4.Install TensorFlow GPU

Before we install TensorFlow GPU, we need to complete configuration of CUDA.
About configuration of CUDA, please refer to 【1.Preparation tutorial】

1. Install pip

We need to input command:

sudo apt-get install python3-pip python3-dev

After installation, pip is version 9.01, you need to upgrade it to the latest version. After upgrading, the pip version is 19.1.1. There will be a bug after the upgrade, you need to manually change it.

We need to input command:

python3 -m pip install --upgrade pip #upgrade pip

```
yahboom@yahboom-desktop:~$ python3 -m pip install --upgrade pip
Collecting pip
  Downloading https://files.pythonhosted.org/packages/00/b6/9cfa56b4081ad13874b0
c6f96af8ce16cfbc1cb06bedf8e9164ce5551ec1/pip-19.3.1-py2.py3-none-any.whl (1.4MB)
    100% |████████████████████████████████| 1.4MB 173kB/s
Installing collected packages: pip
Successfully installed pip-19.3.1
yahboom@yahboom-desktop:~$ pip -V
-bash: pip: command not found
yahboom@yahboom-desktop:~$
```

sudo vim /usr/bin/pip3 #Open pip3 file

Replace

```
from pip import main
if __name__ == '__main__':
    sys.exit(main())
```

to

```
from pip import __main__
if __name__ == '__main__':
    sys.exit(__main__._main())
```

After modification is complete, we need to input command:

pip3 -V

```
jetbot@jetbot-desktop:~$ pip3 -V
pip 20.1 from /home/jetbot/.local/lib/python3.6/site-packages/pip (python 3.6)
jetbot@jetbot-desktop:~$
```

2.Install some software package

sudo apt-get install python3-numpy

(It is an extension library of Python language, which supports a large number of dimensional arrays and matrix operations, and also provides a large number of mathematical function libraries for array operations.)

sudo apt-get install python3-scipy
(Scipy is a common software package used in the fields of mathematics, science, and engineering, which can handle interpolation, integration, optimization, image processing, numerical solution of ordinary differential equations, signal processing, etc.)

sudo apt-get install python3-pandas
(Pandas is a tool based on NumPy, which is created to solve data analysis tasks. Pandas includes a large number of libraries and some standard data models, and provides the tools needed to efficiently operate large data sets. Pandas provides A large number of functions and methods that enable us to process data quickly and easily.)

sudo apt-get install python3-matplotlib
(Matplotlib is a 2D plotting library for Python that generates publishing-quality graphics in a variety of hardcopy formats and a cross-platform interactive environment)

sudo apt-get install python3-sklearn
(Simple and efficient data mining and data analysis tools)

3.Install TensorFlow GPU version
1) Check if CUDA is installed properly
We need to input command:
nvcc -V
If you can see the CUDA version number, as shown below, it is installed correctly.

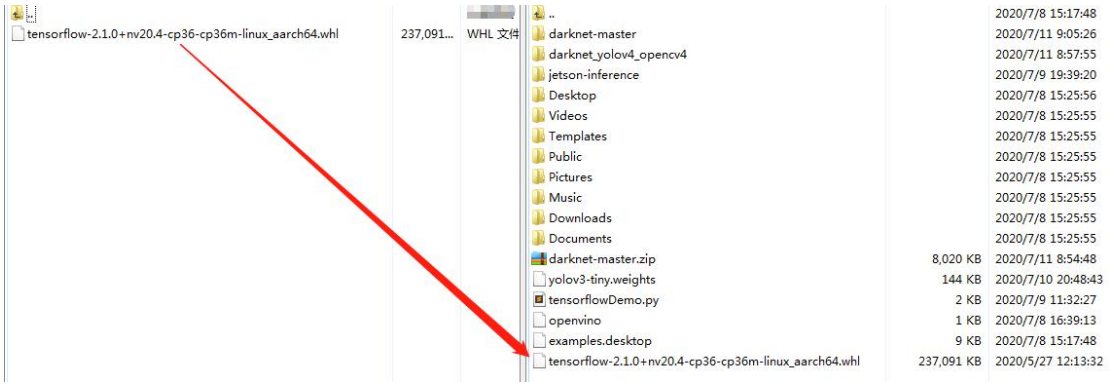
```
nx@nx-desktop:~$ nvcc -V
nvcc: NVIDIA (R) Cuda compiler driver
Copyright (c) 2005-2019 NVIDIA Corporation
Built on Wed_Oct_23_21:14:42_PDT_2019
Cuda compilation tools, release 10.2, V10.2.89
```

2) Install the required package
sudo apt-get install libhdf5-serial-dev hdf5-tools libhdf5-dev zlib1g-dev zip libjpeg8-dev liblapack-dev libblas-dev gfortran

3) Install TensorFlow GPU version
We need to input the following command:
sudo pip3 install --pre --extra-index-url https://developer.download.nvidia.com/compute/redist/jp/v44 tensorflow

4. Install TensorFlow GPU version offline
Because the online download is too slow, we can choose to install the offline package. The tensorflow installation package is placed in the common library and model folder of the data.

1) Upload the WHL file directly to the /home/nx folder on Jetson Xavier NX through WinSCP software.
(WHL files are in the data...5.Commonly used libraries and model files\tensorflow packagedirectory.)



2) After the transfer is complete, enter the following command.
pip3 install tensorflow-2.1.0+nv20.4-cp36-cp36m-linux_aarch64.whl

```
nx@nx-desktop:~$ pip3 install tensorflow-2.1.0+nv20.4-cp36-cp36m-linux_aarch64.whl
```

You may also need to install some software packages online while downloading. Input Y (YES) to pass.

3) Installation is complete.

5. Install Keras

Keras is a high-level neural network API written in Python. It can run with TensorFlow, CNTK, or Theano as the backend.
We can input the following command to install Keras:
sudo pip3 install keras

6. Testing TensorFlow

We can use vi to create a new python file name: tensorflowDemo.py and then copy the following code into it. After saving, run it with
python3 tensorflowDemo.py. This section must be run in a graphical interface, because a chart will appear.

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

x_data = np.linspace(-0.5, 0.5, 200)[:, np.newaxis]
noise = np.random.normal(0, 0.02, x_data.shape)
y_data = np.square(x_data) + noise
```

```
x = tf.placeholder(tf.float32, [None, 1])
y = tf.placeholder(tf.float32, [None, 1])

# Input layer one neuron, output layer one neuron, middle 10 neurons
# First layer
Weights_L1 = tf.Variable(tf.random.normal([1, 10]))
Biases_L1 = tf.Variable(tf.zeros([1, 10]))
Wx_plus_b_L1 = tf.matmul(x, Weights_L1) + Biases_L1
L1 = tf.nn.tanh(Wx_plus_b_L1)

# Second layer
Weights_L2 = tf.Variable(tf.random.normal([10, 1]))
Biases_L2 = tf.Variable(tf.zeros([1, 1]))
Wx_plus_b_L2 = tf.matmul(L1, Weights_L2) + Biases_L2
pred = tf.nn.tanh(Wx_plus_b_L2)

# Loss function
loss = tf.reduce_mean(tf.square(y - pred))

# Train
train = tf.train.GradientDescentOptimizer(0.1).minimize(loss)

with tf.Session() as sess:
    sess.run(tf.global_variables_initializer())
    for i in range(2000):
        sess.run(train, feed_dict={x: x_data, y: y_data})
        print("第{0}次， loss = {1}".format(i, sess.run(loss,feed_dict={x: x_data, y:
y_data})))
    pred_vaule = sess.run(pred, feed_dict={x: x_data})
    plt.figure()
    plt.scatter(x_data, y_data)
    plt.plot(x_data, pred_vaule, 'r-', lw=5)
    plt.show()
```