you find these parameters don't work for your library.

Test accuracy

Test the overall accuracy of your algorithm defined as the number of correctly-labeled samples divided by the total number of samples labeled by the network.

Report

Write a brief report commenting on your experiments. Include:

- Training curves for the Fashion-MNIST datasets. Plot four curves, showing both the training and test values for both the accuracy and loss vs. the number of epochs. (The number of epochs is the number of complete passes over the training set.) You may wish to include loss for every batch even, but it is impractical to report test accuracy/loss this frequently. Label your axes clearly and include a legend tying the line-style of each curve to its name.
- Summary table summarizing your performance on Fashion-MNIST. For both the training set and the testing set, include accuracy and the final loss reported.
- Include a few paragraphs at the end of your report reflecting on what you have learned during this lab sequence. You may discuss your experience in any order (so that your narrative can be driven by your own experience), but revise your narrative so that it touches on:
 - Your experience deriving the backpropagation equations
 - Your experience writing unit tests and/or debugging your software
 - What the training curves and final accuracy reveal about your trained network.

CIFAR-10

5% of the lab grade will be on your testing and training on the CIFAR-10 dataset.

Once your Fashion-MNIST report is complete, add in the same information for CIFAR-10 as well:

- Training curves for CIFAR-10, including training and testing loss and accuracy.
- Summary table, summarizing final training and testing loss and accuracy.

You may also wish to test and train on the CIFAR-**100** dataset and report on these in your report as well.

You should get at least 35% accuracy on CIFAR-10.

If you choose to do this, you may wish to copy your main training and testing loops one more time.

Submission

Submit to Canvas:

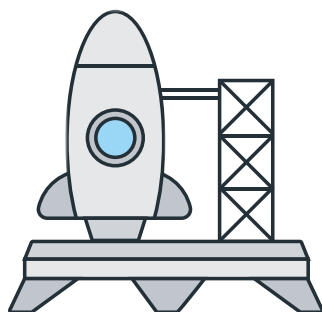
- A pdf with your report on training Fashion-MNIST and CIFAR-10 as described above. Include title information (a title, your name, the date, etc.) on the first page of the report. A separate title page is not required – the first page can also include the introduction to the report.
- All of your code, one more time: `client.py`, `network.py`, `layers.py`, and all the `test_...py` files. The tests should still pass.

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