

Machine Learning Homework 4

Jun. 3, 2020

** Please note that all homework should be your own work. You should also not copy answers from other person's, books or internet resources.*

** I didn't proofread the questions. If you find any typos/errors, let me know.*

O Using the PyTorch CNN & RNN programs and datasets (Mnist & Cifar-10) uploaded at e-class, do the following experiments

1. CNN & MNIST

- 1) refer to the CNN_Mnist program in e-class
- 2) change the current kernel size of the program to different size. (Change 'kernel_size' parameter of 'Conv2D' function.) Repeat this three times and compare the results.
- 3) remove pooling layer in the program (you can remove 'MaxPool2D' function) and compare the results
- 4) change the current activation function to other activation function (e.g. sigmoid, tanh, etc). You can do so by nn.Sigmoid() to nn.ReLU(), nn.Tanh(), etc) Repeat this three times and compare the results.
- 5) change the current optimization method to other optimization methods (e.g. adam, adaGrad, RMSProp, adaDelta, etc). You can use torch.optim.Adam, etc. Repeat this three times and compare the results.
- 6) now add the Xavier weight initialization method and compare the results. (use torch.nn.init.xavier_uniform)
- 7) choose ONE other parameters of CNN program (e.g. number of hidden nodes, dropout, epochs, batch normalization, etc). Change the value of this parameter and compare the results.
- 8) (*optional*) choose Adam optimization method and use L2 (ridge) regularization method this time. You can do so by setting 'weight_decay' value in optimization method (torch.optim.Adam) to a tiny number (e.g. 1e-5). Compare the results of using regularization.

2. CNN & CIFAR-10

- 1) refer to the CNN_Cifar-10 program in e-class
- 2) repeat the question 2)-7) in question 1.

3. RNN & Mnist

(the way changing parameters in RNN is the same as that of CNN unless specified explicitly)

- 1) refer to the RNN_Mnist program in e-class
- 2) change the number of hidden nodes in the program three times and compare the results.
- 3) change the current optimization method to other optimization methods (e.g.

adam, adaGrad, RMSProp, adaDelta, etc). Repeat this three times and compare the results.

- 4) change LSTM to GRU (or vice versa). Compare the results.
- 5) choose ONE other parameters of RNN program (e.g. batch_size, epochs, etc). Change the value of this parameter and compare the results.
- 6) compare the accuracy of RNN for Mnist with that of CNN.
- 7) (*optional*) choose Adam optimization method and use L2 (ridge) regularization method this time. You can do so by setting 'weight_decay' value in optimization method to a tiny number (e.g. 1e-5). Compare the results of using regularization.
- 8) (*optional*) use dropout technique and compare the results.

Hand In

- 1) upload the following files at e-class.
 - report file, ii) program source file, iii) data file

Due: 6/15(Mon)