醍醐灌顶的酸爽

TENSORFLOW 实践

徘徊之秋叶

QQ：809758521 | 南京.天印大道

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目录

前言

Tensorflow 分为 CPU、GPU 版本。官方推荐使用 Ubuntu

Tensorflow 暴露出来的两个弱点：
1、 性能评测中比 caffe 等慢；
2、 中间状态的值不可传递给外部。

部署

pip 安装

Tensorflow 1.8 下载
https://pypi.org/project/tensorflow/#files

安装 Ubuntu 16.04 desktop

开启远程管理：
$ sudo apt install –y openssh-server
$ systemctl status ssh

修改服务器 ip 地址之后，执行：
$ sudo ifconfig ens160 down
$ sudo ifconfig ens160 up
$ ifconfig

SecureCRT 连接 Ubuntu，更新下系统：
$ sudo apt update
$ sudo apt upgrade –y

安装 pip
$ sudo apt-get install python-pip python-dev
tensorflow@tensorflow-vm:~$ pip -V
pip 8.1.1 from /usr/lib/python2.7/dist-packages (python 2.7)

升级 pip：
tensorflow@tensorflow-vm:~$ sudo pip -V
pip 8.1.1 from /usr/local/lib/python2.7/dist-packages/pip (python 2.7)
tensorflow@tensorflow-vm:~$ sudo pip install --upgrade pip

tensorflow@tensorflow-vm:~$ sudo pip -V
pip 10.0.1 from /usr/local/lib/python2.7/dist-packages/pip (python 2.7)

Pip 升级之后，运行 pip：
ImportError: cannot import name main

修改 pip 文件
tensorflow@tfvm:/usr/bin$ cat pip
#!/usr/bin/python
# GENERATED BY DEBIAN
import sys
# Run the main entry point, similarly to how setuptools does it, but because
# we didn't install the actual entry point from setup.py, don't use the
# pkg_resources API.
from pip import __main__
if __name__ == '__main__':
    sys.exit(__main__._main())

第二种改法：
# -*- coding: utf-8 -*-
import re
import sys
from pip._internal import main as _main
if __name__ == '__main__':
    sys.argv[0] = re.sub(r'(-script\.pyw?|\.exe)?$', '', sys.argv[0])
    sys.exit(_main())

sudo pip install --upgrade https://storage.googleapis.com/tensorflow/linux/cpu/tensorflow-1.8.0-cp27-none-linux_x86_64.whl

安装 tensorflow（CPU）
tensorflow@tensorflow-vm:~$ sudo pip install --upgrade https://storage.googleapis.com/tensorflow/linux/cpu/tensorflow-1.8.0-cp27-none-linux_x86_64.whl
安装过程中，一并安装了：wheel、protobuf、six、numpy、setuptools

$ pip install jupyter

$ jupyter notebook
$ jupyter notebook –ip=192.168.100.66
$ jupyter notebook –ip=192.168.100.66 –allow-root

$ jupyter notebook list

http://192.168.100.66:8888

容器部署

Github 地址：
https://github.com/tensorflow/tensorflow/tree/master/tensorflow/tools/docker

TensorFlowCPUImage 标识了 Docker 容器。 指定下列值之一：

- gcr.io/tensorflow/tensorflow，这是 TensorFlow CPU binary image。
- gcr.io/tensorflow/tensorflow:latest-devel，这是最新的 TensorFlow CPU 二进制镜像加源代码。
- gcr.io/tensorflow/tensorflow:version，它是 TensorFlow CPU 二进制镜像的指定版本（例如，1.1.0rc1）。
- gcr.io/tensorflow/tensorflow:version-devel，它是 TensorFlow GPU 二进制镜像的源代码的指定版本（例如，1.1.0rc1）。

We currently maintain two Docker container images:

- tensorflow/tensorflow - TensorFlow with all dependencies - CPU only!
- tensorflow/tensorflow:latest-gpu - TensorFlow with all dependencies and support for NVidia CUDA

Note: We store all our containers on Docker Hub.

[root@Docker-GP ~]# docker search tensor --no-trunc
INDEX NAME DESCRIPTION STARS OFFICIAL AUTOMATED
docker.io docker.io/tensorflow/tensorflow Official docker images for deep learning framework TensorFlow (http://www.tensorflow.org) 928
docker.io docker.io/jupyter/tensorflow-notebook Jupyter Notebook Scientific Python Stack w/ Tensorflow from https://github.com/jupyter/docker-stacks 66
docker.io docker.io/xblaster/tensorflow-jupyter Dockerized Jupyter with tensorflow 50 [OK]
docker.io docker.io/romilly/rpi-docker-tensorflow Tensorflow and Jupyter running in docker container on Raspberry Pi 3B 18
docker.io docker.io/bitnami/tensorflow-serving Bitnami Docker Image for TensorFlow Serving 10 [OK]
docker.io docker.io/floydhub/tensorflow tensorflow 10 [OK]
docker.io docker.io/tensorflow/tf_grpc_server Server for TensorFlow GRPC Distributed Runtime 6
docker.io docker.io/opensciencegrid/tensorflow-gpu TensorFlow GPU set up for OSG

4
docker.io docker.io/tensorflow/tf_grpc_test_server Testing server for GRPC-based distributed runtime in TensorFlow 3
docker.io docker.io/eboraas/tensorflow TensorFlow with Jupyter Notebook, including CPU optimizations 2 [OK]
docker.io docker.io/hytssk/tensorflow tensorflow image with matplotlib.pyplot.imshow() enabled. 2 [OK]
docker.io docker.io/abhishek404/tensorflow-gpu Tensorflow GPU image 1
docker.io docker.io/bitnami/tensorflow-inception Bitnami Docker Image for TensorFlow Inception 1 [OK]
docker.io docker.io/chaneyk/tensorflow Tensorflow Releases with GPU Support 1
docker.io docker.io/mikebirdgeneau/r-tensorflow RStudio and Tensorflow 1 [OK]
docker.io docker.io/tensorlayer/tensorlayer https://github.com/tensorlayer/tensorlayer 1
docker.io docker.io/andreleoni/cnn-tensorflow Container for convlutional network with Python 3.6 + Tensorflow 0
docker.io docker.io/aretelabs/tensorflow 0
docker.io docker.io/davidchiu/tensorflow09 tensorflow09 with GPU support 0
docker.io docker.io/djpetti/rpinets-tensorflow Tensorflow container that is ready to be used with RPINets. 0 [OK]
docker.io docker.io/fluxcapacitor/prediction-tensorflow 0
docker.io docker.io/mediadesignpractices/tensorflow Tensorflow w/ CUDA (GPU) + extras 0 [OK]
docker.io docker.io/opensciencegrid/tensorflow TensorFlow image with some OSG additions 0 [root@Docker-GP ~]# docker pull docker.io/tensorflow/tensorflow
Using default tag: latest
Trying to pull repository docker.io/tensorflow/tensorflow ...
latest: Pulling from docker.io/tensorflow/tensorflow
297061f60c36: Pull complete
e9ccef17b516: Pull complete
dbc33716854d: Pull complete
8fe36b178d25: Pull complete
686596545a94: Pull complete
ed66f2c5f3d9: Pull complete
8405b6c3f141: Pull complete
070615ca3a03: Pull complete
306ac2321f8e: Pull complete
c30111bc1e74: Pull complete
7aa552c3f7f7: Pull complete

4db41af3662a: Pull complete
bf5fbadacf01: Pull complete
Digest: sha256:1cc84937252fcc6e8521901cbbe180c7a93300792aceb0da8a53a5728360320a
Status: Downloaded newer image for docker.io/tensorflow/tensorflow:latest

Running the container
Run non-GPU container using

```
$ docker run -it -p 8888:8888 tensorflow/tensorflow
```

For GPU support install NVidia drivers (ideally latest) and nvidia-docker. Run using

```
$ nvidia-docker run -it -p 8888:8888 tensorflow/tensorflow:latest-gpu
```

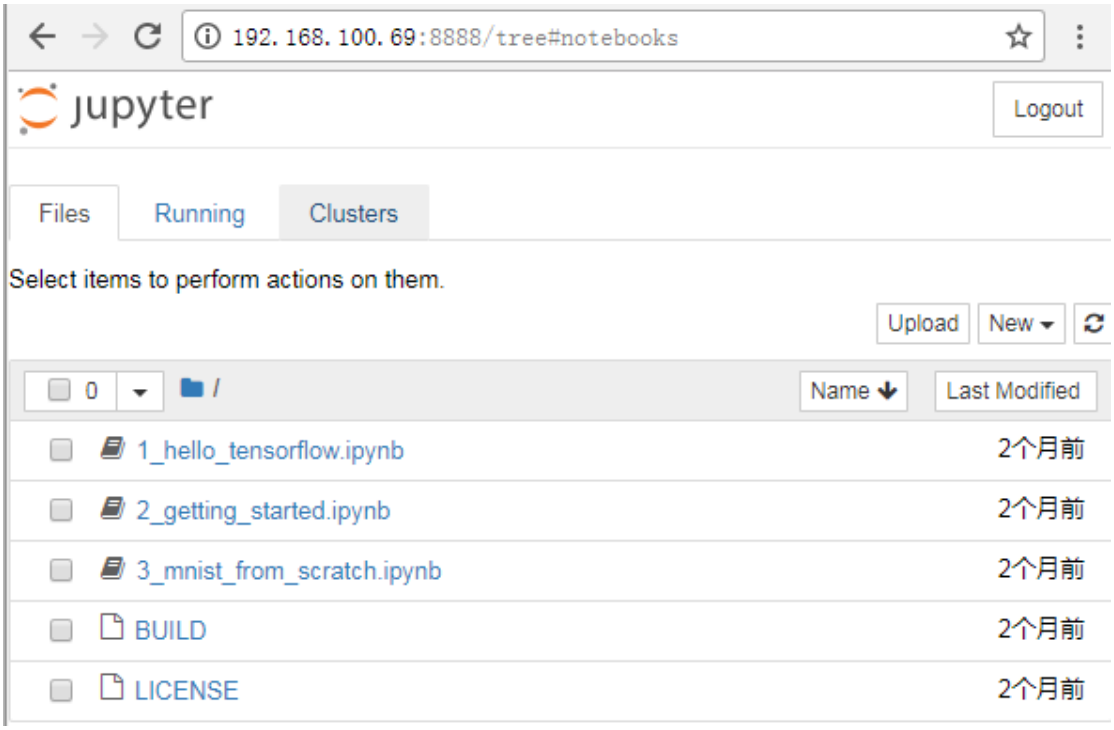
Note: If you would have a problem running nvidia-docker you may try the old method we have used. But it is not recommended. If you find a bug in nvidia-docker, please report it there and try using nvidia-docker as described above.

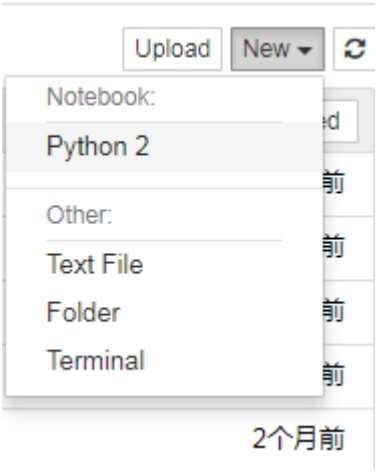
```
$ # The old, not recommended way to run docker with gpu support:
$ export CUDA_SO=$(\ls /usr/lib/x86_64-linux-gnu/libcuda.* | xargs -I{} echo '-v {}:{}')
$ export DEVICES=$(\ls /dev/nvidia* | xargs -I{} echo '--device {}:{}')
$ docker run -it -p 8888:8888 $CUDA_SO $DEVICES tensorflow/tensorflow:latest-gpu
```

[root@Docker-GP ~]# docker run -it -p 8888:8888 tensorflow/tensorflow
[I 03:23:53.508 NotebookApp] Writing notebook server cookie secret to /root/.local/share/jupyter/runtime/notebook_cookie_secret
[W 03:23:53.528 NotebookApp] WARNING: The notebook server is listening on all IP addresses and not using encryption. This is not recommended.
[I 03:23:53.537 NotebookApp] Serving notebooks from local directory: /notebooks
[I 03:23:53.537 NotebookApp] 0 active kernels
[I 03:23:53.537 NotebookApp] The Jupyter Notebook is running at:
[I 03:23:53.537 NotebookApp] http://[all ip addresses on your system]:8888/?token=03e16d7d42944430a08789307676035f3e0661c9033f43d0
[I 03:23:53.537 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[C 03:23:53.538 NotebookApp]

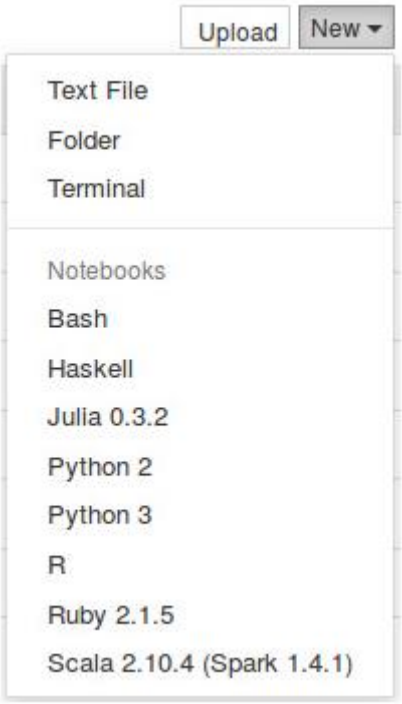
Copy/paste this URL into your browser when you connect for the first time,
to login with a token:

http://localhost:8888/?token=03e16d7d42944430a08789307676035f3e0661c9033f43d0





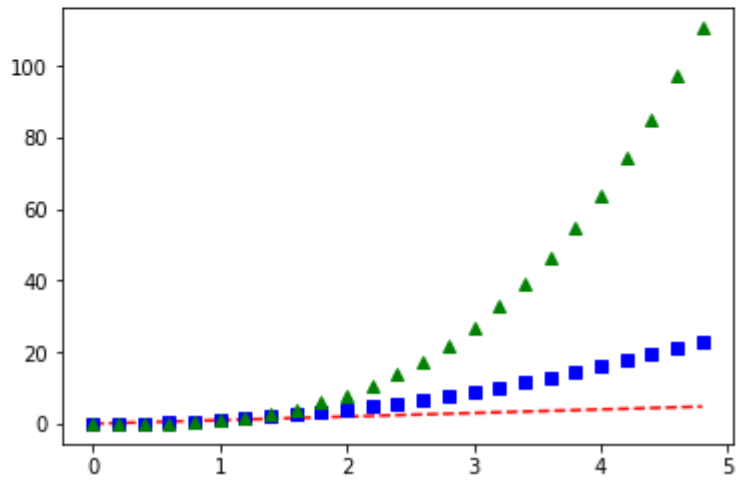
环境被简化了，看看隔壁老王的 jupyter：



In [23]:
```
import numpy as np
import matplotlib.pyplot as plt

# evenly sampled time at 200ms intervals
t = np.arange(0., 5., 0.2)

# red dashes, blue squares and green triangles
plt.plot(t, t, 'r--', t, t**2, 'bs', t, t**3, 'g^')
plt.show()
```



import numpy as np
import matplotlib.pyplot as plt

evenly sampled time at 200ms intervals

t = np.arange(0., 5., 0.2)

# red dashes, blue squares and green triangles
plt.plot(t, t, 'r--', t, t**2, 'bs', t, t**3, 'g^')
plt.show()

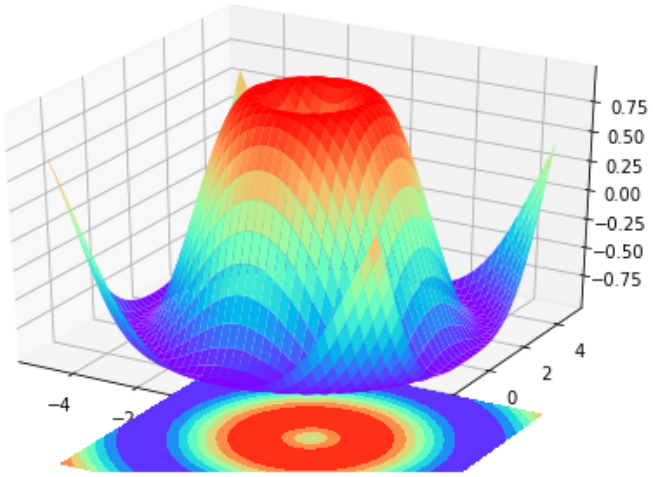
jupyter Untitled Last Checkpoint: 1小时前 (unsaved changes)

File Edit View Insert Cell Kernel Widgets Help

Run Code

In [22]:

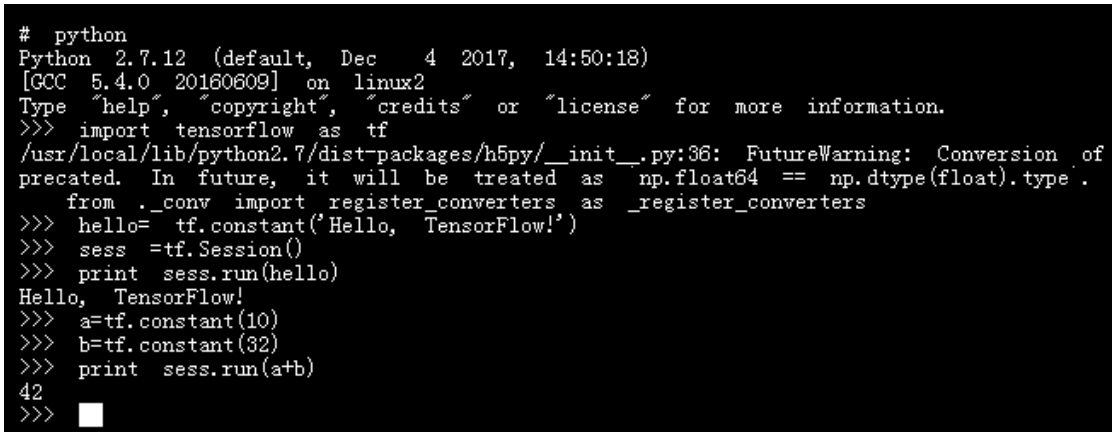
```
import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
fig=plt.figure()
ax=Axes3D(fig)
x=np.arange(-5,5,0.25)
y=np.arange(-5,5,0.25)
x,y=np.meshgrid(x,y)
r=np.sqrt(x**2+y**2)
z=np.sin(r)
#高度
ax.plot_surface(x,y,z,rstride=1,cstride=1,cmap=plt.get_cmap('rainbow'))
#填充rainbow颜色
ax.contourf(x,y,z,zdir='z',offset=-2,cmap='rainbow')
#绘制3D图形,zdir表示从哪个坐标轴上压下去
plt.show()
#显示图片
```




```
import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
fig=plt.figure()
ax=Axes3D(fig)
x=np.arange(-5,5,0.25)
y=np.arange(-5,5,0.25)
x,y=np.meshgrid(x,y)
r=np.sqrt(x**2+y**2)
z=np.sin(r)
#高度
ax.plot_surface(x,y,z,rstride=1,cstride=1,cmap=plt.get_cmap('rainbow'))
```

#填充 rainbow 颜色
ax.contourf(x,y,z,zdir='z',offset=-2,cmap='rainbow')
#绘制 3D 图形,zdir 表示从哪个坐标轴上压下去
plt.show()
#显示图片

打开一个 Terminal：



python
Python 2.7.12 (default, Dec 4 2017, 14:50:18)
[GCC 5.4.0 20160609] on linux2
Type "help", "copyright", "credits" or "license" for more information.
>>> import tensorflow as tf
/usr/local/lib/python2.7/dist-packages/h5py/__init__.py:36: FutureWarning: Conversion of the second argument of issubdtype from `float` to `np.floating` is deprecated. In future, it will be treated as `np.float64 == np.dtype(float).type`.
from ._conv import register_converters as _register_converters
>>> hello= tf.constant('Hello, TensorFlow!')
>>> sess =tf.Session()
>>> print sess.run(hello)
Hello, TensorFlow!
>>> a=tf.constant(10)
>>> b=tf.constant(32)
>>> print sess.run(a+b)
42
>>>

[root@Docker-GP ~]# docker ps -a
[root@Docker-GP ~]# docker image ls
[root@Docker-GP ~]# docker start f8a59e6eb3e3
[root@Docker-GP ~]# docker stop f8a59e6eb3e3
[root@Docker-GP ~]# docker rm f8a59e6eb3e3

Tensorflow 生成散点图测试：

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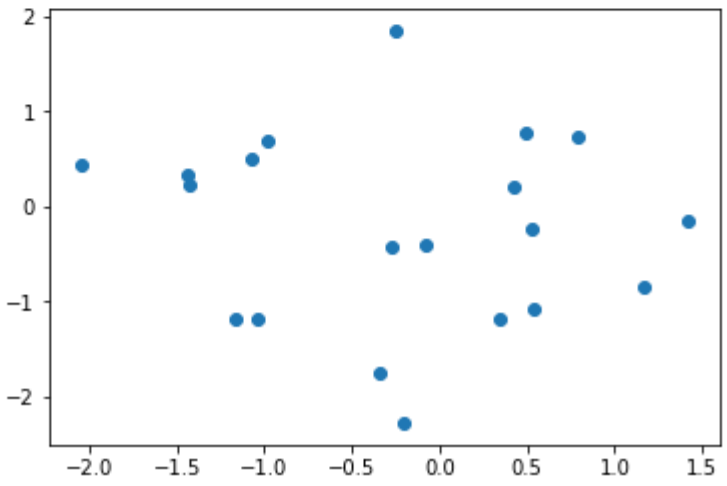
File Edit View Insert Cell Kernel Widgets Help

Run Code

In [1]:
```
import tensorflow as tf
import numpy as np
import matplotlib.pyplot as plt

#表示直接在浏览器中显示matplotlib图表
%matplotlib inline

a = tf.random_normal([2,20]) #定义2x20的随机数矩阵
sess = tf.Session()  #启动一个tensorflow会话
out = sess.run(a)    # 用在sess会话里执行a，结果放out里
x, y = out

plt.scatter(x, y)    #用pyplot创建一系列散列点，坐标为x和y
plt.show()
```

```
/usr/local/lib/python2.7/dist-packages/h5py/__init__.py:36:
np.floating is deprecated. In future, it will be treated a
  from ._conv import register_converters as _register_conve
```



import tensorflow as tf
import numpy as np
import matplotlib.pyplot as plt

#表示直接在浏览器中显示 matplotlib 图表
%matplotlib inline

```
a = tf.random_normal([2,20]) #定义 2x20 的随机数矩阵
sess = tf.Session()   #启动一个 tensorflow 会话
out = sess.run(a)      # 用在 sess 会话里执行 a，结果放 out 里
x, y = out

plt.scatter(x, y)      #用 pyplot 创建一系列散列点，坐标为 x 和 y
plt.show()
```

基于 VirtualEnv 的安装

基于 Anaconda 的安装

Anaconda 是一个集成许多第三方科学计算库的 Python 科学计算环境,Anaconda 使用 conda 作为自己的包管理工具,同时具有自己的计算环境,类似 Virtualenv.

和 Virtualenv 一样,不同 Python 工程需要的依赖包,conda 将他们存储在不同的地方。TensorFlow 上安装的 Anaconda 不会对之前安装的 Python 包进行覆盖.

- 安装 Anaconda
- 建立一个 conda 计算环境
- 激活环境,使用 conda 安装 TensorFlow
- 安装成功后,每次使用 TensorFlow 的时候需要激活 conda 环境

ANACONDA 下载
https://www.anaconda.com/download/

python 第一步——Annaconda 基础使用及 pycharm、spyder
https://blog.csdn.net/u013818990/article/details/79329319#%E6%96%B0%E5%BB%BA%E4%B8%80%E4%B8%AApython%E7%8E%AF%E5%A2%83

创建 python 3.6 测试环境：

```
tensor@tfvm:~$ conda create --name test_py3 python=3.6
Solving environment: done

## Package Plan ##

  environment location: /opt/anaconda2/envs/test_py3

  added / updated specs:
    - python=3.6
```

The following packages will be downloaded:

package	build	
ca-certificates-2018.03.07	0	124 KB
setuptools-39.2.0	py36_0	551 KB
python-3.6.5	hc3d631a_2	29.4 MB
pip-10.0.1	py36_0	1.8 MB
sqlite-3.24.0	h84994c4_0	1.8 MB
wheel-0.31.1	py36_0	62 KB
certifi-2018.4.16	py36_0	142 KB
	Total:	33.8 MB

The following NEW packages will be INSTALLED:

ca-certificates: 2018.03.07-0
certifi: 2018.4.16-py36_0
libedit: 3.1.20170329-h6b74fdf_2
libffi: 3.2.1-hd88cf55_4
libgcc-ng: 7.2.0-hdf63c60_3
libstdcxx-ng: 7.2.0-hdf63c60_3
ncurses: 6.1-hf484d3e_0
openssl: 1.0.2o-h20670df_0
pip: 10.0.1-py36_0
python: 3.6.5-hc3d631a_2
readline: 7.0-ha6073c6_4
setuptools: 39.2.0-py36_0
sqlite: 3.24.0-h84994c4_0
tk: 8.6.7-hc745277_3
wheel: 0.31.1-py36_0
xz: 5.2.4-h14c3975_4
zlib: 1.2.11-ha838bed_2

Downloading and Extracting Packages
ca-certificates-2018 | 124 KB | ##################################### | 100%
setuptools-39.2.0 | 551 KB | ##################################### | 100%
python-3.6.5 | 29.4 MB | ##################################### | 100%
pip-10.0.1 | 1.8 MB | ##################################### | 100%
sqlite-3.24.0 | 1.8 MB | ##################################### | 100%
wheel-0.31.1 | 62 KB | ##################################### | 100%
certifi-2018.4.16 | 142 KB | ##################################### | 100%

Preparing transaction: done
Verifying transaction: done
Executing transaction: done
#
To activate this environment, use:
> source activate test_py3
#
To deactivate an active environment, use:
> source deactivate
#
【Windows 下使用没有 source，譬如：$ activate test_py3、$ deactivate】

创建 python 2.7 测试环境：
tensor@tfvm:~$ conda create --name test_py2 python=2.7
Solving environment: done

Package Plan

environment location: /opt/anaconda2/envs/test_py2

added / updated specs:
- python=2.7

The following packages will be downloaded:

package	build	
certifi-2018.4.16	py27_0	142 KB
setuptools-39.2.0	py27_0	583 KB
	Total:	726 KB

The following NEW packages will be INSTALLED:

ca-certificates: 2018.03.07-0
certifi: 2018.4.16-py27_0
libedit: 3.1.20170329-h6b74fdf_2
libffi: 3.2.1-hd88cf55_4
libgcc-ng: 7.2.0-hdf63c60_3
libstdcxx-ng: 7.2.0-hdf63c60_3
ncurses: 6.1-hf484d3e_0
openssl: 1.0.2o-h20670df_0
pip: 10.0.1-py27_0

```
    python:              2.7.15-h1571d57_0
    readline:            7.0-ha6073c6_4
    setuptools:          39.2.0-py27_0
    sqlite:              3.24.0-h84994c4_0
    tk:                  8.6.7-hc745277_3
    wheel:               0.31.1-py27_0
    zlib:                1.2.11-ha838bed_2

Proceed ([y]/n)? y


Downloading and Extracting Packages
certifi-2018.4.16      |    142 KB | ##################################### | 100%
setuptools-39.2.0      |    583 KB | ##################################### | 100%
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
#
# To activate this environment, use:
# > source activate test_py2
#
# To deactivate an active environment, use:
# > source deactivate
#
```
【Windows 下使用没有 source，譬如：$ activate test_py3、$ deactivate】

INTEL DIGITS

英特尔® 深度学习 SDK 教程：安装指南:
https://software.intel.com/zh-cn/articles/intel-deep-learning-sdk-tutorial

英特尔® 深度学习 SDK 教程：英特尔® 深度学习 SDK 训练工具入门指南
https://software.intel.com/zh-cn/articles/intel-deep-learning-sdk-tutorial-getting-started-with-intel-deep-learning-sdk-training-tool

基本使用

Command Line

测试：

```
tensorflow@tensorflow-vm:~$ python
Python 2.7.12 (default, Dec  4 2017, 14:50:18)
[GCC 5.4.0 20160609] on linux2
Type "help", "copyright", "credits" or "license" for more information.
>>> import tensorflow as tf
>>> hello=tf.constant('Hello, TensorFlow!')
>>> sess=tf.Session()
>>> print sess.run(hello)
Hello, TensorFlow!
>>> a=tf.constant(10)
>>> b= tf.constant(32)
>>> print sess.run(a+b)
42
>>> matrix1=tf.constant([[3.,3.]])
>>> matrix2=tf.constant([[2.],[2.]])
>>> product=tf.matmul(matrix1,matrix2)
>>> sess=tf.Session()
【大小写敏感】
>>> result=sess.run(product)
>>> print result
[[12.]]
>>> sess.close()
>>> with tf.Session() as sess:
...     result=sess.run([product])
...     print result
...
【回车两次】
[array([[12.]], dtype=float32)]
>>>
```

一、 矩阵的加法

定义2 设有两个 $m\times n$ 矩阵 $A=(a_{ij}), B=(b_{ij})$，那末矩阵 A 与 B 的和记作 $A+B$，规定为

$$A+B=\begin{pmatrix} a_{11}+b_{11} & a_{12}+b_{12} & \cdots & a_{1n}+b_{1n} \\ a_{21}+b_{21} & a_{22}+b_{22} & \cdots & a_{2n}+b_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{m1}+b_{m1} & a_{m2}+b_{m2} & \cdots & a_{mn}+b_{mn} \end{pmatrix}$$

同型矩阵才能相加，两个 m*n 的矩阵的结果是 m*n 的矩阵。

矩阵的加法同理就好理解了。

如果设矩阵 D 为矩阵 A 与 B 的差，

那么：$D=A-B=$

$$\begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{pmatrix}-\begin{pmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & b_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ b_{m1} & b_{m2} & \cdots & b_{mn} \end{pmatrix}$$

$$=\begin{pmatrix} a_{11}-b_{11} & a_{12}-b_{12} & \cdots & a_{1n}-b_{1n} \\ a_{21}-b_{21} & a_{22}-b_{22} & \cdots & a_{2n}-b_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{m1}-b_{m1} & a_{m2}-b_{m2} & \cdots & a_{mn}-b_{mn} \end{pmatrix}$$

矩阵线性代数教材上的各种定义都太过复杂了。尝试一个浅显的解释：

小明今天要做饭，消耗 2 斤肉，1 斤蔬菜。肉每斤 20 元，蔬菜每斤 5 元，则一共需多少花费？

这个问题的答案很简单：

$$20\times 2+5\times 1=45$$

我们用向量相乘的方法写出来：

$$\begin{pmatrix}20 & 5\end{pmatrix}\begin{pmatrix}2\\1\end{pmatrix}=45$$

如果小明第二天有另一种做饭的方法，需要消耗 1 斤肉，4 斤蔬菜，那么这两种方法的花费各是多少呢？我们显然需要另算这第二种方法的花费。把这个做饭方式写在第二个矩阵（向量是宽度或长度为 1 的矩阵）里：

$$\begin{pmatrix}20 & 5\end{pmatrix}\begin{pmatrix}2 & 1\\1 & 4\end{pmatrix}=\begin{pmatrix}45 & 40\end{pmatrix}$$

小明家附近还有另一个菜市场，那里肉每斤 15 元，蔬菜每斤 10 元。那么，小明如果去这个菜市场，花费又是多少呢（分别计算上述两种做饭方式）？我们把这另外的一种价格写进第一个矩阵里：

$$\begin{pmatrix}20 & 5\\15 & 10\end{pmatrix}\begin{pmatrix}2 & 1\\1 & 4\end{pmatrix}=\begin{pmatrix}45 & 40\\40 & 55\end{pmatrix}$$

这样我们看到了一个矩阵乘法的例子。在左边的这个矩阵的每一行，都代表了一种价目表；在右边的矩阵的每一列，都代表了一种做饭方式。那么所有可能的组合所最终产生的花费，则在结果矩阵中表示出来了。

小明有一天成为了餐厅大厨，小红做掌柜兼管算账。我们假设物价不变。小红发现，如果今天买 10 斤肉花了 A 元，明天买 20 斤肉就得花 2A 元。如果买一斤肉要花 C 元，买 1 斤菜要花 D 元，那么买一斤肉和一斤菜就要花(C+D)元。每天小明汇报今日的材料消耗之后，小红便会将材料消耗转为需要花的钱数。如果材料消耗翻倍，花的钱数也翻倍。另外，如果去不同的菜市场，也会得到不同的花钱数量。

小明每月送来一张长列表，里面是每日的材料消耗；而经过小红的处理，这张列表会转为每日，在不同的菜市场购买这些材料的花费。材料消耗翻倍，花费也翻倍。我们管这种从材料列表转为开销表的过程，就叫做一个线性映射。这也即是矩阵乘法的意义。

三、矩阵与矩阵相乘

定义4 设 $A=(a_{ij})$ 是一个 $m\times s$ 矩阵，$B=(b_{ij})$ 是一个 $s\times n$ 矩阵，那末规定矩阵 A 与矩阵 B 的乘积是一个 $m\times n$ 矩阵 $C=(c_{ij})$，其中

$$c_{ij}=a_{i1}b_{1j}+a_{i2}b_{2j}+\cdots+a_{is}b_{sj}=\sum_{k=1}^{s}a_{ik}b_{kj}$$

$$(i=1,2,\cdots m;\ j=1,2,\cdots,n)$$

并把此乘积记作 $C=AB$

结果是 m*n 的矩阵

矩阵乘法满足的运算规律：

(1) 结合律：$(AB)C=A(BC)$;

(2) 分配律：$A(B+C)=AB+AC$,

$(B+C)A=BA+CA$;

(3) $\lambda(AB)=(\lambda A)B=A(\lambda B)$

(4) $AE=EA=A$;

$$\begin{pmatrix} a_1 & & & \\ & a_2 & & \\ & & \ddots & \\ & & & a_n \end{pmatrix}_{n\times n}\begin{pmatrix} b_1 & & & \\ & b_2 & & \\ & & \ddots & \\ & & & b_n \end{pmatrix}_{n\times n}$$

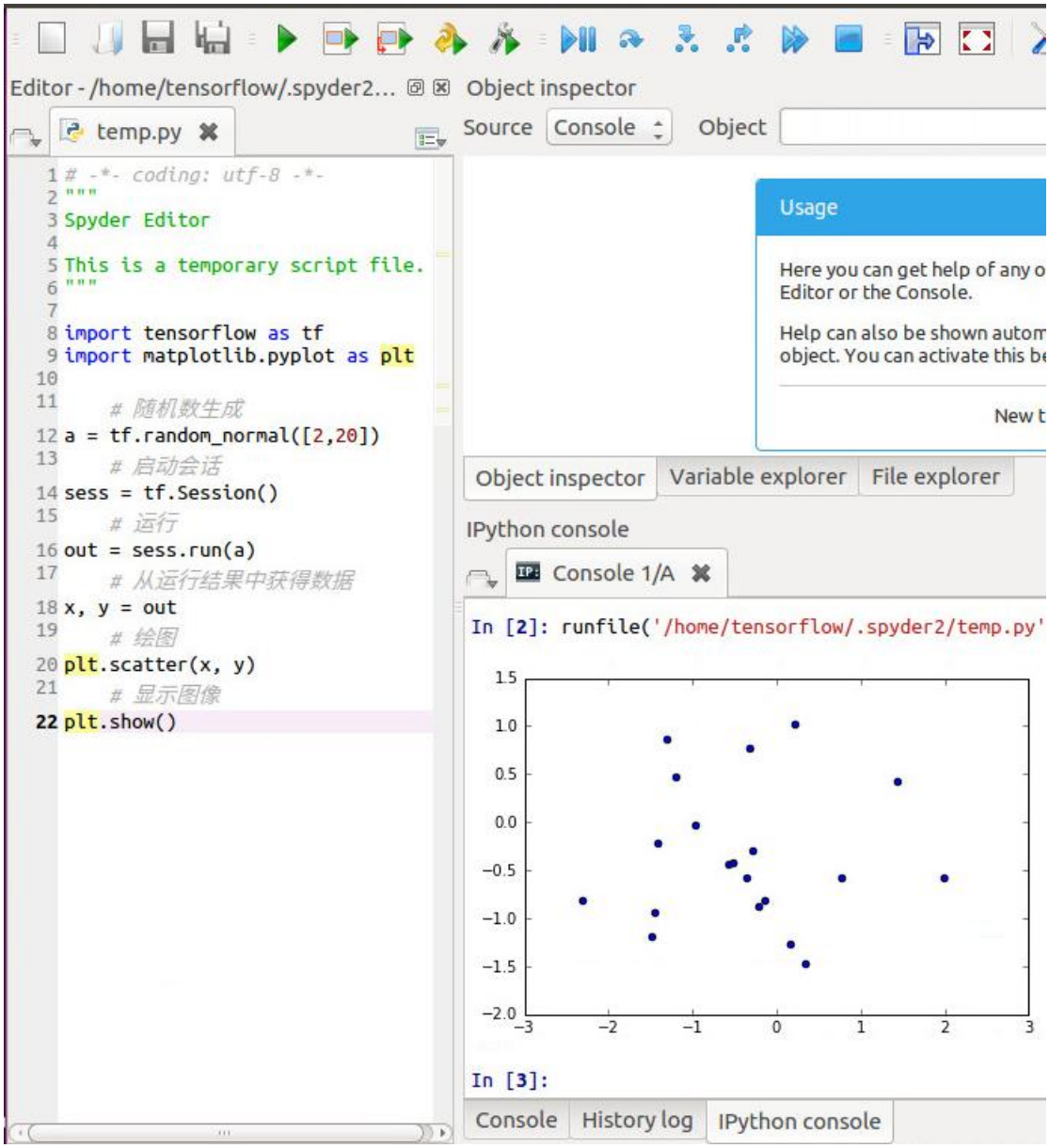
$$=\begin{pmatrix} a_1b_1 & & & \\ & a_2b_2 & & \\ & & \ddots & \\ & & & a_nb_n \end{pmatrix}_{n\times n}$$

矩阵的加法：

Spyder

Python 2,Anaconda 2,spyder 2
Python 3,Anaconda 3,spyder 3

Ubuntu 16.04 desktop python 2 安装 spyder
tensorflow@tfvm:/usr/bin$ sudo apt install spyder
tensorflow@tfvm:/usr/bin$ spyder
Spyder: cannot connect to X server
【需要 X Windows 支持】
tensorflow@tfvm:/usr/bin$ spyder




```
# -*- coding: utf-8 -*-
"""
Spyder Editor

This is a temporary script file.
"""

import tensorflow as tf
import matplotlib.pyplot as plt

    # 随机数生成
a = tf.random_normal([2,20])
    # 启动会话
sess = tf.Session()
    # 运行
out = sess.run(a)
    # 从运行结果中获得数据
x, y = out
    # 绘图
plt.scatter(x, y)
    # 显示图像
plt.show()
```

Anaconda3 自带 spyder
tensorflow@tensorflow-vm:~$ which spyder
/home/tensorflow/anaconda3/bin/spyder

$ sudo apt install –y spyder3
启动：
$ spyder3

Jupyter notebook

Jupyter 啥东东？涨姿势的桀纣。

快速入门参考：
https://www.cnblogs.com/nxld/p/6566380.html

Jupyter 是软件（开发环境）套装。

Jupyter Notebook（此前被称为 IPython notebook）是一个交互式笔记本，支持运行 40 多种编程语言。

Jupyter Notebook 的本质是一个 Web 应用程序，便于创建和共享文学化程序文档，支持实时代码，数学方程，可视化和 markdown。 用途包括：数据清理和转换，数值模拟，统计建模，机器学习等等。

数据挖掘领域中最热门的比赛 Kaggle 里的资料都是 Jupyter 格式 。

tensorflow@tfvm:/usr/bin$ sudo pip install jupyter

通过 Anaconda 安装 Jupyter notebook

通过套件 anaconda 使用 jupyter notebook，进而调用 python 2 的 tensorflow 能保持与操作系统的 python 2 保持相对的独立性。

在此处下载：
https://mirrors.tuna.tsinghua.edu.cn/help/anaconda/
https://mirrors.tuna.tsinghua.edu.cn/anaconda/miniconda/Miniconda2-4.5.4-Linux-x86_64.sh

tensorflow@tfvm:~chmod +x Miniconda2-4.5.4-Linux-x86_64.sh
tensorflow@tfvm:~./ Miniconda2-4.5.4-Linux-x86_64.sh
【建议还是现在全版的 Anaconda】

如果在安装过程中没有选择将 Anaconda 的目录加入的 PATH 中，需要手工添加：
tensorflow@tfvm:~/anaconda2/bin$ export PATH=/home/tensorflow/anaconda2/bin:$PATH

anaconda2 使用自己的 python 2，所以在 annaconda2 中需要安装自身的 tensorflow。

查询安装信息
$ conda info
tensorflow@tfvm:~$ conda info
Current conda install:

```
          platform : linux-64
             conda version : 4.3.30
        conda is private : False
      conda-env version : 4.3.30
```

```
      conda-build version : 3.10.5
             python version : 2.7.15.final.0
           requests version : 2.18.4
           root environment : /home/tensorflow/anaconda2  (writable)
        default environment : /home/tensorflow/anaconda2
           envs directories : /home/tensorflow/anaconda2/envs
                             /home/tensorflow/.conda/envs
                 package cache : /home/tensorflow/anaconda2/pkgs
                             /home/tensorflow/.conda/pkgs
                  channel URLs : https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free/linux-64
                             https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free/noarch
                             https://repo.continuum.io/pkgs/main/linux-64
                             https://repo.continuum.io/pkgs/main/noarch
                             https://repo.continuum.io/pkgs/free/linux-64
                             https://repo.continuum.io/pkgs/free/noarch
                             https://repo.continuum.io/pkgs/r/linux-64
                             https://repo.continuum.io/pkgs/r/noarch
                             https://repo.continuum.io/pkgs/pro/linux-64
                             https://repo.continuum.io/pkgs/pro/noarch
                  config file : /home/tensorflow/.condarc
                netrc file : None
                       offline mode : False
                user-agent : conda/4.3.30 requests/2.18.4 CPython/2.7.15 Linux/4.13.0-45-generic
debian/stretch/sid glibc/2.23
                    UID:GID : 1000:1000
```

查询当前已经安装的库

```
$ conda list
```

安装库(***代表库名称）

```
$ conda install ***
```

更新库

```
$ conda update ***
```

Anaconda 仓库镜像

官方下载更新工具包的速度很慢，所以继续添加清华大学 TUNA 提供的 Anaconda 仓库镜像，在终端或 cmd 中输入如下命令进行添加

```
$ conda config --add channels https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free/
$ conda config --set show_channel_urls yes

$ conda install numpy      #测试是否添加成功
```

之后会自动在用户根目录生成“.condarc”文件，Ubuntu 环境下路径为~/.condarc，Windows 环境下路径为 C:\用户\your_user_name\.condarc

```
channels:
  - https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free/
  - defaults
show_channel_urls: yes
```

如果要删除镜像，直接删除“.condarc”文件即可

```
tensorflow@tfvm:~/anaconda2/bin$ anaconda search -t conda tensorflow
Using Anaconda API: https://api.anaconda.org
Packages:
     Name                  |  Version | Package Types     | Platforms             | Builds
     ----------------------- |     ------ | --------------- | --------------- | ----------
     GlaxoSmithKline/tensorflow  |       0.12.0  |  conda                      |  linux-64                |
py27hb0d0e74_0
                  : TensorFlow is a machine learning library
     HCC/tensorflow          |        1.7.0  |  conda                      |  linux-64                |  py34_1,
py27_1, py27_0, py36_0, np113py35_0, np113py27_0, np113py36_0, py35_0, py35_1
                  : Computation using data flow graphs for scalable machine learning.

Run 'anaconda show <USER/PACKAGE>' to get installation details

tensorflow@tfvm:~/anaconda2/bin$ anaconda show HCC/tensorflow
Using Anaconda API: https://api.anaconda.org
Name:       tensorflow
Summary: Computation using data flow graphs for scalable machine learning.
Access:    public
Package Types:    conda
Versions:
    + 0.12.1
    + 1.0.0
    + 1.3.1
    + 1.4.0
    + 1.5.0
    + 1.7.0

To install this package with conda run:
        conda install --channel https://conda.anaconda.org/HCC tensorflow

tensorflow@tfvm:~/anaconda2/bin$ conda install --channel https://conda.anaconda.org/HCC
tensorflow
```

Solving environment: done

Package Plan

environment location: /opt/anaconda2

added / updated specs:
- tensorflow

The following packages will be downloaded:

package	build
tensorflow-1.4.0	py27_0 33.7 MB HCC
libprotobuf-3.5.2	h6f1eeef_0 4.2 MB
protobuf-3.5.2	py27hf484d3e_0 603 KB
libgcc-7.2.0	h69d50b8_2 304 KB
Total:	38.7 MB

The following NEW packages will be INSTALLED:

libgcc: 7.2.0-h69d50b8_2
libprotobuf: 3.5.2-h6f1eeef_0
protobuf: 3.5.2-py27hf484d3e_0
tensorflow: 1.4.0-py27_0 HCC

Fetching package metadata .....
Solving package specifications: .

Package plan for installation in environment /home/tensorflow/anaconda2:

The following NEW packages will be INSTALLED:

absl-py: 0.1.10-py27_0 HCC
astor: 0.6.2-py27_0 defaults
backports.weakref: 1.0rc1-py27_0 https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free
gast: 0.2.0-py27_0 defaults
grpcio: 1.12.0-py27hdbcaa40_0 defaults
libgcc: 5.2.0-0 https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free
libprotobuf: 3.5.2-h6f1eeef_0 defaults
markdown: 2.6.9-py27_0

https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free
    mock: 2.0.0-py27_0
https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free
    pbr: 1.10.0-py27_0
https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free
    protobuf: 3.5.2-py27hf484d3e_0 defaults
    tensorboard: 1.7.0-np113py27_0 HCC
    tensorflow: 1.7.0-np113py27_0 HCC
    termcolor: 1.1.0-py27_0
https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free

The following packages will be UPDATED:

    anaconda: 5.2.0-py27_3 defaults --> custom-py27_0
https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free

The following packages will be SUPERSEDED by a higher-priority channel:

    bleach: 2.1.3-py27_0 defaults --> 1.5.0-py27_0
https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free
    conda-env: 2.6.0-h36134e3_1 defaults --> 2.6.0-0
https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free
    futures: 3.2.0-py27h7b459c0_0 defaults --> 3.1.1-py27_0
https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free
    html5lib: 1.0.1-py27h5233db4_0 defaults --> 0.9999999-
py27_0 https://mirrors.tuna.tsinghua.edu.cn/anaconda/pkgs/free

The following packages will be DOWNGRADED:

    numpy: 1.14.3-py27hcd700cb_1 defaults --> 1.13.3-py27hdbf6ddf_4
defaults

Proceed ([y]/n)? y

conda-env-2.6. 100% |###################################| Time: 0:00:00 776.95 kB/s
libgcc-5.2.0-0 100% |###################################| Time: 0:00:00 4.80 MB/s
libprotobuf-3. 100% |###################################| Time: 0:00:01 2.20 MB/s
anaconda-custo 100% |###################################| Time: 0:00:00 6.44 MB/s
astor-0.6.2-py 100% |###################################| Time: 0:00:00 5.22 MB/s
futures-3.1.1- 100% |###################################| Time: 0:00:00 32.15 MB/s
gast-0.2.0-py2 100% |###################################| Time: 0:00:00 10.18 MB/s
markdown-2.6.9 100% |###################################| Time: 0:00:00 480.50 kB/s
termcolor-1.1. 100% |###################################| Time: 0:00:00 17.43 MB/s
absl-py-0.1.10 100% |###################################| Time: 0:00:02 43.35 kB/s

backports.weak 100% |################################| Time: 0:00:00 16.58 MB/s
html5lib-0.999 100% |################################| Time: 0:00:00 13.13 MB/s
protobuf-3.5.2 100% |################################| Time: 0:00:00 3.94 MB/s
bleach-1.5.0-p 100% |################################| Time: 0:00:00 30.15 MB/s
grpcio-1.12.0- 100% |################################| Time: 0:00:00 4.46 MB/s
pbr-1.10.0-py2 100% |################################| Time: 0:00:00 14.49 MB/s
mock-2.0.0-py2 100% |################################| Time: 0:00:00 14.59 MB/s
numpy-1.13.3-p 100% |################################| Time: 0:00:00 5.27 MB/s
tensorboard-1. 100% |################################| Time: 0:00:12 261.62 kB/s
tensorflow-1.7 100% |################################| Time: 0:00:45 884.91 kB/s

在浏览器中浏览 anaconda 下的 tensorflow channel：
https://anaconda.org/search?q=tensorflow

安装时指定版本号：
conda install --channel https://conda.anaconda.org/conda-forge tensorflow=1.0.0
tensor@tfvm:/opt$ conda install --channel https://conda.anaconda.org/anaconda tensorflow=1.8.0
Solving environment: done

Package Plan

  environment location: /opt/anaconda2

  added / updated specs:
    - tensorflow=1.8.0

The following packages will be downloaded:

package	build
absl-py-0.2.2	py27_0 132 KB anaconda
certifi-2018.4.16	py27_0 142 KB anaconda
astor-0.6.2	py27_0 41 KB anaconda
_tflow_180_select-3.0	eigen 2 KB anaconda
tensorflow-1.8.0	h7b2774c_0 3 KB anaconda
gast-0.2.0	py27_0 15 KB anaconda
termcolor-1.1.0	py27_1 7 KB anaconda
markdown-2.6.11	py27_0 102 KB anaconda
ca-certificates-2018.03.07	0 124 KB anaconda
protobuf-3.5.2	py27hf484d3e_0 603 KB anaconda
bleach-1.5.0	py27_0 21 KB anaconda
pbr-4.0.4	py27_0 114 KB anaconda

```
tensorboard-1.8.0          |  py27hf484d3e_0         3.0 MB  anaconda
tensorflow-base-1.8.0      |  py27h5f64886_0        40.0 MB  anaconda
conda-4.5.4                |           py27_0         1.0 MB  anaconda
html5lib-0.9999999         |           py27_0       183 KB  anaconda
libprotobuf-3.5.2          |       h6f1eeef_0         4.2 MB  anaconda
mock-2.0.0                 |  py27h0c0c831_0       100 KB  anaconda
backports.weakref-1.0.post1|  py27h0df1112_0         8 KB  anaconda
grpcio-1.12.1              |  py27hdbcaa40_0         1.7 MB  anaconda
openssl-1.0.2o             |       h20670df_0         3.4 MB  anaconda
------------------------------------------------------------
                   Total:        55.0 MB

The following NEW packages will be INSTALLED:

    _tflow_180_select: 3.0-eigen          anaconda
    absl-py:           0.2.2-py27_0       anaconda
    astor:             0.6.2-py27_0       anaconda
    backports.weakref: 1.0.post1-py27h0df1112_0 anaconda
    gast:              0.2.0-py27_0       anaconda
    grpcio:            1.12.1-py27hdbcaa40_0  anaconda
    libprotobuf:       3.5.2-h6f1eeef_0       anaconda
    markdown:          2.6.11-py27_0      anaconda
    mock:              2.0.0-py27h0c0c831_0   anaconda
    pbr:               4.0.4-py27_0       anaconda
    protobuf:          3.5.2-py27hf484d3e_0   anaconda
    tensorboard:       1.8.0-py27hf484d3e_0   anaconda
    tensorflow:        1.8.0-h7b2774c_0       anaconda
    tensorflow-base:   1.8.0-py27h5f64886_0   anaconda
    termcolor:         1.1.0-py27_1       anaconda

The following packages will be REMOVED:

    anaconda:          5.2.0-py27_3

The following packages will be UPDATED:

    ca-certificates:   2018.03.07-0       --> 2018.03.07-0       anaconda
    certifi:           2018.4.16-py27_0   --> 2018.4.16-py27_0   anaconda
    conda:             4.5.4-py27_0       --> 4.5.4-py27_0       anaconda
    openssl:           1.0.2o-h20670df_0  --> 1.0.2o-h20670df_0  anaconda

The following packages will be DOWNGRADED:

    bleach:            2.1.3-py27_0       --> 1.5.0-py27_0       anaconda
```

html5lib: 1.0.1-py27h5233db4_0 --> 0.9999999-py27_0 anaconda

tensorflow@tfvm:~$ python -V
Python 2.7.15 :: Anaconda custom (64-bit)

错误提示：
ImportError: No module named google.protobuf
tensor@tfvm:/opt$ conda install protobuf

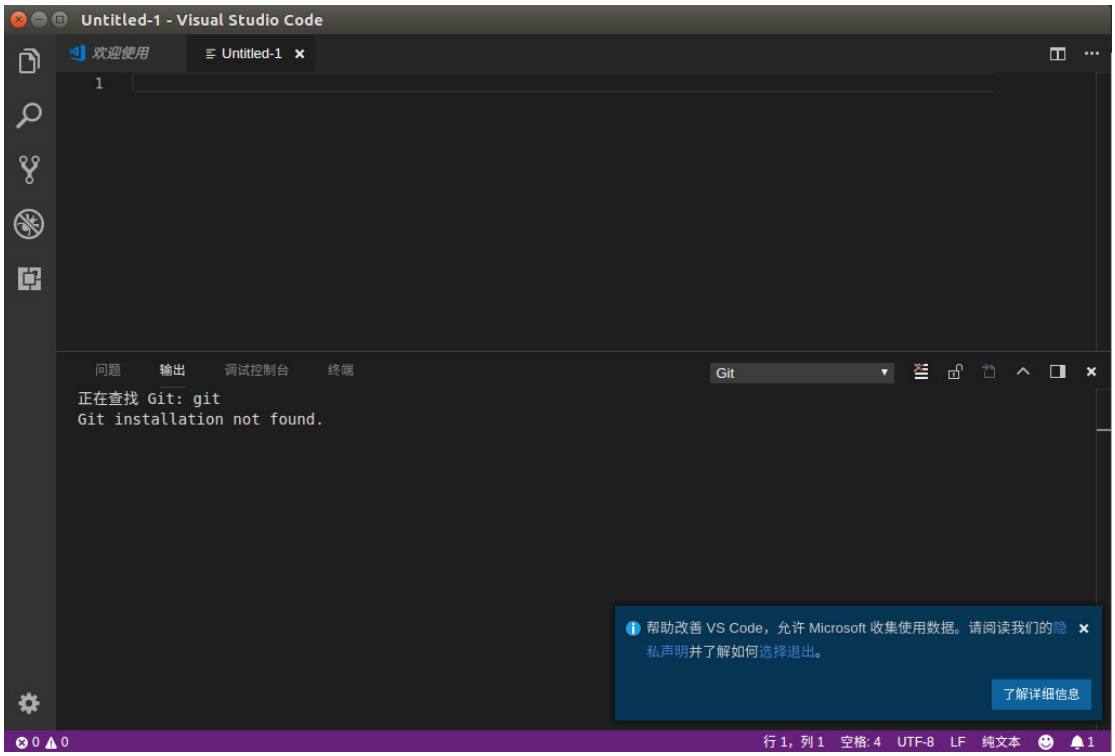
ImportError: cannot import name pywrap_tensorflow
这个问题是 PATH 的问题，安装 tensorflow 之后没有更新 PATH 设置，重启之后正常。
tensor@tfvm:/opt$ sudo reboot

确认 tensorflow 版本：
tensor@tfvm:~$ conda list tensorflow
packages in environment at /opt/anaconda2:
#
Name Version Build Channel
tensorflow 1.8.0 h7b2774c_0 anaconda
tensorflow-base 1.8.0 py27h5f64886_0 anaconda

tensor@tfvm:~$ anaconda --version
anaconda Command line client (version 1.6.14)
tensor@tfvm:~$ conda --v
conda 4.5.4

tensorflow@tfvm:~/anaconda2/bin$ jupyter notebook –ip=192.168.100.66
tensorflow@tfvm:~/anaconda2/bin$ jupyter notebook list

Anaconda 2 中还包括了 VSCode（微软推出的免费的轻量级的编辑器），启动命令
tensorflow@tfvm:~code



https://blog.csdn.net/u011258217/article/details/78693564

DOIT

10 行代码搞一个对象检测系统

Python 3、anaconda、conda 4.5.4、tensorflow 1.8、keras 2.1.6、ImageAI 2.0.1

街景识别

识别对象：car、person、handbag

参考：
https://mp.weixin.qq.com/s/Moi1-yGLOJOAbHYxYL6Hjw

在 test_py3 环境下重复过程（ImageAI 官网提供的安装包是 python 3 的）：
tensor@tfvm:~$ source activate test_py3
(test_py3) tensor@tfvm:~$ conda list tensorflow
packages in environment at /opt/anaconda2/envs/test_py3:
#
Name Version Build Channel

没有 tensorflow

(test_py3) tensor@tfvm:~$ mkdir ~/.pip
(test_py3) tensor@tfvm:~$ vi ~/.pip/pip.conf
[global]
index-url = https://pypi.tuna.tsinghua.edu.cn/simple

(test_py3) tensor@tfvm:~$ conda install --channel https://conda.anaconda.org/anaconda tensorflow=1.8.0
Solving environment: done

Package Plan

environment location: /opt/anaconda2/envs/test_py3

added / updated specs:
- tensorflow=1.8.0

The following packages will be downloaded:

package	build		
six-1.11.0	py36h372c433_1	21 KB	anaconda
mkl-2018.0.3	1	198.7 MB	anaconda
blas-1.0	mkl	6 KB	anaconda
astor-0.6.2	py36_0	42 KB	anaconda
tensorflow-base-1.8.0	py36h5f64886_0	40.1 MB	anaconda
grpcio-1.12.1	py36hdbcaa40_0	1.7 MB	anaconda
markdown-2.6.11	py36_0	104 KB	anaconda
ca-certificates-2018.03.07	0	124 KB	anaconda
tensorboard-1.8.0	py36hf484d3e_0	3.1 MB	anaconda
libgfortran-ng-7.2.0	hdf63c60_3	1.2 MB	anaconda
certifi-2018.4.16	py36_0	142 KB	anaconda
absl-py-0.2.2	py36_0	135 KB	anaconda
intel-openmp-2018.0.3	0	705 KB	anaconda
numpy-1.14.5	py36hcd700cb_0	94 KB	anaconda
gast-0.2.0	py36_0	15 KB	anaconda
mkl_fft-1.0.1	py36h3010b51_0	140 KB	anaconda
werkzeug-0.14.1	py36_0	423 KB	anaconda
mkl_random-1.0.1	py36h629b387_0	373 KB	anaconda
openssl-1.0.2o	h20670df_0	3.4 MB	anaconda
termcolor-1.1.0	py36_1	7 KB	anaconda

```
bleach-1.5.0                |           py36_0          22 KB  anaconda
tensorflow-1.8.0            |       h57681fa_0           3 KB  anaconda
numpy-base-1.14.5           |   py36hdbf6ddf_0         4.1 MB  anaconda
protobuf-3.5.2              |   py36hf484d3e_0         610 KB  anaconda
html5lib-0.9999999          |           py36_0         176 KB  anaconda
------------------------------------------------------------
                                       Total:         255.5 MB

The following NEW packages will be INSTALLED:

    _tflow_180_select: 3.0-eigen                anaconda
    absl-py:           0.2.2-py36_0             anaconda
    astor:             0.6.2-py36_0             anaconda
    blas:              1.0-mkl                  anaconda
    bleach:            1.5.0-py36_0             anaconda
    gast:              0.2.0-py36_0             anaconda
    grpcio:            1.12.1-py36hdbcaa40_0    anaconda
    html5lib:          0.9999999-py36_0         anaconda
    intel-openmp:      2018.0.3-0               anaconda
    libgfortran-ng:    7.2.0-hdf63c60_3         anaconda
    libprotobuf:       3.5.2-h6f1eeef_0         anaconda
    markdown:          2.6.11-py36_0            anaconda
    mkl:               2018.0.3-1               anaconda
    mkl_fft:           1.0.1-py36h3010b51_0     anaconda
    mkl_random:        1.0.1-py36h629b387_0     anaconda
    numpy:             1.14.5-py36hcd700cb_0    anaconda
    numpy-base:        1.14.5-py36hdbf6ddf_0    anaconda
    protobuf:          3.5.2-py36hf484d3e_0     anaconda
    six:               1.11.0-py36h372c433_1    anaconda
    tensorboard:       1.8.0-py36hf484d3e_0     anaconda
    tensorflow:        1.8.0-h57681fa_0         anaconda
    tensorflow-base:   1.8.0-py36h5f64886_0     anaconda
    termcolor:         1.1.0-py36_1             anaconda
    werkzeug:          0.14.1-py36_0            anaconda

The following packages will be UPDATED:

    ca-certificates:   2018.03.07-0                 --> 2018.03.07-0           anaconda
    certifi:           2018.4.16-py36_0             --> 2018.4.16-py36_0       anaconda
    openssl:           1.0.2o-h20670df_0            --> 1.0.2o-h20670df_0      anaconda

Proceed ([y]/n)? y
```

Downloading and Extracting Packages
six-1.11.0 | 21 KB | ## | 100%
mkl-2018.0.3 | 198.7 MB | ## | 100%
blas-1.0 | 6 KB | ## | 100%
astor-0.6.2 | 42 KB | ## | 100%
tensorflow-base-1.8. | 40.1 MB | ## | 100%
grpcio-1.12.1 | 1.7 MB | ## | 100%
markdown-2.6.11 | 104 KB | ## | 100%
ca-certificates-2018 | 124 KB | ## | 100%
tensorboard-1.8.0 | 3.1 MB | ################################## | 100%
libgfortran-ng-7.2.0 | 1.2 MB | ## | 100%
certifi-2018.4.16 | 142 KB | ## | 100%
absl-py-0.2.2 | 135 KB | ################################## | 100%
intel-openmp-2018.0. | 705 KB | ## | 100%
numpy-1.14.5 | 94 KB | ## | 100%
gast-0.2.0 | 15 KB | ## | 100%
mkl_fft-1.0.1 | 140 KB | ######################## | 100%
werkzeug-0.14.1 | 423 KB | ################################## | 100%
mkl_random-1.0.1 | 373 KB | ################################### | 100%
openssl-1.0.2o | 3.4 MB | ## | 100%
termcolor-1.1.0 | 7 KB | ################################## | 100%
bleach-1.5.0 | 22 KB | ## | 100%
tensorflow-1.8.0 | 3 KB | ## | 100%
numpy-base-1.14.5 | 4.1 MB | ################################### | 100%
protobuf-3.5.2 | 610 KB | ################################## | 100%
html5lib-0.9999999 | 176 KB | ## | 100%
Preparing transaction: done
Verifying transaction: done
Executing transaction: done

(test_py3) tensor@tfvm:~$ sudo apt install python3-pip

(test_py3) tensor@tfvm:~$ pip install numpy
Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple
Requirement already satisfied: numpy in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (1.14.5)
mkl-random 1.0.1 requires cython, which is not installed.
mkl-fft 1.0.0 requires cython, which is not installed.

(test_py3) tensor@tfvm:~$ pip install scipy
Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple
Collecting scipy
  Downloading
https://pypi.tuna.tsinghua.edu.cn/packages/a8/0b/f163da98d3a01b3e0ef1cab8dd2123c34aee2

```
bafbb1c5bffa354cc8a1730/scipy-1.1.0-cp36-cp36m-manylinux1_x86_64.whl (31.2MB)
    100% |████████████████████████████████| 31.2MB 1.5MB/s
Requirement already satisfied: numpy>=1.8.2 in
/opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from scipy) (1.14.5)
mkl-random 1.0.1 requires cython, which is not installed.
mkl-fft 1.0.0 requires cython, which is not installed.
Installing collected packages: scipy
Successfully installed scipy-1.1.0

(test_py3) tensor@tfvm:~$ pip install opencv-python
Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple
Collecting opencv-python
  Downloading
https://pypi.tuna.tsinghua.edu.cn/packages/e6/d1/732afb3a056d7e7f3af08f3fcb67a7c1ceedd6b
e941f8e3907da0400c36e/opencv_python-3.4.0.14-cp36-cp36m-manylinux1_x86_64.whl
(24.8MB)
    100% |████████████████████████████████| 24.8MB 421kB/s
Requirement already satisfied: numpy>=1.11.3 in
/opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from opencv-python) (1.14.5)
mkl-random 1.0.1 requires cython, which is not installed.
mkl-fft 1.0.0 requires cython, which is not installed.
Installing collected packages: opencv-python
Successfully installed opencv-python-3.4.0.14

(test_py3) tensor@tfvm:~$ pip install pillow
Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple
Collecting pillow
  Downloading
https://pypi.tuna.tsinghua.edu.cn/packages/5f/4b/8b54ab9d37b93998c81b364557dff9f61972c0
f650efa0ceaf470b392740/Pillow-5.1.0-cp36-cp36m-manylinux1_x86_64.whl (2.0MB)
    100% |████████████████████████████████| 2.0MB 16.8MB/s
mkl-random 1.0.1 requires cython, which is not installed.
mkl-fft 1.0.0 requires cython, which is not installed.
Installing collected packages: pillow
Successfully installed pillow-5.1.0

(test_py3) tensor@tfvm:~$ pip install matplotlib
Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple
Collecting matplotlib
  Downloading
https://pypi.tuna.tsinghua.edu.cn/packages/49/b8/89dbd27f2fb171ce753bb56220d4d4f6dbc5fe
32b95d8edc4415782ef07f/matplotlib-2.2.2-cp36-cp36m-manylinux1_x86_64.whl (12.6MB)
    100% |████████████████████████████████| 12.6MB 3.3MB/s
Collecting cycler>=0.10 (from matplotlib)
```

Downloading
https://pypi.tuna.tsinghua.edu.cn/packages/f7/d2/e07d3ebb2bd7af696440ce7e754c59dd546ffe1bbe732c8ab68b9c834e61/cycler-0.10.0-py2.py3-none-any.whl
Collecting kiwisolver>=1.0.1 (from matplotlib)
Downloading
https://pypi.tuna.tsinghua.edu.cn/packages/69/a7/88719d132b18300b4369fbffa741841cfd36d1e637e1990f27929945b538/kiwisolver-1.0.1-cp36-cp36m-manylinux1_x86_64.whl (949kB)
100% |████████████████████████████████| 952kB 24.2MB/s
Collecting pytz (from matplotlib)
Downloading
https://pypi.tuna.tsinghua.edu.cn/packages/dc/83/15f7833b70d3e067ca91467ca245bae0f6fe56ddc7451aa0dc5606b120f2/pytz-2018.4-py2.py3-none-any.whl (510kB)
100% |████████████████████████████████| 512kB 11.9MB/s
Requirement already satisfied: six>=1.10 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from matplotlib) (1.11.0)
Collecting python-dateutil>=2.1 (from matplotlib)
Downloading
https://pypi.tuna.tsinghua.edu.cn/packages/cf/f5/af2b09c957ace60dcfac112b669c45c8c97e32f94aa8b56da4c6d1682825/python_dateutil-2.7.3-py2.py3-none-any.whl (211kB)
100% |████████████████████████████████| 215kB 11.3MB/s
Requirement already satisfied: numpy>=1.7.1 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from matplotlib) (1.14.5)
Collecting pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 (from matplotlib)
Downloading
https://pypi.tuna.tsinghua.edu.cn/packages/6a/8a/718fd7d3458f9fab8e67186b00abdd345b639976bc7fb3ae722e1b026a50/pyparsing-2.2.0-py2.py3-none-any.whl (56kB)
100% |████████████████████████████████| 61kB 16.0MB/s
Requirement already satisfied: setuptools in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from kiwisolver>=1.0.1->matplotlib) (39.2.0)
mkl-random 1.0.1 requires cython, which is not installed.
mkl-fft 1.0.0 requires cython, which is not installed.
Installing collected packages: cycler, kiwisolver, pytz, python-dateutil, pyparsing, matplotlib
pip install h5pySuccessfully installed cycler-0.10.0 kiwisolver-1.0.1 matplotlib-2.2.2 pyparsing-2.2.0 python-dateutil-2.7.3 pytz-2018.4

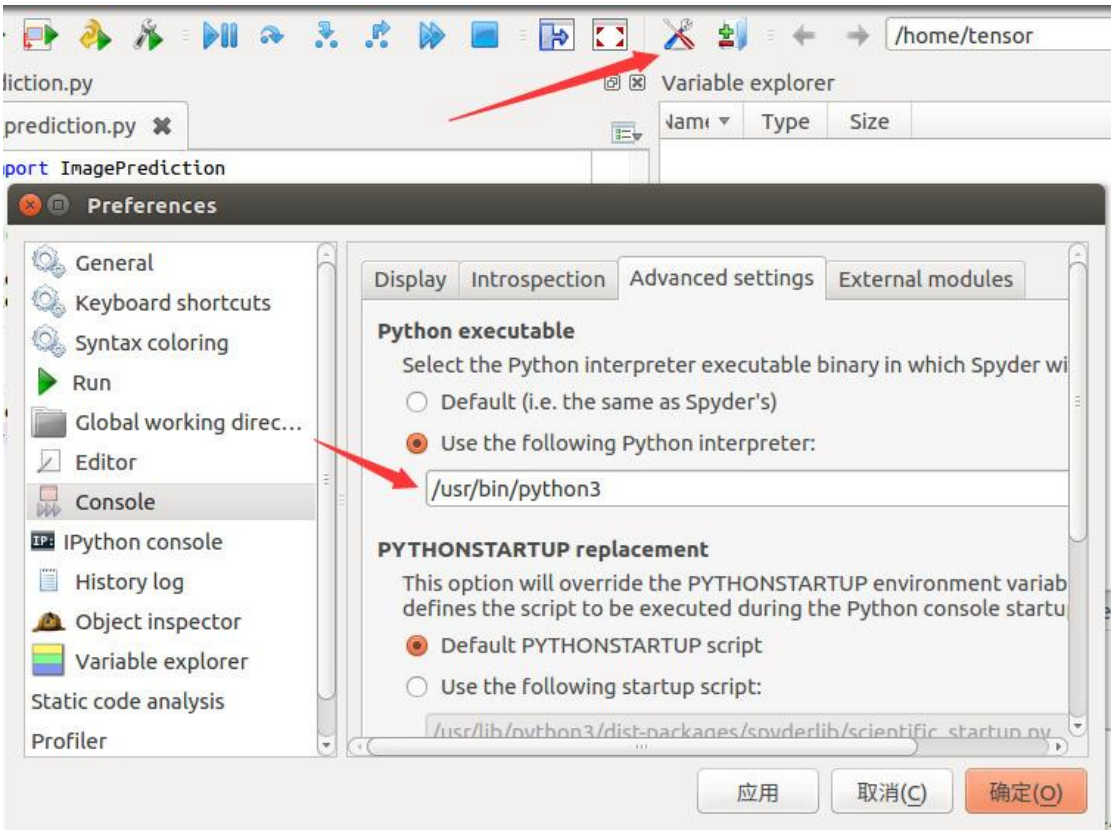
(test_py3) tensor@tfvm:~$ pip install h5py
Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple
Collecting h5py
Downloading
https://pypi.tuna.tsinghua.edu.cn/packages/f2/b8/a63fcc840bba5c76e453dd712dbca63178a264c8990e0086b72965d4e954/h5py-2.7.1-cp36-cp36m-manylinux1_x86_64.whl (5.4MB)
100% |████████████████████████████████| 5.4MB 6.1MB/s
Requirement already satisfied: six in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from h5py) (1.11.0)

Requirement already satisfied: numpy>=1.7 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from h5py) (1.14.5)
mkl-random 1.0.1 requires cython, which is not installed.
mkl-fft 1.0.0 requires cython, which is not installed.
Installing collected packages: h5py
Successfully installed h5py-2.7.1

(test_py3) tensor@tfvm:~$ pip install keras
Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple
Collecting keras
  Downloading https://pypi.tuna.tsinghua.edu.cn/packages/54/e8/eaff7a09349ae9bd40d3ebaf028b49f5e2392c771f294910f75bb608b241/Keras-2.1.6-py2.py3-none-any.whl (339kB)
    100% |████████████████████████████████| 348kB 9.2MB/s
Requirement already satisfied: six>=1.9.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from keras) (1.11.0)
Requirement already satisfied: numpy>=1.9.1 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from keras) (1.14.5)
Requirement already satisfied: scipy>=0.14 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from keras) (1.1.0)
Requirement already satisfied: h5py in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from keras) (2.7.1)
Collecting pyyaml (from keras)
  Downloading https://pypi.tuna.tsinghua.edu.cn/packages/4a/85/db5a2df477072b2902b0eb892feb37d88ac635d36245a72a6a69b23b383a/PyYAML-3.12.tar.gz (253kB)
    100% |████████████████████████████████| 256kB 19.0MB/s
Building wheels for collected packages: pyyaml
  Running setup.py bdist_wheel for pyyaml ... done
  Stored in directory: /home/tensor/.cache/pip/wheels/00/b2/1d/2174fdfb3948921579b0842b8159f9f7f136562311b43fee49
Successfully built pyyaml
mkl-random 1.0.1 requires cython, which is not installed.
mkl-fft 1.0.0 requires cython, which is not installed.
Installing collected packages: pyyaml, keras
Successfully installed keras-2.1.6 pyyaml-3.12

(test_py3) tensor@tfvm:~$ pip install https://github.com/OlafenwaMoses/ImageAI/releases/download/2.0.1/imageai-2.0.1-py3-none-any.whl
Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple
Collecting imageai==2.0.1 from https://github.com/OlafenwaMoses/ImageAI/releases/download/2.0.1/imageai-2.0.1-py3-none-

```
any.whl
    Downloading  https://github.com/OlafenwaMoses/ImageAI/releases/download/2.0.1/imageai-2.0.1-py3-none-any.whl (137kB)
       100% |████████████████████████████████| 143kB 94kB/s
mkl-random 1.0.1 requires cython, which is not installed.
mkl-fft 1.0.0 requires cython, which is not installed.
Installing collected packages: imageai
Successfully installed imageai-2.0.1

(test_py3) tensor@tfvm:~$ pip install cython
Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple
Collecting cython
    Downloading
https://pypi.tuna.tsinghua.edu.cn/packages/6f/79/d8e2cd00bea8156a995fb284ce7b6677c49eccd2d318f73e201a9ce560dc/Cython-0.28.3-cp36-cp36m-manylinux1_x86_64.whl (3.4MB)
       100% |████████████████████████████████| 3.4MB 9.5MB/s
Installing collected packages: cython
Successfully installed cython-0.28.3

(test_py3) tensor@tfvm:~$ pip -V
pip 10.0.1 from /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages/pip (python 3.6)

(test_py3) tensor@tfvm:~$ sudo apt install spyder3
(test_py3) tensor@tfvm:~$ spyder3
```



在环境 test_py3 下测试成功：

下载 tensorflow-1.8.0-cp36-cp36m-manylinux1_x86_64.whl 之后 pip 安装：

(test_py3) tensor@tfvm:~$ pip install tensorflow-1.8.0-cp36-cp36m-manylinux1_x86_64.whl

Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple

Requirement already satisfied: tensorflow==1.8.0 from file:///home/tensor/tensorflow-1.8.0-cp36-cp36m-manylinux1_x86_64.whl in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (1.8.0)

Requirement already satisfied: absl-py>=0.1.6 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (0.2.2)

Requirement already satisfied: wheel>=0.26 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (0.31.1)

Requirement already satisfied: protobuf>=3.4.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (3.5.2)

Requirement already satisfied: termcolor>=1.1.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (1.1.0)

Requirement already satisfied: six>=1.10.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (1.11.0)

Requirement already satisfied: grpcio>=1.8.6 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (1.12.1)

Requirement already satisfied: gast>=0.2.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (0.2.0)

Requirement already satisfied: numpy>=1.13.3 in

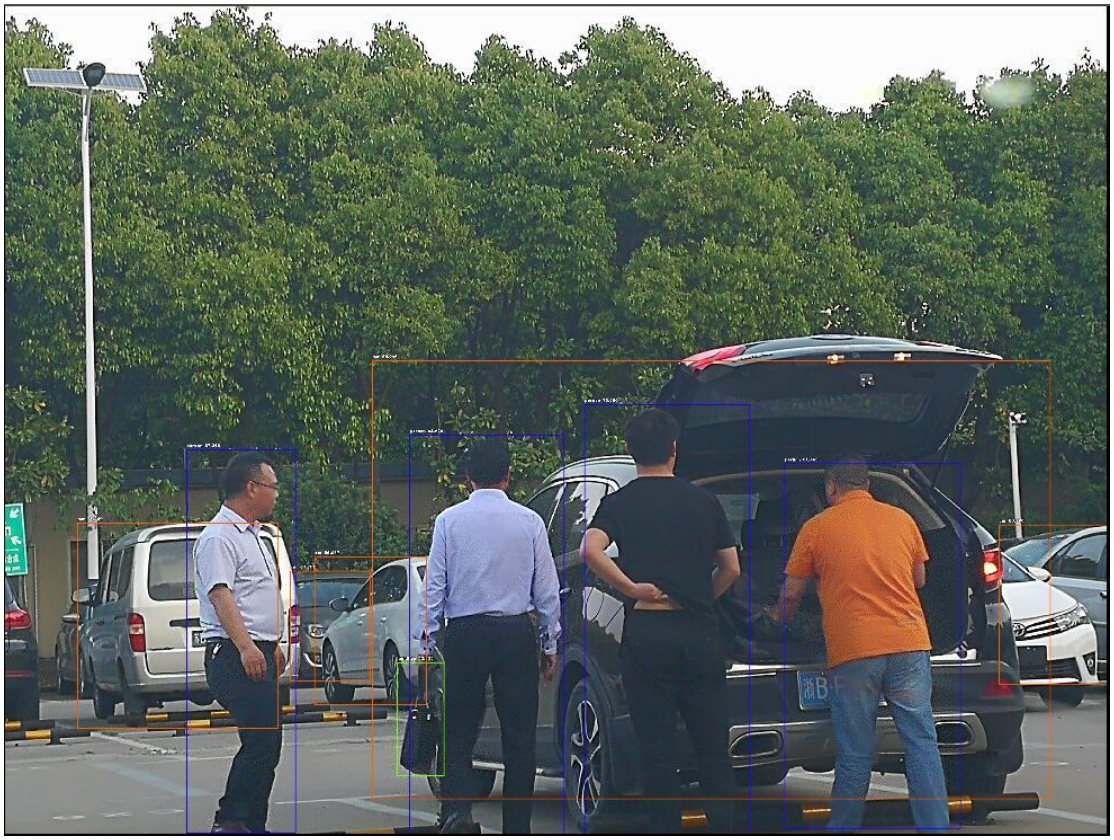
/opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (1.14.5)
Requirement already satisfied: tensorboard<1.9.0,>=1.8.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (1.8.0)
Requirement already satisfied: astor>=0.6.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (0.6.2)
Requirement already satisfied: setuptools in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from protobuf>=3.4.0->tensorflow==1.8.0) (39.2.0)
Requirement already satisfied: werkzeug>=0.11.10 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorboard<1.9.0,>=1.8.0->tensorflow==1.8.0) (0.14.1)
Requirement already satisfied: html5lib==0.9999999 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorboard<1.9.0,>=1.8.0->tensorflow==1.8.0) (0.9999999)
Requirement already satisfied: markdown>=2.6.8 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorboard<1.9.0,>=1.8.0->tensorflow==1.8.0) (2.6.11)
Requirement already satisfied: bleach==1.5.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorboard<1.9.0,>=1.8.0->tensorflow==1.8.0) (1.5.0)
(test_py3) tensor@tfvm:~$ pip install tensorflow-1.8.0-cp36-cp36m-manylinux1_x86_64.whl
Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple
Requirement already satisfied: tensorflow==1.8.0 from file:///home/tensor/tensorflow-1.8.0-cp36-cp36m-manylinux1_x86_64.whl in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (1.8.0)
Requirement already satisfied: astor>=0.6.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (0.6.2)
Requirement already satisfied: absl-py>=0.1.6 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (0.2.2)
Requirement already satisfied: gast>=0.2.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (0.2.0)
Requirement already satisfied: protobuf>=3.4.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (3.5.2)
Requirement already satisfied: numpy>=1.13.3 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (1.14.5)
Requirement already satisfied: six>=1.10.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (1.11.0)
Requirement already satisfied: termcolor>=1.1.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (1.1.0)
Requirement already satisfied: grpcio>=1.8.6 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (1.12.1)
Requirement already satisfied: tensorboard<1.9.0,>=1.8.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (1.8.0)
Requirement already satisfied: wheel>=0.26 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorflow==1.8.0) (0.31.1)

Requirement already satisfied: setuptools in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from protobuf>=3.4.0->tensorflow==1.8.0) (39.2.0)
Requirement already satisfied: werkzeug>=0.11.10 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorboard<1.9.0,>=1.8.0->tensorflow==1.8.0) (0.14.1)
Requirement already satisfied: html5lib==0.9999999 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorboard<1.9.0,>=1.8.0->tensorflow==1.8.0) (0.9999999)
Requirement already satisfied: markdown>=2.6.8 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorboard<1.9.0,>=1.8.0->tensorflow==1.8.0) (2.6.11)
Requirement already satisfied: bleach==1.5.0 in /opt/anaconda2/envs/test_py3/lib/python3.6/site-packages (from tensorboard<1.9.0,>=1.8.0->tensorflow==1.8.0) (1.5.0)

代码：

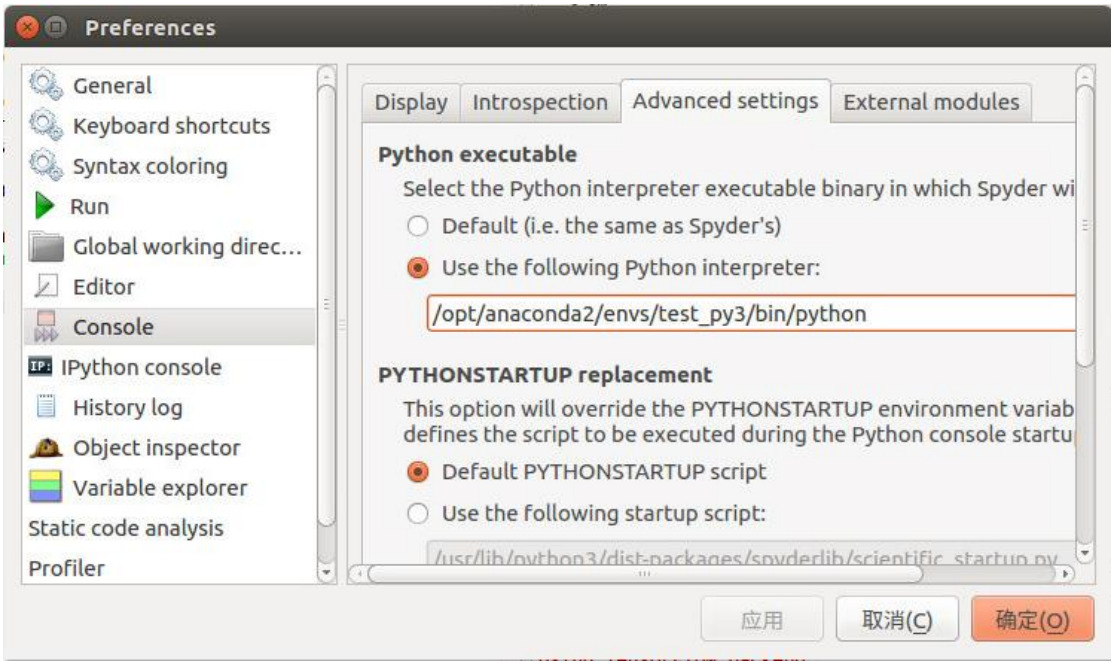
```
(test_py3) tensor@tfvm:~$ cat FirstDetection.py
from imageai.Detection import ObjectDetection
import os

execution_path = os.getcwd()

detector = ObjectDetection()
detector.setModelTypeAsRetinaNet()
detector.setModelPath(os.path.join(execution_path,"resnet50_coco_best_v2.0.1.h5"))
detector.loadModel()
detections=detector.detectObjectsFromImage(input_image=os.path.join(execution_path,"image.jpg"),output_image_path=os.path.join(execution_path,"imagenew.jpg"))

for eachObject in detections:
        print(eachObject["name"] + "    :    " + eachObject["percentage_probability"])


(test_py3) tensor@tfvm:~$ python FirstDetection.py
/opt/anaconda2/envs/test_py3/lib/python3.6/site-packages/h5py/__init__.py:36:
FutureWarning: Conversion of the second argument of issubdtype from `float` to `np.floating` is deprecated. In future, it will be treated as `np.float64 == np.dtype(float).type`.
  from ._conv import register_converters as _register_converters
Using TensorFlow backend.
2018-06-24 17:49:39.152047: I tensorflow/core/platform/cpu_feature_guard.cc:140] Your CPU supports instructions that this TensorFlow binary was not compiled to use: SSE4.1 SSE4.2 AVX
car    :    80.99603056907654
car    :    63.76085877418518
handbag    :    52.554577589035034
```

person : 84.87399816513062
person : 75.58995485305786
car : 65.04697799682617
car : 71.75977826118469
person : 87.2457504272461
person : 81.74251914024353
car : 58.996182680130005



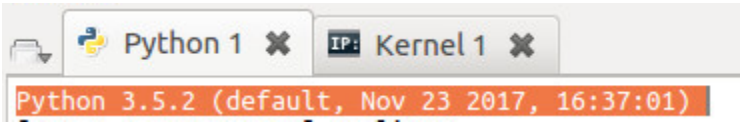
(test_py3) tensor@tfvm:~$ cp 2018spring.jpg image.jpg
(test_py3) tensor@tfvm:~$ python FirstDetection.py
/opt/anaconda2/envs/test_py3/lib/python3.6/site-packages/h5py/__init__.py:36: FutureWarning: Conversion of the second argument of issubdtype from `float` to `np.floating` is deprecated. In future, it will be treated as `np.float64 == np.dtype(float).type`.
  from ._conv import register_converters as _register_converters
Using TensorFlow backend.
2018-06-24 17:53:34.431756: I tensorflow/core/platform/cpu_feature_guard.cc:140] Your CPU supports instructions that this TensorFlow binary was not compiled to use: SSE4.1 SSE4.2 AVX
person : 82.31648802757263
person : 82.685387134552
person : 82.50718712806702
person : 94.79280710220337
person : 96.5410828590393
person : 71.31900787353516
person : 96.81103229522705
person : 61.69199347496033

回过头来整 spyder3 的环境，spyder3 在 ubuntu 的 python 3（python 3.5.2）的环境下运行。



tensor@tfvm:~$ pip3 -V

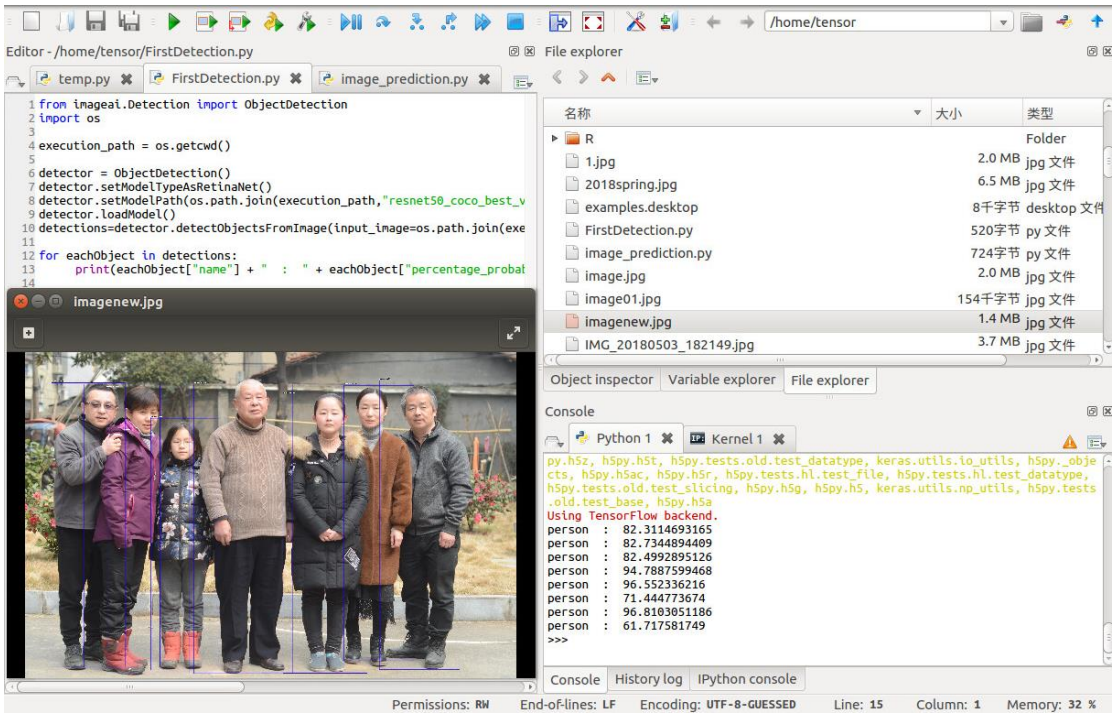
pip 8.1.1 from /usr/lib/python3/dist-packages (python 3.5)



使用 pip3 安装一系列依赖：

tensor@tfvm:~$ pip3 install tensorflow-1.8.0-cp35-cp35m-manylinux1_x86_64.whl

成功运行：



汽车类型识别

代码：

```
tensor@tfvm:~$ cat image_prediction.py
from imageai.Prediction import ImagePrediction
import os

execution_path = os.getcwd()
print("NOw path:"+execution_path)

prediction = ImagePrediction()
prediction.setModelTypeAsResNet()
prediction.setModelPath(os.path.join(execution_path,
"resnet50_weights_tf_dim_ordering_tf_kernels.h5"))

#prediction.setModelPath(os.path.join(execution_path, "resnet50_coco_best_v2.0.1.h5"))

print(os.path.join(execution_path, "resnet50_weights_tf_dim_ordering_tf_kernels.h5"))

prediction.loadModel()

predictions, probabilities = prediction.predictImage(os.path.join(execution_path, "1.jpg"),
result_count=5 )
for eachPrediction, eachProbability in zip(predictions, probabilities):
```

```
    print(eachPrediction + " : " + eachProbability)
```

```
tensor@tfvm:~$ python3 image_prediction.py
/home/tensor/.local/lib/python3.5/site-packages/h5py/__init__.py:36: FutureWarning: Conversion of the second argument of issubdtype from `float` to `np.floating` is deprecated. In future, it will be treated as `np.float64 == np.dtype(float).type`.
  from ._conv import register_converters as _register_converters
NOw path:/home/tensor
/home/tensor/resnet50_weights_tf_dim_ordering_tf_kernels.h5
convertible : 53.22014093399048
sports_car : 34.547680616378784
pickup : 3.907627612352371
minivan : 2.6654161512851715
car_wheel : 1.8447380512952805
```

convertible : 折篷车；敞篷车
sports_car : 运动轿车
pickup : 皮卡、轻型货车
minivan : （尤指载客的）小型面包车
car_wheel : 汽车轮子？

参考

官网：
https://www.tensorflow.org/
【好像访问不了】

Tensorflow 官方文档中文版（极客学院）：
http://wiki.jikexueyuan.com/project/tensorflow-zh/

tensorflow 教程——莫烦 Python
https://morvanzhou.github.io/tutorials/machine-learning/tensorflow/

英文教程：
http://learningtensorflow.com/

工具——云算子：
http://www.yunsuanzi.com/cgi-bin/matrix_multiplication.py

清华大学镜像源
https://mirrors.tuna.tsinghua.edu.cn/anaconda/archive/
https://mirrors.tuna.tsinghua.edu.cn

镜像源汇总：
http://www.mamicode.com/info-detail-2279504.html

tensorflow 1.8 下载地址：
https://pypi.org/project/tensorflow/1.8.0/#files

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