Assignment 2 Report

ECE 4438B

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# Organizing the Dataset

We have chosen to work with the CIFAR10 [1] dataset. The images are packed in six different files. The first five are training and the final sixth is the testing data set. There is also a file that helps convert the label numbers to label words.

# Design of Deep Convolutional Neural Network

### Network 1: 5 Convolution Layers with no maxpooling with descending learning rate

options = trainingOptions('sgdm', ...

'MiniBatchSize', 64, ...

'MaxEpochs',20,...

'InitialLearnRate',1e-4, ...

'LearnRateSchedule','piecewise', ...

'LearnRateDropFactor', 0.2000, ...

'LearnRateDropPeriod', 5, ...

'Verbose',false, ...

'Plots','training-progress');

layers = [

imageInputLayer([32 32 3])

convolution2dLayer(3,8, 'Padding','same')

batchNormalizationLayer

reluLayer

convolution2dLayer(3,16, 'Padding','same')

batchNormalizationLayer

reluLayer

convolution2dLayer(3,32, 'Padding','same')

batchNormalizationLayer

reluLayer

convolution2dLayer(3,64, 'Padding','same')

batchNormalizationLayer

reluLayer

convolution2dLayer(3,128, 'Padding','same')

batchNormalizationLayer

reluLayer

fullyConnectedLayer(10)

softmaxLayer

classificationLayer];

### Network 2:

### 5 Convolution Layers with maxpooling with descending learning rate

%%options

options = trainingOptions('sgdm', ...

'MiniBatchSize', 64, ...

'MaxEpochs',20,...

'InitialLearnRate',1e-4, ...

'LearnRateSchedule','piecewise', ...

'LearnRateDropFactor', 0.2000, ...

'LearnRateDropPeriod', 5, ...

'Verbose',false, ...

'Plots','training-progress');

%%layers

layers = [

imageInputLayer([32 32 3])

convolution2dLayer(3,8, 'Padding','same')

batchNormalizationLayer

reluLayer

maxPooling2dLayer(2,'Stride',2)

convolution2dLayer(3,16, 'Padding','same')

batchNormalizationLayer

reluLayer

maxPooling2dLayer(2,'Stride',2)

convolution2dLayer(3,32, 'Padding','same')

batchNormalizationLayer

reluLayer

maxPooling2dLayer(2,'Stride',2)

convolution2dLayer(3,64, 'Padding','same')

batchNormalizationLayer

reluLayer

maxPooling2dLayer(2,'Stride',2)

convolution2dLayer(3,128, 'Padding','same')

batchNormalizationLayer

reluLayer

fullyConnectedLayer(10)

softmaxLayer

classificationLayer];

### Network 3: 5 Convolution Layers with no maxpooling with constant learning rate

%%options

options = trainingOptions('sgdm', ...

'MiniBatchSize', 64, ...

'MaxEpochs',20,...

'InitialLearnRate',1e-4, ...

'Verbose',false, ...

'Plots','training-progress');

%%layers

layers = [

imageInputLayer([32 32 3])

convolution2dLayer(3,8, 'Padding','same')

batchNormalizationLayer

reluLayer

convolution2dLayer(3,16, 'Padding','same')

batchNormalizationLayer

reluLayer

convolution2dLayer(3,32, 'Padding','same')

batchNormalizationLayer

reluLayer

convolution2dLayer(3,64, 'Padding','same')

batchNormalizationLayer

reluLayer

convolution2dLayer(3,128, 'Padding','same')

batchNormalizationLayer

reluLayer

fullyConnectedLayer(10)

softmaxLayer

classificationLayer];

# Performances

## Network 1:

A screen shot of a computer

Description automatically generated

## A close-up of a sign Description automatically generated

## Network 2:

A screenshot of a computer

Description automatically generated

## A close-up of a number Description automatically generated

## Network 3:

A graph showing a blue and red line

Description automatically generated  
A close-up of a number

Description automatically generated

Dataset

[1] Alex. Kirzhevsky, “Learning Multiple Layers of Features from Tiny Images,” 2009.