

2019 PKU Summer School Projects(Part 1)

July 20, 2019

1 VGG on MNIST

Implement Very Deep Convolutional Networks (VGG). Specifically, this project includes the following parts.

1. Implement VGG16.
2. Implement VGG19.
3. Test them on the dataset MNIST.

2 ResNet on MNIST

Implement Deep Residual Networks (ResNet). Deep residual networks solve the problem that the neural network can not be that long. Specifically,

1. Implement ResNet18.
2. Test them on the dataset MNIST.

3 CIFAR-10

Apply the VGG and ResNet models to CIFAR-10, and compare the performance. Specifically,

1. Compare the performance of VGG16, VGG19 and ResNet18 on CIFAR-10.
2. Compare the performance of stochastic gradient descent (SGD) methods with different mini-batch size, at least of 32, 64, 128, and 256, on CIFAR-10, based on the three implemented networks.

For the comparison, plot the loss and accuracy (including TOP-1 and TOP-5) curves in the first 120 steps of the training and validation datasets. The loss curves, TOP-1 accuracy curves and TOP-5 accuracy curves should be plotted in three figures separately. Comparison of other hyper-parameters like mini-batch size and learning rate, and further analysis on the performance, are encouraged.

4 Reference

1. Very Deep Convolutional Networks for Large-Scale Image Recognition, arxiv.org/abs/1409.1556.
2. Deep Residual Learning for Image Recognition, arxiv.org/abs/1512.03385.
3. CIFAR-10 and CIFAR-100 datasets, www.cs.toronto.edu/~kriz/cifar.html.