Computer Vision Assignment 3

Abstract

- Platform: NYU HPC (Prince).
- Best model based on: VGG11 with 30 epochs.
- Best accuracy: 98.273% with the model_24.pth

Selected Models Explored

- The baseline model:
  1. The training accuracy convergence pattern:

  Validation set: Average loss: 3.6500, Accuracy: 485/3870 (13%)

  Validation set: Average loss: 2.4524, Accuracy: 1216/3870 (31%)

  Validation set: Average loss: 1.6001, Accuracy: 2089/3870 (54%)

  Validation set: Average loss: 1.2020, Accuracy: 2476/3870 (64%)

  Validation set: Average loss: 0.9377, Accuracy: 2829/3870 (73%)

  Validation set: Average loss: 0.7879, Accuracy: 2956/3870 (76%)

  Validation set: Average loss: 0.7283, Accuracy: 3072/3870 (79%)

  Validation set: Average loss: 0.6098, Accuracy: 3220/3870 (83%)

  Validation set: Average loss: 0.5678, Accuracy: 3251/3870 (84%)

  Validation set: Average loss: 0.5411, Accuracy: 3243/3870 (84%)

  2. Final test accuracy: 90.277%

- Then I simply change the total number of epoch into 100:
  1. Final accuracy 95.930

- Training for 100 epochs is definitely too much, so I choose the final Model based on VGG11 with total 30 epochs:
  1. Modifications to the VGG11 baseline model:
     a. In make_layers(), we introduce an extra average pooling.
     b. In the linear layers, decrease the input and output size to below 512 (which is still very large compared to our baseline model) – finally choose 512 after doing some experiment with Yihui.
     c. Introduce a log softmax in the final layer.

2. The final training accuracy convergence pattern:

Validation set: Average loss: 2.2140, Accuracy: 1567/3870 (40%)

Validation set: Average loss: 1.3424, Accuracy: 2407/3870 (62%)

Validation set: Average loss: 0.6739, Accuracy: 3213/3870 (83%)

Validation set: Average loss: 0.3195, Accuracy: 3520/3870 (91%)

Validation set: Average loss: 0.1789, Accuracy: 3635/3870 (94%)

Validation set: Average loss: 0.1511, Accuracy: 3691/3870 (95%)

Validation set: Average loss: 0.2317, Accuracy: 3631/3870 (94%)

Validation set: Average loss: 0.2038, Accuracy: 3678/3870 (95%)

Validation set: Average loss: 0.3913, Accuracy: 3536/3870 (91%)

Validation set: Average loss: 0.1553, Accuracy: 3693/3870 (95%)

Validation set: Average loss: 0.1297, Accuracy: 3733/3870 (96%)

Validation set: Average loss: 0.1420, Accuracy: 3731/3870 (96%)

Validation set: Average loss: 0.1313, Accuracy: 3735/3870 (97%)

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3. The final training accuracy: 98.273%

References

Special thanks to some warm help from Yihui Wu!

[1] https://github.com/pytorch/vision/blob/master/torchvision/models/vgg.py

[2] https://github.com/fchollet/keras/blob/master/keras/applications/vgg16.py

[3] https://github.com/fchollet/keras/blob/master/keras/applications/vgg16.py

[4] http://pytorch.org/docs/master/torchvision/models.html