

程序说明

实例：4.7-3 功能：基于CIFAR-10数据集训练卷积神经网络 作者：zhaoxch_mail@sina.com 时间：2020年3月21日 版本：DLTEX703-V1

清除内存、清除屏幕

```
clear  
clc
```

导入CIFAR-10数据集并查看数据集的相关信息

```
[trainingImages,trainingLabels,testImages,testLabels] = helperCIFAR10Data.load('cifar10Data');  
% 查看数据集用于训练的图像的尺寸大小  
size(trainingImages);  
% 数据集的分类数为10  
numImageCategories = 10;  
% 显示用于训练的数据的分类标签  
categories(trainingLabels)
```

创建卷积神经网络

根据数据集图像的大小创建深度卷积神经网络的输入层

```
[height, width, numChannels, ~] = size(trainingImages);  
imageSize = [height width numChannels];  
inputLayer = imageInputLayer(imageSize)  
  
% 创建具有特征提取功能的层  
filterSize = [5 5];  
numFilters = 32;  
middleLayers = [ convolution2dLayer(filterSize, numFilters, 'Padding', 2)  
    reluLayer()  
    maxPooling2dLayer(3, 'Stride', 2)  
    convolution2dLayer(filterSize, numFilters, 'Padding', 2)  
    batchNormalizationLayer  
    reluLayer()  
    maxPooling2dLayer(3, 'Stride', 2)  
    convolution2dLayer(filterSize, 2 * numFilters, 'Padding', 2)  
    reluLayer()  
    maxPooling2dLayer(3, 'Stride', 2) ]  
  
% 创建具有分类功能的层  
finalLayers = [ fullyConnectedLayer(64)  
    reluLayer  
    fullyConnectedLayer(numImageCategories)  
    softmaxLayer  
    classificationLayer ]  
  
% 将上述创建的层构成网络  
layers = [inputLayer  
    middleLayers  
    finalLayers ]
```

进行训练参数的设置

```
opts = trainingOptions('sgdm', ...  
    'InitialLearnRate', 0.001, ...  
    'LearnRateSchedule', 'piecewise', ...  
    'LearnRateDropFactor', 0.1, ...  
    'LearnRateDropPeriod', 20, ...  
    'Shuffle','every-epoch',...  
    'MaxEpochs', 40, ...  
    'MiniBatchSize', 128, ...  
    'Verbose', true,...  
    'Plots','training-progress');
```

训练网络

```
cifar10Net = trainNetwork(trainingImages(:,:,:),1:5000), trainingLabels(1:5000), layers, opts);
```

采用训练好的网络对测试图像进行分类并计算准确率

```
YTest = classify(cifar10Net, testImages);  
accuracy = sum(YTest == testLabels)/numel(testLabels)
```