Install Tensorflow GPU with Cuda9 & Ubuntu 16.06

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Ref: https://blog.csdn.net/qq_35976351/article/details/79325476

- ✓ Existed System Settings and Drivers:
  - Ubuntu 16.04.3LTS + NVIDIA GeForce 1080 + NV 384.130 Driver

```
schraterlab@schraterlab1:~$ nvidia-smi
Fri Aug  3 10:30:26 2018
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 384.130                Driver Version: 384.130                   |
|-------------------------------+----------------------+----------------------+
| GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|===============================+======================+======================|
|   0  GeForce GTX 1080    Off  | 00000000:01:00.0  On |                  N/A |
|  0%   37C    P8    10W / 215W |    354MiB /  8112MiB |      0%      Default |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                       GPU Memory |
|  GPU       PID   Type   Process name                             Usage      |
|=============================================================================|
|    0      1225      G   /usr/lib/xorg/Xorg                           180MiB |
|    0      2413      G   compiz                                       172MiB |
+-----------------------------------------------------------------------------+
```

- ✓ Download CUDA 9.0 Installer
  - https://developer.nvidia.com/compute/cuda/9.0/Prod/local_installers/cuda-repo-ubuntu1604-9-0-local_9.0.176-1_amd64-deb

```
schraterlab@schraterlab1:~/Downloads$ wget https://developer.nvidia.com/compute/cuda/9.0/Prod/local_installers/cuda-repo-ubuntu1604-9-0-local_9.0.176-1_amd64-deb
--2018-08-03 10:53:34--  https://developer.nvidia.com/compute/cuda/9.0/Prod/local_installers/cuda-repo-ubuntu1604-9-0-local_9.0.176-1_amd64-deb
Resolving developer.nvidia.com (developer.nvidia.com)... 192.229.162.216
Connecting to developer.nvidia.com (developer.nvidia.com)|192.229.162.216|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://developer.download.nvidia.com/compute/cuda/9.0/secure/Prod/local_installers/cuda-repo-ubuntu1604-9-0-local_9.0.176-1_amd64.deb?OKThhyODxGBveQFdh0Fn9Y
ZBSZARlwCNEg73tfPTXnUlBbSm_lh1v-bvHSb5ieggYd2AjS1pF8Mk6WHrwJmvXWCKDLiN6axtMXf34NjLzmJTnnksv4AkkBBU4cLP7XwiXIQ47MeWIau0hM06pXxDRIQ4lmBuiiqxO5fo_HTwSWuBa6rvxxvekdS3HZQeF
Ye_s4aY5GWuij_NjvlzEiJ1 [following]
--2018-08-03 10:53:34--  https://developer.download.nvidia.com/compute/cuda/9.0/secure/Prod/local_installers/cuda-repo-ubuntu1604-9-0-local_9.0.176-1_amd64.deb?OKThhyO
DxGBveQFdh0Fn9YZBSZARlwCNEg73tfPTXnUlBbSm_lh1v-bvHSb5ieggYd2AjS1pF8Mk6WHrwJmvXWCKDLiN6axtMXf34NjLzmJTnnksv4AkkBBU4cLP7XwiXIQ47MeWIau0hM06pXxDRIQ4lmBuiiqxO5fo_HTwSWuBa6
rvxxvekdS3HZQeFYe_s4aY5GWuij_NjvlzEiJ1
Resolving developer.download.nvidia.com (developer.download.nvidia.com)... 2606:2800:21f:3aa:dcf:37b:1ed6:1fb, 192.229.211.70
Connecting to developer.download.nvidia.com (developer.download.nvidia.com)|2606:2800:21f:3aa:dcf:37b:1ed6:1fb|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1212738714 (1.1G) [application/x-deb]
Saving to: 'cuda-repo-ubuntu1604-9-0-local_9.0.176-1_amd64-deb'

ocal_9.0.176-1_amd64-deb                43%[==================================>                                  ] 503.74M  11.0MB/s    eta 60s
```

- ✓ Install CUDA
  - sudo dpkg -i cuda-repo-ubuntu1604-9-0-local_9.0.176-1_amd64.deb

```
schraterlab@schraterlab1:~/Downloads$ sudo dpkg -i cuda-repo-ubuntu1604-9-0-local_9.0.176-1_amd64-deb
Selecting previously unselected package cuda-repo-ubuntu1604-9-0-local.
(Reading database ... 526966 files and directories currently installed.)
Preparing to unpack cuda-repo-ubuntu1604-9-0-local_9.0.176-1_amd64-deb ...
Unpacking cuda-repo-ubuntu1604-9-0-local (9.0.176-1) ...
Setting up cuda-repo-ubuntu1604-9-0-local (9.0.176-1) ...

The public CUDA GPG key does not appear to be installed.
To install the key, run this command:
sudo apt-key add /var/cuda-repo-9-0-local/7fa2af80.pub
```

- sudo apt-key add /var/cuda-repo-9-0-local/7fa2af80.pub

```
schraterlab@schraterlab1:~/Downloads$ sudo apt-key add /var/cuda-repo-9-0-local/7fa2af80.pub
OK
```

- sudo apt-get update
- sudo apt-get install cuda (See: Log of CUDA9 Install.txt)

✓ Add Path

- export PATH=/usr/local/cuda-9.0/bin${PATH:+:${PATH}}
- export LD_LIBRARY_PATH=/usr/local/cuda-9.0/lib64${LD_LIBRARY_PATH:+:${LD_LIBRARY_PATH}}

```
schraterlab@schraterlab1:~/Downloads$ export PATH=/usr/local/cuda-9.0/bin${PATH:+:${PATH}}
schraterlab@schraterlab1:~/Downloads$ export LD_LIBRARY_PATH=/usr/local/cuda-9.0/lib64${LD_LIBRARY_PATH:+:${LD_LIBRARY_PATH}}
```

✓ Test CUDA installation

- cd /usr/local/cuda-9.0/samples/
- sudo make

```
schraterlab@schraterlab1:~$ cd /usr/local/cuda-9.0/samples/
schraterlab@schraterlab1:/usr/local/cuda-9.0/samples$ make
```

```
Finished building CUDA samples
```

!!!! QQ 第一次一口氣成功的 QQQQ

- cd bin/x86_64/linux/release/
- ./deviceQuery

```
schraterlab@schraterlab1:/usr/local/cuda-9.0/samples/bin/x86_64/linux/release$ ./deviceQuery
./deviceQuery Starting...

 CUDA Device Query (Runtime API) version (CUDART static linking)

Detected 1 CUDA Capable device(s)

Device 0: "GeForce GTX 1080"
  CUDA Driver Version / Runtime Version          9.0 / 9.0
  CUDA Capability Major/Minor version number:    6.1
  Total amount of global memory:                 8113 MBytes (8506769408 bytes)
  (20) Multiprocessors, (128) CUDA Cores/MP:     2560 CUDA Cores
  GPU Max Clock rate:                            1860 MHz (1.86 GHz)
  Memory Clock rate:                             5005 Mhz
  Memory Bus Width:                              256-bit
  L2 Cache Size:                                 2097152 bytes
  Maximum Texture Dimension Size (x,y,z)         1D=(131072), 2D=(131072, 65536), 3D=(16384, 16384, 16384)
  Maximum Layered 1D Texture Size, (num) layers  1D=(32768), 2048 layers
  Maximum Layered 2D Texture Size, (num) layers  2D=(32768, 32768), 2048 layers
  Total amount of constant memory:               65536 bytes
  Total amount of shared memory per block:       49152 bytes
  Total number of registers available per block: 65536
  Warp size:                                     32
  Maximum number of threads per multiprocessor:  2048
  Maximum number of threads per block:           1024
  Max dimension size of a thread block (x,y,z): (1024, 1024, 64)
  Max dimension size of a grid size    (x,y,z): (2147483647, 65535, 65535)
  Maximum memory pitch:                          2147483647 bytes
  Texture alignment:                             512 bytes
  Concurrent copy and kernel execution:          Yes with 2 copy engine(s)
  Run time limit on kernels:                     Yes
  Integrated GPU sharing Host Memory:            No
  Support host page-locked memory mapping:       Yes
  Alignment requirement for Surfaces:            Yes
  Device has ECC support:                        Disabled
  Device supports Unified Addressing (UVA):      Yes
  Supports Cooperative Kernel Launch:            Yes
  Supports MultiDevice Co-op Kernel Launch:      Yes
  Device PCI Domain ID / Bus ID / location ID:   0 / 1 / 0
  Compute Mode:
     < Default (multiple host threads can use ::cudaSetDevice() with device simultaneously) >

deviceQuery, CUDA Driver = CUDART, CUDA Driver Version = 9.0, CUDA Runtime Version = 9.0, NumDevs = 1
Result = PASS
```

CuDNN Installation

- ✓ Download CuDNN (need to login)
  - (After login in the local computer → download locally and upload to server)
  - sudo dpkg -i libcudnn7_7.1.4.18-1+cuda9.0_amd64.deb
  - sudo dpkg -i libcudnn7-dev_7.1.4.18-1+cuda9.0_amd64.deb
  - sudo dpkg -i libcudnn7-doc_7.1.4.18-1+cuda9.0_amd64.deb

```
schraterlab@schraterlab1:~/Downloads$ sudo dpkg -i libcudnn7_7.1.4.18-1+cuda9.0_amd64.deb
[sudo] password for schraterlab:
Selecting previously unselected package libcudnn7.
(Reading database ... 538882 files and directories currently installed.)
Preparing to unpack libcudnn7_7.1.4.18-1+cuda9.0_amd64.deb ...
Unpacking libcudnn7 (7.1.4.18-1+cuda9.0) ...
Setting up libcudnn7 (7.1.4.18-1+cuda9.0) ...
Processing triggers for libc-bin (2.23-0ubuntu10) ...
```

```
schraterlab@schraterlab1:~/Downloads$ sudo dpkg -i libcudnn7-dev_7.1.4.18-1+cuda9.0_amd64.deb
[sudo] password for schraterlab:
Selecting previously unselected package libcudnn7-dev.
(Reading database ... 538889 files and directories currently installed.)
Preparing to unpack libcudnn7-dev_7.1.4.18-1+cuda9.0_amd64.deb ...
Unpacking libcudnn7-dev (7.1.4.18-1+cuda9.0) ...
Setting up libcudnn7-dev (7.1.4.18-1+cuda9.0) ...
update-alternatives: using /usr/include/x86_64-linux-gnu/cudnn_v7.h to provide /usr/include/cudnn.h (libcudnn) in auto mode
schraterlab@schraterlab1:~/Downloads$ sudo dpkg -i libcudnn7-doc_7.1.4.18-1+cuda9.0_amd64.deb
Selecting previously unselected package libcudnn7-doc.
(Reading database ... 538895 files and directories currently installed.)
Preparing to unpack libcudnn7-doc_7.1.4.18-1+cuda9.0_amd64.deb ...
Unpacking libcudnn7-doc (7.1.4.18-1+cuda9.0) ...
Setting up libcudnn7-doc (7.1.4.18-1+cuda9.0) ...
```

- ✓ TEST Installation
  - cp -r /usr/src/cudnn_samples_v7/ [/home/schraterlab/karenguo/] → change to your path
  - (go to your folder) cd cudnn_samples_v7/mnistCUDNN/
  - make clean && make
  - ./mnistCUDNN → Test passed! **Means OK :D**

```
schraterlab@schraterlab1:~/karenguo/cudnn_samples_v7/mnistCUDNN$ make clean && make
rm -rf *o
rm -rf mnistCUDNN
/usr/local/cuda/bin/nvcc -ccbin g++ -I/usr/local/cuda/include -IFreeImage/include  -m64    -gencode arch=compute_30,code=sm_30 -gencode arch=compute_35,code=sm_35 -gencode arch=compute_50,code=sm_50 -gencode arch=compute_53,code=sm_53 -gencode arch=compute_53,code=compute_53 -o fp16_dev.o -c fp16_dev.cu
g++ -I/usr/local/cuda/include -IFreeImage/include   -o fp16_emu.o -c fp16_emu.cpp
g++ -I/usr/local/cuda/include -IFreeImage/include   -o mnistCUDNN.o -c mnistCUDNN.cpp
/usr/local/cuda/bin/nvcc -ccbin g++   -m64      -gencode arch=compute_30,code=sm_30 -gencode arch=compute_35,code=sm_35 -gencode arch=compute_50,code=sm_50 -gencode arch=compute_53,code=sm_53 -gencode arch=compute_53,code=compute_53 -o mnistCUDNN fp16_dev.o fp16_emu.o mnistCUDNN.o  -LFreeImage/lib/linux/x86_64 -LFreeImage/lib/linux -lcudart -lcublas -lcudnn -lfreeimage -lstdc++ -lm
schraterlab@schraterlab1:~/karenguo/cudnn_samples_v7/mnistCUDNN$ ./mnistCUDNN
cudnnGetVersion() : 7104 , CUDNN_VERSION from cudnn.h : 7104 (7.1.4)
Host compiler version : GCC 5.4.0
There are 1 CUDA capable devices on your machine :
device 0 : sms 20  Capabilities 6.1, SmClock 1860.0 Mhz, MemSize (Mb) 8112, MemClock 5005.0 Mhz, Ecc=0, boardGroupID=0
Using device 0

Testing single precision
Loading image data/one_28x28.pgm
Performing forward propagation ...
Testing cudnnGetConvolutionForwardAlgorithm ...
Fastest algorithm is Algo 1
Testing cudnnFindConvolutionForwardAlgorithm ...
^^^^ CUDNN_STATUS_SUCCESS for Algo 0: 0.024576 time requiring 0 memory
^^^^ CUDNN_STATUS_SUCCESS for Algo 2: 0.032768 time requiring 57600 memory
^^^^ CUDNN_STATUS_SUCCESS for Algo 1: 0.039936 time requiring 3464 memory
^^^^ CUDNN_STATUS_SUCCESS for Algo 7: 0.066368 time requiring 2057744 memory
^^^^ CUDNN_STATUS_SUCCESS for Algo 5: 0.093184 time requiring 203008 memory
Resulting weights from Softmax:
0.0000000 0.9999399 0.0000000 0.0000000 0.0000561 0.0000000 0.0000012 0.0000017 0.0000010 0.0000000
Loading image data/three_28x28.pgm
Performing forward propagation ...
Resulting weights from Softmax:
0.0000000 0.0000000 0.0000000 0.9999288 0.0000000 0.0000711 0.0000000 0.0000000 0.0000000 0.0000000
Loading image data/five_28x28.pgm
Performing forward propagation ...
Resulting weights from Softmax:
0.0000000 0.0000008 0.0000000 0.0000002 0.0000000 0.9999820 0.0000154 0.0000000 0.0000012 0.0000006

Result of classification: 1 3 5

Test passed!
```

- ✓ Installation Reference Website (2018)
  - OFFICIAL: https://docs.nvidia.com/deeplearning/sdk/cudnn-install/index.html
  - Ubuntu 16.04 + CUDA8.0 + CuDNN 5.1 (Mandarin)
    - https://kairen.github.io/2017/03/12/tensorflow/install-source/ (繁體)
    - https://segmentfault.com/a/1190000008234390 (簡體)
  - Ubuntu 16.04 + CUDA 9.0 + CuDNN 7.0 (Mandarin)
    - https://blog.csdn.net/qq_35976351/article/details/79325476
    - https://blog.csdn.net/jmh1996/article/details/80287030
  - Some Common Issues while installation (Traditional Mandarin)
    - https://medium.com/@afun/ubuntu-16-04-%E5%AE%89%E8%A3%9D-cuda-cudnn-nvidia-driver-%E7%9A%84%E8%B8%A9%E9%9B%B7%E5%BF%83%E5%BE%97-%E9%9D%9E%E5%AE%89%E8%A3%9D%E6%AD%A5%E9%A9%9F%E8%A9%B3%E8%A7%A3-b13121d95025

Install TENSORFLOW-GPU

https://www.tensorflow.org/install/install_linux#choose_which_tensorflow_to_install

- ✓ Install and Generate Virtualenv
  - sudo apt-get install python-virtualenv
  - (Create and cd to your desired work folder)
  - **sudo** virtualenv --system-site-packages venv (for python2)
    - sudo virtualenv --system-site-packages venv -p python3 (for pyhon3)
    - May getting error if not use sudo → cannot install
- ✓ Open Virtualenv and Install Tensorflow
  - source ~/karenguo/my_tf_gpu/venv/bin/activate
  - pip install -U pip
  - pip install **--user** tensorflow-gpu
    - instead of using "pip install -U tensorflow-gpu" due to the venv permission problem.

```
(venv) schraterlab@schraterlab1:~/karenguo/my_tf_gpu$ pip install --user tensorflow-gpu
Collecting tensorflow-gpu
  Using cached https://files.pythonhosted.org/packages/68/45/8ed49fb2decd4ce7849fc9755d9e066f414fb29c40e811bf4c12287de0af/tensorflow_gpu-1.9.0-cp27-cp27mu-manylinux1_x
86_64.whl
Requirement already satisfied: mock>=2.0.0 in ./venv/lib/python2.7/site-packages (from tensorflow-gpu) (2.0.0)
Requirement already satisfied: grpcio>=1.8.6 in ./venv/lib/python2.7/site-packages (from tensorflow-gpu) (1.14.0)
Requirement already satisfied: termcolor>=1.1.0 in ./venv/lib/python2.7/site-packages (from tensorflow-gpu) (1.1.0)
Requirement already satisfied: numpy>=1.13.3 in ./venv/lib/python2.7/site-packages (from tensorflow-gpu) (1.15.0)
Collecting tensorboard<1.10.0,>=1.9.0 (from tensorflow-gpu)
  Using cached https://files.pythonhosted.org/packages/d5/98/e2e9d5afbc86cef0b2dd0f4ab791519b9bd305ea207e1e5c2f9a9f2f6da6/tensorboard-1.9.0-py2-none-any.whl
Collecting backports.weakref>=1.0rc1 (from tensorflow-gpu)
  Using cached https://files.pythonhosted.org/packages/88/ec/f598b633c3d5ffe267aaada57d961c94fdfa183c5c3ebda2b6d151943db6/backports.weakref-1.0.post1-py2.py3-none-any.
whl
Collecting absl-py>=0.1.6 (from tensorflow-gpu)
Requirement already satisfied: wheel in ./venv/lib/python2.7/site-packages (from tensorflow-gpu) (0.31.1)
Requirement already satisfied: enum34>=1.1.6 in ./venv/lib/python2.7/site-packages (from tensorflow-gpu) (1.1.6)
Requirement already satisfied: six>=1.10.0 in ./venv/lib/python2.7/site-packages (from tensorflow-gpu) (1.11.0)
Collecting gast>=0.2.0 (from tensorflow-gpu)
Collecting protobuf>=3.4.0 (from tensorflow-gpu)
  Using cached https://files.pythonhosted.org/packages/27/e7/bf96130ebe633b08a3913da4bb25e50dac5779f1f68e51c99485423f7443/protobuf-3.6.0-cp27-cp27mu-manylinux1_x86_64.
whl
Collecting astor>=0.6.0 (from tensorflow-gpu)
  Using cached https://files.pythonhosted.org/packages/35/6b/11530768cac581a12952a2aad00e1526b89d242d0b9f59534ef6e6a1752f/astor-0.7.1-py2.py3-none-any.whl
Collecting setuptools<=39.1.0 (from tensorflow-gpu)
  Using cached https://files.pythonhosted.org/packages/8c/10/79282747f9169f21c053c562a0baa21815a8c7879be97abd930dbcf862e8/setuptools-39.1.0-py2.py3-none-any.whl
Requirement already satisfied: funcsigs>=1; python_version < "3.3" in ./venv/lib/python2.7/site-packages (from mock>=2.0.0->tensorflow-gpu) (1.0.2)
Requirement already satisfied: pbr>=0.11 in ./venv/lib/python2.7/site-packages (from mock>=2.0.0->tensorflow-gpu) (4.2.0)
Requirement already satisfied: futures>=2.2.0 in ./venv/lib/python2.7/site-packages (from grpcio>=1.8.6->tensorflow-gpu) (3.2.0)
Collecting markdown>=2.6.8 (from tensorboard<1.10.0,>=1.9.0->tensorflow-gpu)
  Using cached https://files.pythonhosted.org/packages/6d/7d/488b90f470b96531a3f5788cf12a93332f543dbab13c423a5e7ce96a0493/Markdown-2.6.11-py2.py3-none-any.whl
Collecting werkzeug>=0.11.10 (from tensorboard<1.10.0,>=1.9.0->tensorflow-gpu)
  Using cached https://files.pythonhosted.org/packages/20/c4/12e3e56473e52375aa29c4764e70d1b8f3efa6682bef8d0aae04fe335243/Werkzeug-0.14.1-py2.py3-none-any.whl
Installing collected packages: setuptools, protobuf, markdown, werkzeug, tensorboard, backports.weakref, absl-py, gast, astor, tensorflow-gpu
Successfully installed absl-py-0.3.0 astor-0.7.1 backports.weakref-1.0.post1 gast-0.2.0 markdown-2.6.11 protobuf-3.6.0 setuptools-39.1.0 tensorboard-1.9.0 tensorflow-g
pu-1.9.0 werkzeug-0.14.1
```

- ✓ TEST
  - python -c "import tensorflow as tf; print(tf.__version__)"

```
(venv) schraterlab@schraterlab1:~/karenguo/my_tf_gpu$ python -c "import tensorflow as tf; print(tf.__version__)"
1.9.0
```

  - (GPU test) cat <<EOF > simple.py
    - Paste the following code:

```
import tensorflow as tf

hello = tf.constant('Hello, TensorFlow!')
sess = tf.Session()
print(sess.run(hello))
EOF
```

  - python simple.py

```
(venv) schraterlab@schraterlab1:~/karenguo/my_tf_gpu$ cat <<EOF > simple.py
> import tensorflow as tf
>
> hello = tf.constant('Hello, TensorFlow!')
> sess = tf.Session()
> print(sess.run(hello))
> EOF
(venv) schraterlab@schraterlab1:~/karenguo/my_tf_gpu$ ls
simple.py  venv
```

```
(venv) schraterlab@schraterlab1:~/karenguo/my_tf_gpu$ python simple.py
2018-08-03 16:02:42.790617: I tensorflow/core/platform/cpu_feature_guard.cc:141] You
X2 FMA
2018-08-03 16:02:42.878220: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:8
 at least one NUMA node, so returning NUMA node zero
2018-08-03 16:02:42.878599: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1392]
name: GeForce GTX 1080 major: 6 minor: 1 memoryClockRate(GHz): 1.86
pciBusID: 0000:01:00.0
totalMemory: 7.92GiB freeMemory: 7.46GiB
2018-08-03 16:02:42.878626: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1471]
2018-08-03 16:02:43.034474: I tensorflow/core/common_runtime/gpu/gpu_device.cc:952]
2018-08-03 16:02:43.034503: I tensorflow/core/common_runtime/gpu/gpu_device.cc:958]
2018-08-03 16:02:43.034510: I tensorflow/core/common_runtime/gpu/gpu_device.cc:971]
2018-08-03 16:02:43.034645: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1084]
MB memory) -> physical GPU (device: 0, name: GeForce GTX 1080, pci bus id: 0000:01:0
Hello, TensorFlow!
(venv) schraterlab@schraterlab1:~/karenguo/my_tf_gpu$ python simple.py
2018-08-03 16:07:01.506209: I tensorflow/core/platform/cpu_feature_guard.cc:141] You
r CPU supports instructions that this TensorFlow binary was not compiled to use: AVX
2 FMA
2018-08-03 16:07:01.601352: I tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:8
97] successful NUMA node read from SysFS had negative value (-1), but there must be
at least one NUMA node, so returning NUMA node zero
2018-08-03 16:07:01.602517: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1392]
 Found device 0 with properties:
name: GeForce GTX 1080 major: 6 minor: 1 memoryClockRate(GHz): 1.86
pciBusID: 0000:01:00.0
totalMemory: 7.92GiB freeMemory: 7.46GiB
2018-08-03 16:07:01.602544: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1471]
 Adding visible gpu devices: 0
2018-08-03 16:07:01.758647: I tensorflow/core/common_runtime/gpu/gpu_device.cc:952]
Device interconnect StreamExecutor with strength 1 edge matrix:
2018-08-03 16:07:01.758689: I tensorflow/core/common_runtime/gpu/gpu_device.cc:958]
     0
2018-08-03 16:07:01.758695: I tensorflow/core/common_runtime/gpu/gpu_device.cc:971]
0:   N
2018-08-03 16:07:01.758844: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1084]
 Created TensorFlow device (/job:localhost/replica:0/task:0/device:GPU:0 with 7196 M
B memory) -> physical GPU (device: 0, name: GeForce GTX 1080, pci bus id: 0000:01:00
.0, compute capability: 6.1)
Hello, TensorFlow!
```