summary

Yifu Yuan

2020/3/14

The model is basically the same as last time, with 6 layers of CNN. I tried fewer blocks but those models did not reach 85% accuracy. For the final model I used, the only changes I made were to rescale dropout probability during testing and get rid of l2 regularization, so that there is no weird loss fluctuation anymore with a better accuracy. The result is as following, and please see figure 1 for learning curve:

Epoch 99, CIFAR-10 Batch 3: Loss: 0.1132 Validation Accuracy: 0.854000
Epoch 99, CIFAR-10 Batch 4: Loss: 0.1519 Validation Accuracy: 0.853400
Epoch 99, CIFAR-10 Batch 5: Loss: 0.1131 Validation Accuracy: 0.853200
Epoch 100, CIFAR-10 Batch 1: Loss: 0.1254 Validation Accuracy: 0.853600
Epoch 100, CIFAR-10 Batch 2: Loss: 0.1312 Validation Accuracy: 0.853400
Epoch 100, CIFAR-10 Batch 3: Loss: 0.1129 Validation Accuracy: 0.853600
Epoch 100, CIFAR-10 Batch 4: Loss: 0.1516 Validation Accuracy: 0.854200
Epoch 100, CIFAR-10 Batch 5: Loss: 0.1137 Validation Accuracy: 0.853000

As for the test cases when there is no dropout, no batch normalization.

The result of no dropout: (converge at around epoch 35)
Epoch 35, CIFAR-10 Batch 3: Loss: 0.0000 Validation Accuracy: 0.788200
Epoch 35, CIFAR-10 Batch 4: Loss: 0.0000 Validation Accuracy: 0.788000
Epoch 35, CIFAR-10 Batch 5: Loss: 0.0000 Validation Accuracy: 0.787800
Epoch 36, CIFAR-10 Batch 1: Loss: 0.0000 Validation Accuracy: 0.787000
Epoch 36, CIFAR-10 Batch 2: Loss: 0.0000 Validation Accuracy: 0.787600
Epoch 36, CIFAR-10 Batch 3: Loss: 0.0000 Validation Accuracy: 0.788400

The result of no batch normalization:

Epoch 99, CIFAR-10 Batch 4: Loss: 0.1168 Validation Accuracy: 0.836200
Epoch 99, CIFAR-10 Batch 5: Loss: 0.1102 Validation Accuracy: 0.835600
Epoch 100, CIFAR-10 Batch 1: Loss: 0.1828 Validation Accuracy: 0.835600
Epoch 100, CIFAR-10 Batch 2: Loss: 0.1791 Validation Accuracy: 0.835800
Epoch 100, CIFAR-10 Batch 3: Loss: 0.0966 Validation Accuracy: 0.835600
Epoch 100, CIFAR-10 Batch 4: Loss: 0.1166 Validation Accuracy: 0.835600
Epoch 100, CIFAR-10 Batch 5: Loss: 0.1108 Validation Accuracy: 0.835400

Figure 2 is the learning curve of no batch normalization. Obviously, there is obvious loss fluctuation; yet, the accuracy is close to the model with normalization.

The following is the layer visualization of six convolutional layers. Due to my use of many tensors, it might be blurry for 128 filter outputs in one image, but layer 1 and layer 2 have good resolution.

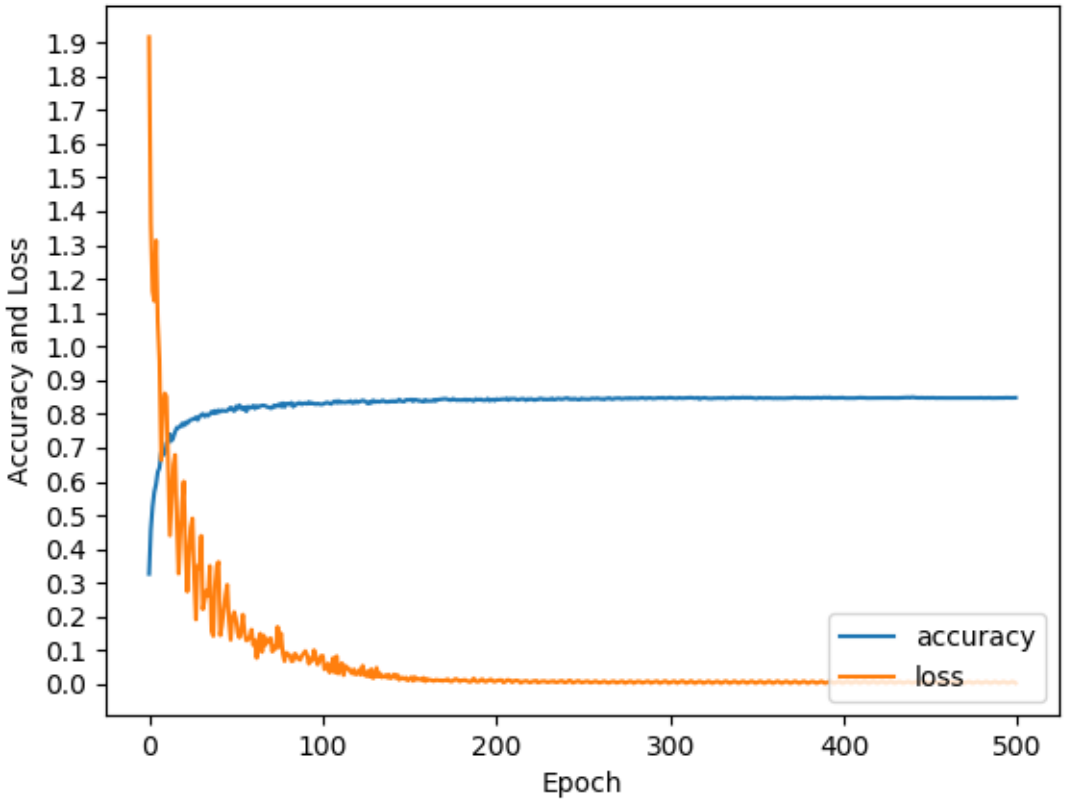


Figure 1: Accuracy 85%

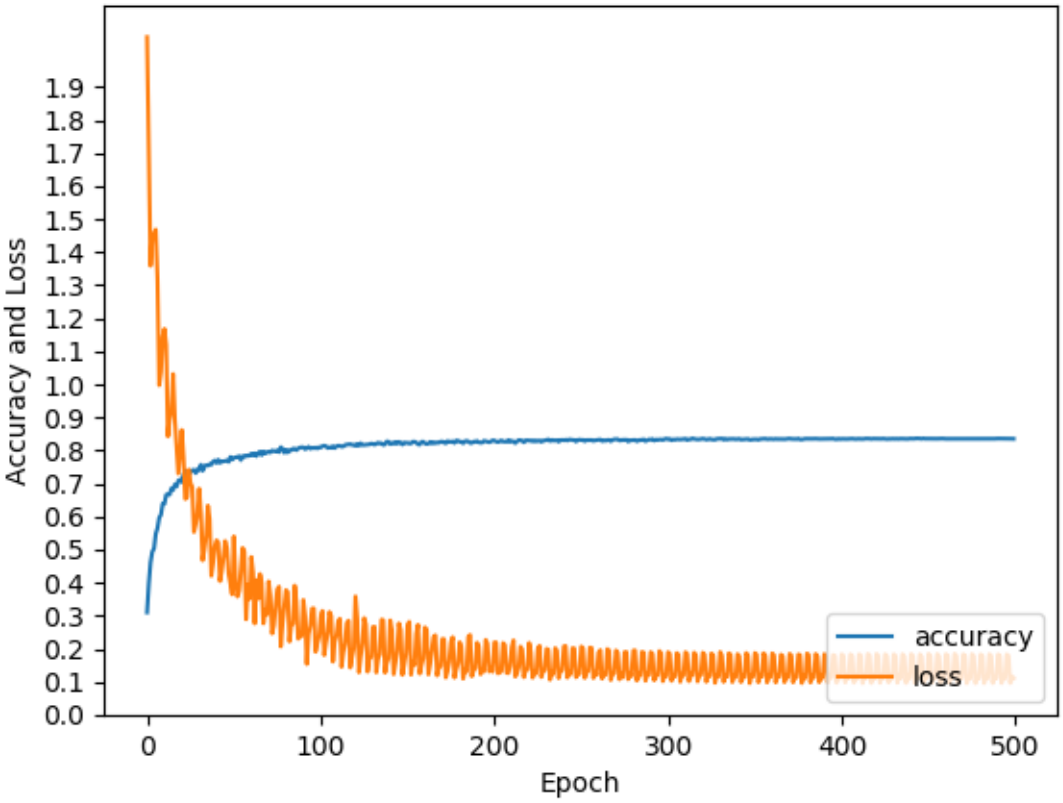
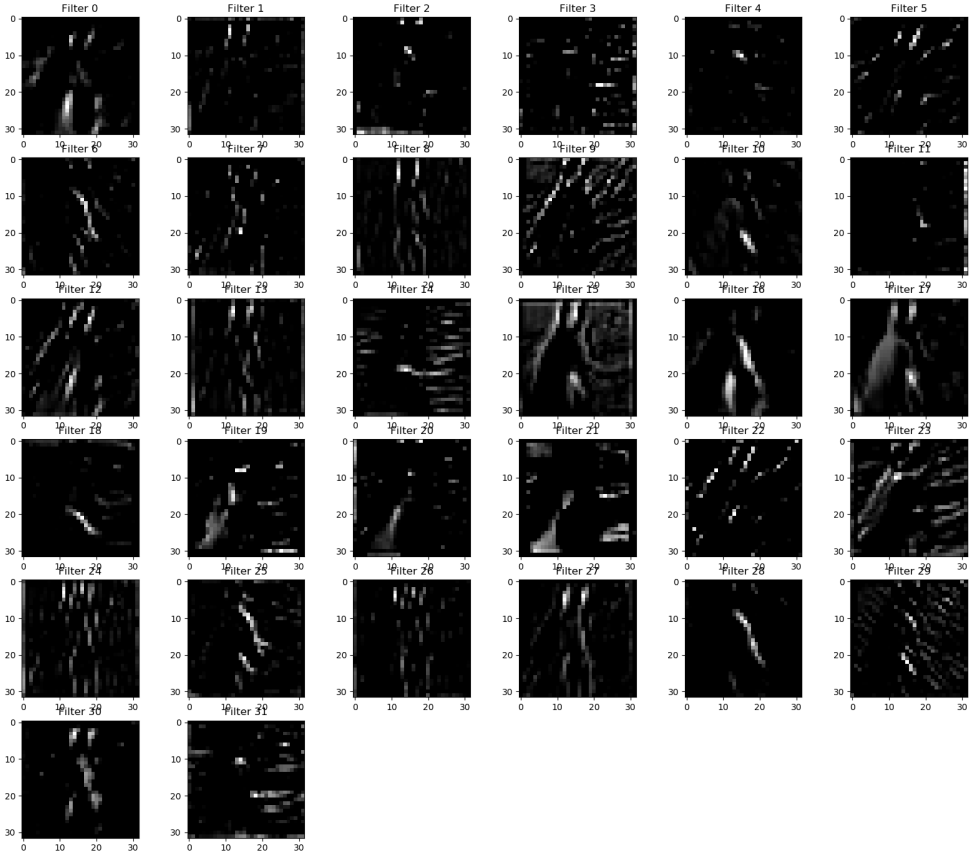


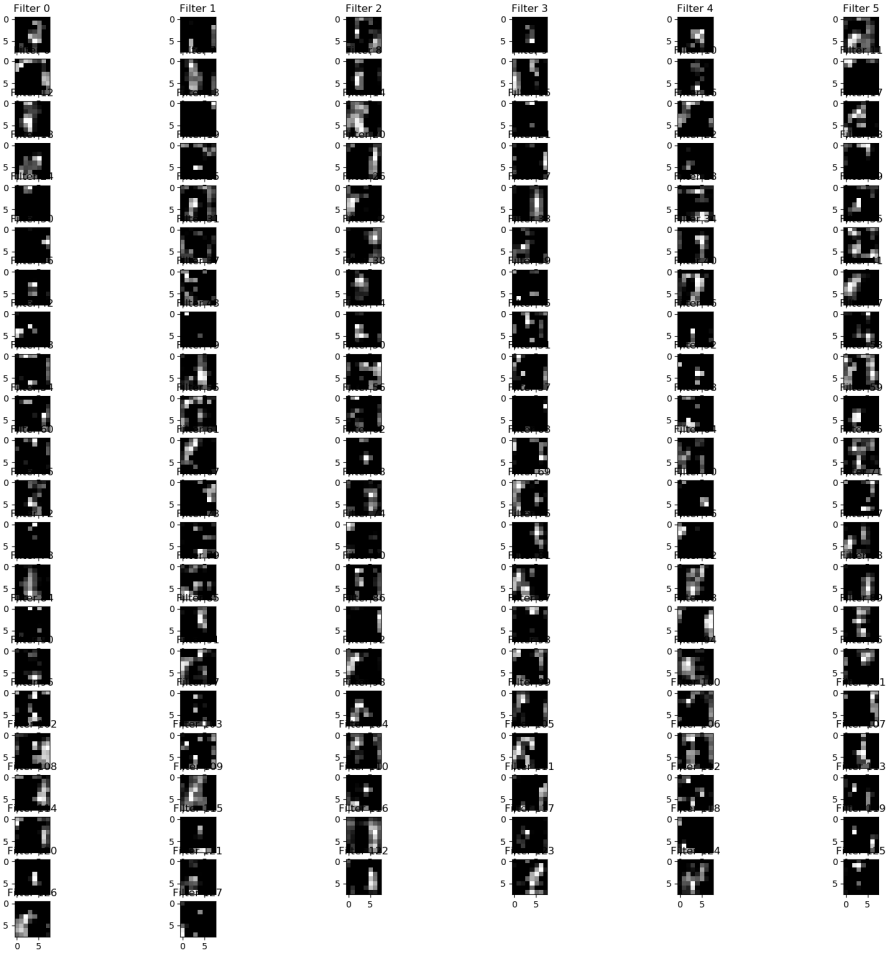
Figure 2: No batch normalization

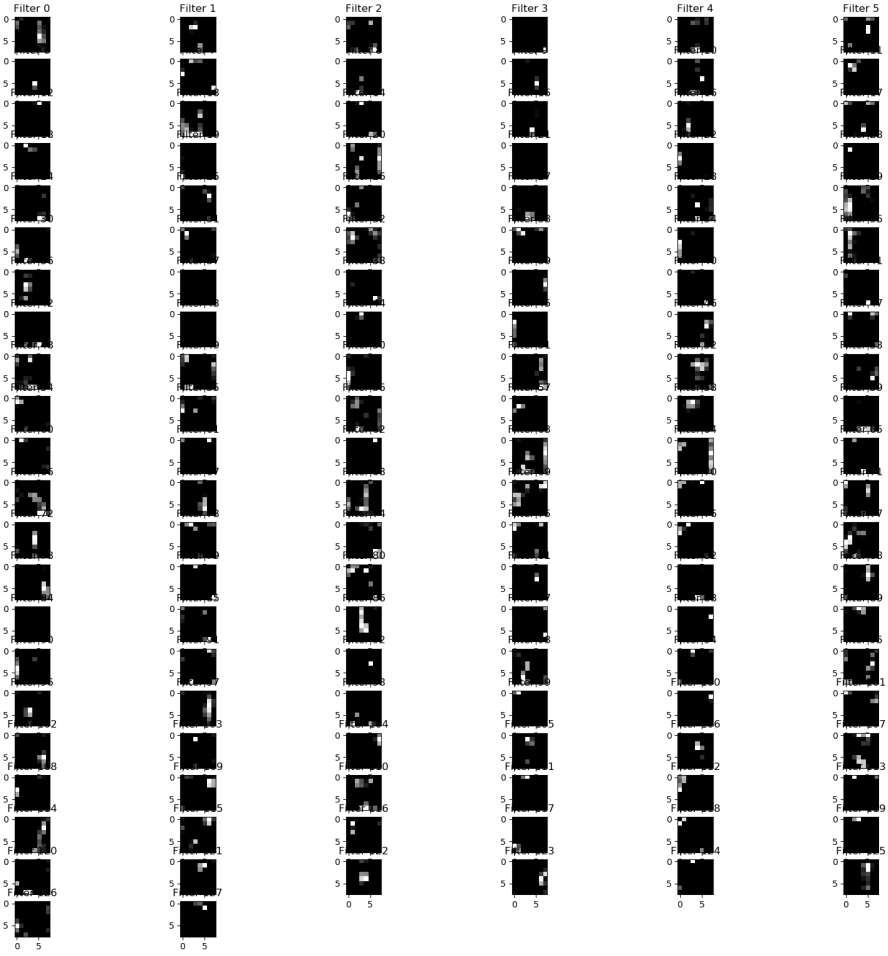
Figure 3: Conv1


Filter 0
Filter 1
Filter 2
Filter 3
Filter 4
Filter 5
Filter 6
Filter 7
Filter 8
Filter 9
Filter 10
Filter 11
Filter 12
Filter 13
Filter 14
Filter 15
Filter 16
Filter 17
Filter 18
Filter 19
Filter 20
Filter 21
Filter 22
Filter 23
Filter 24
Filter 25
Filter 26
Filter 27
Filter 28
Filter 29
Filter 30
Filter 31


Filter 0
Filter 1
Filter 2
Filter 3
Filter 4
Filter 5
Filter 6
Filter 7
Filter 8
Filter 9
Filter 10
Filter 11
Filter 12
Filter 13
Filter 14
Filter 15
Filter 16
Filter 17
Filter 18
Filter 19
Filter 20
Filter 21
Filter 22
Filter 23
Filter 24
Filter 25
Filter 26
Filter 27
Filter 28
Filter 29
Filter 30
Filter 31
Filter 32
Filter 33
Filter 34
Filter 35
Filter 36
Filter 37
Filter 38
Filter 39
Filter 40
Filter 41
Filter 42
Filter 43
Filter 44
Filter 45
Filter 46
Filter 47
Filter 48
Filter 49
Filter 50
Filter 51
Filter 52
Filter 53
Filter 54
Filter 55
Filter 56
Filter 57
Filter 58
Filter 59
Filter 60
Filter 61
Filter 62
Filter 63


Filter 0
Filter 1
Filter 2
Filter 3
Filter 4
Filter 5
Filter 6
Filter 7
Filter 8
Filter 9
Filter 10
Filter 11
Filter 12
Filter 13
Filter 14
Filter 15
Filter 16
Filter 17
Filter 18
Filter 19
Filter 20
Filter 21
Filter 22
Filter 23
Filter 24
Filter 25
Filter 26
Filter 27
Filter 28
Filter 29
Filter 30
Filter 31
Filter 32
Filter 33
Filter 34
Filter 35
Filter 36
Filter 37
Filter 38
Filter 39
Filter 40
Filter 41
Filter 42
Filter 43
Filter 44
Filter 45
Filter 46
Filter 47
Filter 48
Filter 49
Filter 50
Filter 51
Filter 52
Filter 53
Filter 54
Filter 55
Filter 56
Filter 57
Filter 58
Filter 59
Filter 60
Filter 61
Filter 62
Filter 63


Filter 0
Filter 1
Filter 2
Filter 3
Filter 4
Filter 5


Filter 0
Filter 1
Filter 2
Filter 3
Filter 4
Filter 5