# 1、CIFAR-10介绍

CIFAR-10和CIFAR-100是8000万个微小图像数据集的标记子集。他们是由Alex Krizhevsky，Vinod Nair和Geoffrey Hinton收集的。

CIFAR-10数据集由10个类中的60000个32x32彩色图像组成，每个类有6000个图像。有50000个训练图像和10000个测试图像。

数据集分为五个训练批次和一个测试批次，每个批次有10000个图像。测试批次包含来自每个类别的1000个随机选择的图像。训练批次以随机顺序包含剩余图像，但是一些训练批次可能包含来自一个类别的更多图像而不是另一个类别。在它们之间，训练批次包含来自每个类别的5000个图像。

以下是数据集中的类，以及每个中的10个随机图像：

**airplane** http://www.cs.toronto.edu/~kriz/cifar-10-sample/airplane1.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/airplane2.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/airplane3.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/airplane4.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/airplane5.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/airplane6.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/airplane7.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/airplane8.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/airplane9.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/airplane10.png

**automobile** http://www.cs.toronto.edu/~kriz/cifar-10-sample/automobile1.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/automobile2.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/automobile3.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/automobile4.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/automobile5.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/automobile6.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/automobile7.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/automobile8.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/automobile9.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/automobile10.png

**bird**  http://www.cs.toronto.edu/~kriz/cifar-10-sample/bird1.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/bird2.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/bird3.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/bird4.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/bird5.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/bird6.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/bird7.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/bird8.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/bird9.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/bird10.png

**cat** http://www.cs.toronto.edu/~kriz/cifar-10-sample/cat1.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/cat2.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/cat3.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/cat4.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/cat5.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/cat6.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/cat7.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/cat8.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/cat9.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/cat10.png

**deer**  http://www.cs.toronto.edu/~kriz/cifar-10-sample/deer1.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/deer2.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/deer3.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/deer4.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/deer5.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/deer6.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/deer7.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/deer8.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/deer9.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/deer10.png

**dog** http://www.cs.toronto.edu/~kriz/cifar-10-sample/dog1.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/dog2.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/dog3.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/dog4.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/dog5.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/dog6.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/dog7.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/dog8.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/dog9.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/dog10.png

**frog**  http://www.cs.toronto.edu/~kriz/cifar-10-sample/frog1.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/frog2.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/frog3.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/frog4.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/frog5.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/frog6.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/frog7.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/frog8.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/frog9.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/frog10.png

**horse** http://www.cs.toronto.edu/~kriz/cifar-10-sample/horse1.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/horse2.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/horse3.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/horse4.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/horse5.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/horse6.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/horse7.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/horse8.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/horse9.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/horse10.png

**ship**  http://www.cs.toronto.edu/~kriz/cifar-10-sample/ship1.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/ship2.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/ship3.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/ship4.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/ship5.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/ship6.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/ship7.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/ship8.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/ship9.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/ship10.png

**truck** http://www.cs.toronto.edu/~kriz/cifar-10-sample/truck1.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/truck2.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/truck3.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/truck4.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/truck5.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/truck6.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/truck7.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/truck8.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/truck9.pnghttp://www.cs.toronto.edu/~kriz/cifar-10-sample/truck10.png

# 2、使用TensorFlow Slim微调模型训练

TF-slim是Google公司公布的一种新的轻量级的、用于定义、训练和评估复杂模型的TensorFlow高级API。它提供的接口可以帮助我们从头开始训练模型，或者从预先训练的网络权值中对它们进行微调。提供的模型包括VGG16，VGG19，Inception V1~4，ResNet50，Resnt101，MobileNet等。

## 2.1、下载TF-slim源码

下载命令：

git clone https://github.com/tensorflow/models/

从research目录下将slim目录复制出来。

## 2.2、下载cifar10数据并转换格式为trconf

下载命令：

python slim/download\_and\_convert\_data.py --dataset\_name=cifar10 --dataset\_dir=data

## 2.3、下载resnet50模型

下载地址：http://download.tensorflow.org/models/resnet\_v2\_50\_2017\_04\_14.tar.gz

解压之后放在pretrained目录，新建一个训练用的目录train\_dir，一个测试用的目录eval\_dir，最终形成的目录如下：

---slim

---data

------ cifar10\_test.tfrecord

------ cifar10\_train.tfrecord

------ labels.txt

---train-dir

-- eval-dir

-- pretrained

------ resnet\_v2\_50.ckpt

## 2.4、训练resnet50

训练全部层的命令如下：

python slim/train\_image\_classifier.py

--train\_dir=train\_dir \

--dataset\_name=cifar10 \

--dataset\_split\_name=train \

--dataset\_dir=data \

--model\_name=resnet\_v2\_50 \

--checkpoint\_path=pretrained/resnet\_v2\_50.ckpt \

--checkpoint\_exclude\_scopes=resnet\_v2\_50/logits \

--max\_number\_of\_steps=50000 \

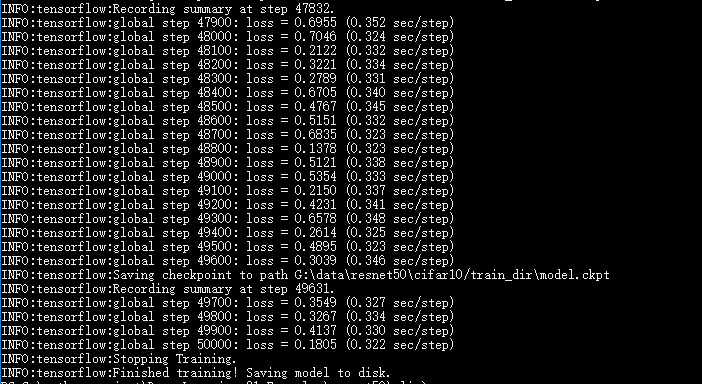
--batch\_size=16 \

--learning\_rate=0.001 \

--log\_every\_n\_steps=100 \

--optimizer=adma

优化器选择adma，初始学习率为0.001，一共训练50000步，其他参数都为默认，详情可查看slim/train\_image\_classifier.py。经过50000训练后，loss值为0.18，如下图所示。



## 2.5、验证模型准确率

使用如下命令验证模型准确率，准确率达到了95.17%。

python slim/eval\_image\_classifier.py \

--checkpoint\_path=train\_dir \

--eval\_dir=eval\_dir \

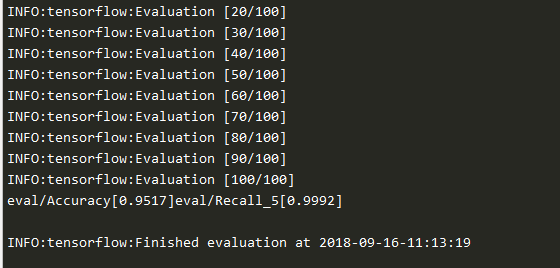
--dataset\_name=cifar10 \

--dataset\_split\_name=test \

--dataset\_dir=data \

--model\_name=resnet\_v2\_50

验证结果如下图所示：



项目地址：https://github.com/tryrus/Cifar10-Classification-useResnet50