Tensorflow基本使用

一个最基本的例子

1-导入数据

```
# -*- coding:utf-8 -*-
import tensorflow as tf
from tensorflow.examples.tutorials.mnist import input_data
```

```
WARNING:tensorflow:From d:\projects\jupyter_projects\venv\lib\site-
packages\tensorflow\contrib\learn\python\learn\datasets\base.py:198: retry
(from tensorflow.contrib.learn.python.learn.datasets.base) is deprecated and
will be removed in a future version.
Instructions for updating:
Use the retry module or similar alternatives.
```

2-线性回归模型

2.1-定义

```
## 输入的x和y
x = tf.placeholder(tf.float32, [None, 784])
y_ = tf.placeholder("float", [None,10])

## 变量定义
W = tf.Variable(tf.zeros([784,10]))
b = tf.Variable(tf.zeros([10]))
y = tf.nn.softmax(tf.matmul(x,W) + b)

## 学习的方式定义（loss方法）
cross_entropy = -tf.reduce_sum(y_*tf.log(y))
train_step = tf.train.GradientDescentOptimizer(0.01).minimize(cross_entropy)

## 准确性计算
```

```
correct_prediction = tf.equal(tf.argmax(y,1), tf.argmax(y_,1))
accuracy = tf.reduce_mean(tf.cast(correct_prediction, "float"))

init = tf.global_variables_initializer()
```

2.2 运行及结果

```
linear_list=[]
x_list=[]
mnist = input_data.read_data_sets("MNIST_data/", one_hot=True)
with tf.Session() as sess:
    sess.run(init)
    for i in range(20000):
        batch_xs, batch_ys =
mnist.train.next_batch(batch_size=128,shuffle=True)
        sess.run(train_step, feed_dict={x: batch_xs, y_: batch_ys})
        if i%500 == 0:
            x_list.append(i)
            acc = sess.run(accuracy, feed_dict={x: mnist.test.images, y_:
mnist.test.labels})
            linear_list.append(acc)
            print('迭代次数为%d,准确性为：%.4f ' % (i,acc))
```

```
WARNING:tensorflow:From <ipython-input-3-aeba3a395d22>:3: read_data_sets
(from tensorflow.contrib.learn.python.learn.datasets.mnist) is deprecated and
will be removed in a future version.
Instructions for updating:
Please use alternatives such as official/mnist/dataset.py from
tensorflow/models.
WARNING:tensorflow:From d:\projects\jupyter_projects\venv\lib\site-
packages\tensorflow\contrib\learn\python\learn\datasets\mnist.py:260:
maybe_download (from tensorflow.contrib.learn.python.learn.datasets.base) is
deprecated and will be removed in a future version.
Instructions for updating:
Please write your own downloading logic.
WARNING:tensorflow:From d:\projects\jupyter_projects\venv\lib\site-
packages\tensorflow\contrib\learn\python\learn\datasets\mnist.py:262:
extract_images (from tensorflow.contrib.learn.python.learn.datasets.mnist) is
deprecated and will be removed in a future version.
Instructions for updating:
```

```
Please use tf.data to implement this functionality.
Extracting MNIST_data/train-images-idx3-ubyte.gz
WARNING:tensorflow:From d:\projects\jupyter_projects\venv\lib\site-
packages\tensorflow\contrib\learn\python\learn\datasets\mnist.py:267:
extract_labels (from tensorflow.contrib.learn.python.learn.datasets.mnist) is
deprecated and will be removed in a future version.
Instructions for updating:
Please use tf.data to implement this functionality.
Extracting MNIST_data/train-labels-idx1-ubyte.gz
WARNING:tensorflow:From d:\projects\jupyter_projects\venv\lib\site-
packages\tensorflow\contrib\learn\python\learn\datasets\mnist.py:110:
dense_to_one_hot (from tensorflow.contrib.learn.python.learn.datasets.mnist)
is deprecated and will be removed in a future version.
Instructions for updating:
Please use tf.one_hot on tensors.
Extracting MNIST_data/t10k-images-idx3-ubyte.gz
Extracting MNIST_data/t10k-labels-idx1-ubyte.gz
WARNING:tensorflow:From d:\projects\jupyter_projects\venv\lib\site-
packages\tensorflow\contrib\learn\python\learn\datasets\mnist.py:290:
DataSet.__init__ (from tensorflow.contrib.learn.python.learn.datasets.mnist)
is deprecated and will be removed in a future version.
Instructions for updating:
Please use alternatives such as official/mnist/dataset.py from
tensorflow/models.
迭代次数为0,准确性为：0.2194
迭代次数为500,准确性为：0.9103
迭代次数为1000,准确性为：0.9162
迭代次数为1500,准确性为：0.9150
迭代次数为2000,准确性为：0.9141
迭代次数为2500,准确性为：0.9111
迭代次数为3000,准确性为：0.9069
迭代次数为3500,准确性为：0.9148
迭代次数为4000,准确性为：0.9176
迭代次数为4500,准确性为：0.9061
迭代次数为5000,准确性为：0.9228
迭代次数为5500,准确性为：0.9185
迭代次数为6000,准确性为：0.9236
迭代次数为6500,准确性为：0.9220
迭代次数为7000,准确性为：0.9227
迭代次数为7500,准确性为：0.9158
迭代次数为8000,准确性为：0.9227
迭代次数为8500,准确性为：0.9152
迭代次数为9000,准确性为：0.9245
```

```
迭代次数为9500,准确性为：0.9182
迭代次数为10000,准确性为：0.9197
迭代次数为10500,准确性为：0.9203
迭代次数为11000,准确性为：0.9193
迭代次数为11500,准确性为：0.9185
迭代次数为12000,准确性为：0.9209
迭代次数为12500,准确性为：0.9185
迭代次数为13000,准确性为：0.9092
迭代次数为13500,准确性为：0.9145
迭代次数为14000,准确性为：0.9204
迭代次数为14500,准确性为：0.9213
迭代次数为15000,准确性为：0.9140
迭代次数为15500,准确性为：0.9177
迭代次数为16000,准确性为：0.9207
迭代次数为16500,准确性为：0.9119
迭代次数为17000,准确性为：0.9203
迭代次数为17500,准确性为：0.9197
迭代次数为18000,准确性为：0.9201
迭代次数为18500,准确性为：0.9145
迭代次数为19000,准确性为：0.9234
迭代次数为19500,准确性为：0.9120
```

3-CNN模型（网上示例）

3.1-方法定义

```
# 变量定义
def weight_variable(shape):
    initial = tf.truncated_normal(shape,stddev=0.1)
    return tf.Variable(initial)

# 偏好值初始化
def bias_variable(shape):
    initial=tf.constant(0.1,shape=shape)
    return tf.Variable(initial)

# 卷积过程
def conv2d(x,W):
    return tf.nn.conv2d(input=x,filter=W,strides=[1,1,1,1],padding='SAME')

# 池化过程
```

```
def max_pool_2x2(x):
    return tf.nn.max_pool(x,ksize=[1,2,2,1],
                          strides=[1,2,2,1],padding='SAME')
# relu
def relu(x):
    return tf.nn.relu(x)

# softmax
def softmax(x):
    return tf.nn.softmax(x)
```

3.2-流程定义

```
##说明：代码在网上copy下来的，只是加了一些注释

## 需要传入的数据定义
cnn_x = tf.placeholder(tf.float32,[None,784],name='cnn_x')
cnn_y = tf.placeholder(tf.float32, [None,10],name='cnn_y')
keep_prob = tf.placeholder(tf.float32,name='keep_prob')


## 因为传入的数据为转好的列向量，需要将他转化成矩阵的形式
x_image = tf.reshape(cnn_x, [-1, 28, 28, 1])

## 第一层卷积+池化+relu
W_conv1 = weight_variable([5,5, 1,32])             # patch 5x5, in size 1,
out size 32
b_conv1 = bias_variable([32])
h_conv1 = relu(conv2d(x_image, W_conv1) + b_conv1) # output size 28x28x32
h_pool1 = max_pool_2x2(h_conv1)                    # output size 14x14x32

## 第二层卷积+池化+relu
W_conv2 = weight_variable([5,5, 32, 64])                # patch 5x5, in size
32, out size 64
b_conv2 = bias_variable([64])
h_conv2 = relu(conv2d(h_pool1, W_conv2) + b_conv2)      # output size
14x14x64
h_pool2 = max_pool_2x2(h_conv2)                         # output size 7x7x64


## 全连接层：经过卷积+池化+relu的过程之后，获得的还是很多矩阵的结果，
```

```
## 全连接层就是将矩阵的结果转化而向我们之前做的扁平化的向量
## 一共会经过两次

## 例如有两张4x4的图片，其中一共包括32个像素点（4x4x2），相当于一个大小为[1,32]矩阵，经过全连接，我们可以用一个大小为[32,x]的矩阵去作用
## 那么这个原矩阵就的大小就会变成[1,x]，x可以为任意数，如下例子就是1024

# ## 第一层
W_fc1 = weight_variable([7*7*64, 1024])
b_fc1 = bias_variable([1024])
# [n_samples, 7, 7, 64] ->> [n_samples, 7*7*64]
h_pool2_flat = tf.reshape(h_pool2, [-1, 7*7*64])
h_fc1 = relu(tf.matmul(h_pool2_flat, W_fc1) + b_fc1)

## 为了防止梯度消失，会加入dropout
h_fc1_drop = tf.nn.dropout(h_fc1, keep_prob)

# ## 第二层
W_fc2 = weight_variable([1024, 10])
b_fc2 = bias_variable([10])
prediction = tf.nn.softmax(tf.matmul(h_fc1_drop, W_fc2)+ b_fc2)

### 训练方法
cross_entropy = tf.reduce_mean(-tf.reduce_sum(cnn_y * tf.log(prediction),
                                              reduction_indices=[1]))  # loss
train_step = tf.train.GradientDescentOptimizer(1e-3).minimize(cross_entropy)

## 准确性判别方法
correct_prediction = tf.equal(tf.argmax(cnn_y,1), tf.argmax(prediction,1))
accuracy = tf.reduce_mean(tf.cast(correct_prediction, "float"))

init = tf.global_variables_initializer()
```

3.3-运行及结果

```
mnist2 = input_data.read_data_sets("MNIST_data/", one_hot=True)

cnn_list = []
with tf.Session() as sess:
    sess.run(init)
    for i in range(20000):
```

```
        batch_xs, batch_ys = mnist2.train.next_batch(128)
        sess.run(train_step,feed_dict=
{cnn_x:batch_xs,cnn_y:batch_ys,keep_prob:0.5})
        if i%500 == 0:
            acc = sess.run(accuracy, feed_dict={cnn_x: mnist2.test.images,
cnn_y: mnist2.test.labels, keep_prob:1})
            cnn_list.append(acc)
            print('迭代次数为%d,准确性为：%.4f '
                  % (i,acc))
##因为cnn中有第三个传入数据，keep_prob，所以一定要传入
```

```
Extracting MNIST_data/train-images-idx3-ubyte.gz
Extracting MNIST_data/train-labels-idx1-ubyte.gz
Extracting MNIST_data/t10k-images-idx3-ubyte.gz
Extracting MNIST_data/t10k-labels-idx1-ubyte.gz
迭代次数为0,准确性为：0.1094
迭代次数为500,准确性为：0.8134
迭代次数为1000,准确性为：0.8844
迭代次数为1500,准确性为：0.9086
迭代次数为2000,准确性为：0.9235
迭代次数为2500,准确性为：0.9314
迭代次数为3000,准确性为：0.9368
迭代次数为3500,准确性为：0.9404
迭代次数为4000,准确性为：0.9452
迭代次数为4500,准确性为：0.9476
迭代次数为5000,准确性为：0.9499
迭代次数为5500,准确性为：0.9529
迭代次数为6000,准确性为：0.9548
迭代次数为6500,准确性为：0.9554
迭代次数为7000,准确性为：0.9574
迭代次数为7500,准确性为：0.9588
迭代次数为8000,准确性为：0.9594
迭代次数为8500,准确性为：0.9607
迭代次数为9000,准确性为：0.9621
迭代次数为9500,准确性为：0.9632
迭代次数为10000,准确性为：0.9639
迭代次数为10500,准确性为：0.9647
迭代次数为11000,准确性为：0.9651
迭代次数为11500,准确性为：0.9659
迭代次数为12000,准确性为：0.9671
迭代次数为12500,准确性为：0.9675
迭代次数为13000,准确性为：0.9677
```

```
迭代次数为13500,准确性为：0.9678
迭代次数为14000,准确性为：0.9689
迭代次数为14500,准确性为：0.9689
迭代次数为15000,准确性为：0.9689
迭代次数为15500,准确性为：0.9695
迭代次数为16000,准确性为：0.9698
迭代次数为16500,准确性为：0.9705
迭代次数为17000,准确性为：0.9707
迭代次数为17500,准确性为：0.9712
迭代次数为18000,准确性为：0.9713
迭代次数为18500,准确性为：0.9712
迭代次数为19000,准确性为：0.9720
迭代次数为19500,准确性为：0.9726
```

4-CNN模型（自己胡乱构造）

4.1-方法定义（略）

方法可以直接使用之前CNN的方法，只是需要修改流程就可以了

4.2-流程定义

```
cnn_x = tf.placeholder(tf.float32,[None,784],name='cnn_x')
cnn_y = tf.placeholder(tf.float32, [None,10],name='cnn_y')
## 自己就不加keep_prob，因为不知道影响有多大


image = tf.reshape(cnn_x,shape=[-1,28,28,1])

w_1 = weight_variable([3,3,1,7])
## 没有加bias，而且修改了卷积的大小，输出减少为7
h_1 = relu(max_pool_2x2(conv2d(image,w_1)))


w_2 = weight_variable([5,5,7,64])
h_2 = relu(max_pool_2x2(conv2d(h_1,w_2)))
```

```
w_fc1 = weight_variable([7*7*64,1024])
b_fc1 = bias_variable([1024])
h_2_flat = tf.reshape(h_2, [-1, 7 * 7 * 64])
h_fc1 = tf.nn.relu(tf.matmul(h_2_flat, w_fc1) + b_fc1)


#全连接层fc2
W_fc2 = weight_variable([1024, 10])
b_fc2 = bias_variable([10])
# 直接经过softmax进行分类
prediction = tf.nn.softmax(tf.matmul(h_fc1, W_fc2) + b_fc2)

correct_prediction = tf.equal(tf.argmax(cnn_y,1), tf.argmax(prediction,1))
accuracy = tf.reduce_mean(tf.cast(correct_prediction, "float"))


cross_entropy = tf.reduce_mean(-tf.reduce_sum(cnn_y * tf.log(prediction),
                                              reduction_indices=[1]))  # loss
train_step = tf.train.GradientDescentOptimizer(1e-3).minimize(cross_entropy)
init = tf.global_variables_initializer()
```

4.3-运行及结果

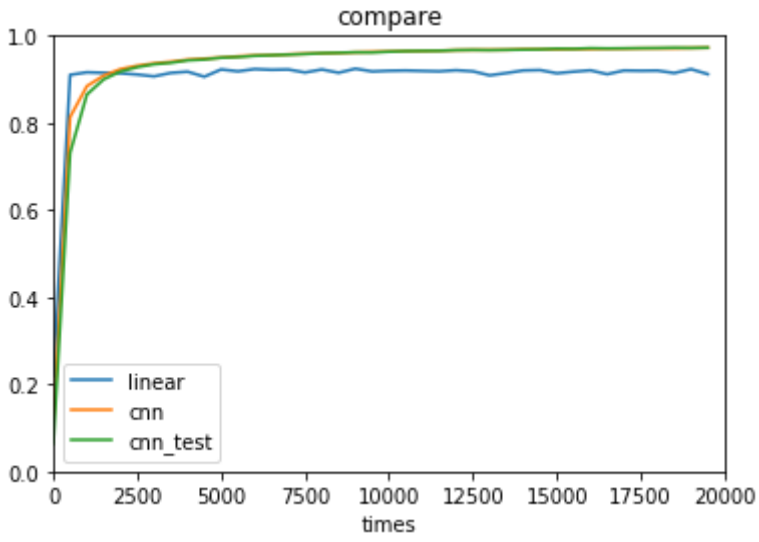
```
mnist3 = input_data.read_data_sets("MNIST_data/", one_hot=True)
cnn2_list = []
with tf.Session() as sess:
    sess.run(init)
    for i in range(20000):
        batch_xs, batch_ys = mnist3.train.next_batch(128)
        test=sess.run(train_step,feed_dict={cnn_x:batch_xs,cnn_y:batch_ys})
        if i%500 == 0:
            acc = sess.run(accuracy, feed_dict={cnn_x: mnist3.test.images,
cnn_y: mnist3.test.labels})
            cnn2_list.append(acc)
            print('迭代次数为%d,准确性为：%.4f '
                  % (i,acc))
```

```
Extracting MNIST_data/train-images-idx3-ubyte.gz
Extracting MNIST_data/train-labels-idx1-ubyte.gz
```

```
Extracting MNIST_data/t10k-images-idx3-ubyte.gz
Extracting MNIST_data/t10k-labels-idx1-ubyte.gz
迭代次数为0,准确性为：0.0635
迭代次数为500,准确性为：0.7312
迭代次数为1000,准确性为：0.8651
迭代次数为1500,准确性为：0.9000
迭代次数为2000,准确性为：0.9181
迭代次数为2500,准确性为：0.9280
迭代次数为3000,准确性为：0.9347
迭代次数为3500,准确性为：0.9380
迭代次数为4000,准确性为：0.9436
迭代次数为4500,准确性为：0.9456
迭代次数为5000,准确性为：0.9498
迭代次数为5500,准确性为：0.9512
迭代次数为6000,准确性为：0.9541
迭代次数为6500,准确性为：0.9554
迭代次数为7000,准确性为：0.9567
迭代次数为7500,准确性为：0.9583
迭代次数为8000,准确性为：0.9602
迭代次数为8500,准确性为：0.9609
迭代次数为9000,准确性为：0.9621
迭代次数为9500,准确性为：0.9617
迭代次数为10000,准确性为：0.9636
迭代次数为10500,准确性为：0.9648
迭代次数为11000,准确性为：0.9653
迭代次数为11500,准确性为：0.9655
迭代次数为12000,准确性为：0.9671
迭代次数为12500,准确性为：0.9676
迭代次数为13000,准确性为：0.9671
迭代次数为13500,准确性为：0.9678
迭代次数为14000,准确性为：0.9683
迭代次数为14500,准确性为：0.9689
迭代次数为15000,准确性为：0.9703
迭代次数为15500,准确性为：0.9700
迭代次数为16000,准确性为：0.9715
迭代次数为16500,准确性为：0.9709
迭代次数为17000,准确性为：0.9712
迭代次数为17500,准确性为：0.9716
迭代次数为18000,准确性为：0.9719
迭代次数为18500,准确性为：0.9726
迭代次数为19000,准确性为：0.9721
迭代次数为19500,准确性为：0.9727
```

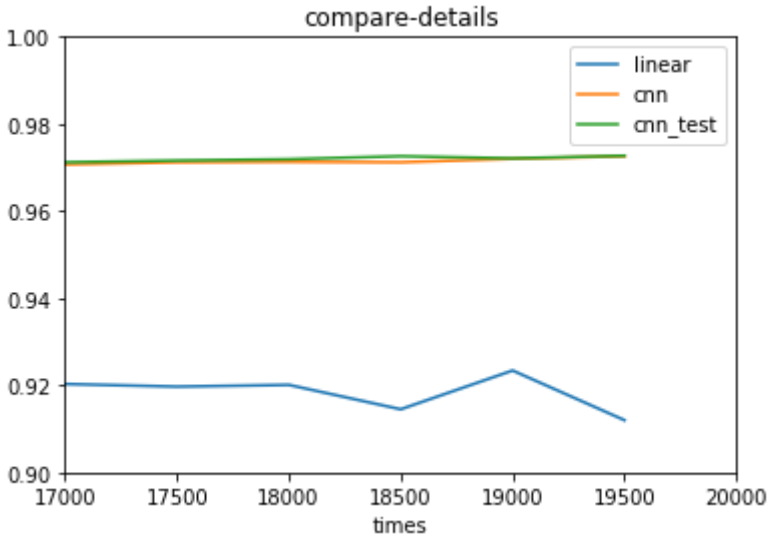
```
import matplotlib.pyplot as plt
import pandas as pd

plt.figure(figsize=(50,25),dpi=300)

data = pd.DataFrame([x_list,linear_list,cnn_list,cnn2_list]).T
data.columns=['times','linear','cnn','cnn_test']


data.plot(x='times',xlim=(0,20000),ylim=(0,1),title='compare')


plt.show()
```

```
<Figure size 15000x7500 with 0 Axes>
```



png

```
data.plot(x='times',xlim=(17000,20000),ylim=(0.9,1),title='compare-details')
plt.show()
```


compare-details
1.00
0.98
0.96
0.94
0.92
0.90
17000
17500
18000
18500
19000
19500
20000
times
linear
cnn
cnn_test

png