

How to use Pytorch on GPU?

Reference:

<https://medium.com/udacity-pytorch-challengers/pytorch-on-google-cloud-platform-gcp-66644bfc07eb>

1. Install development toolchain and setup VM (copy and paste the following command without comments)

```
sudo apt update && sudo apt upgrade
sudo apt install dkms build-essential linux-headers-$(uname
-r)

sudo mkdir -p /var/cache/swap/ # create a directory that holds the swap file
sudo dd if=/dev/zero of=/var/cache/swap/myswap bs=1M
count=4096 # for 4 GByte
sudo chmod 0600 /var/cache/swap/myswap # only root should have access
sudo mkswap /var/cache/swap/myswap # format as swap
sudo swapon /var/cache/swap/myswap # announce to system
```

Add the following line to /etc/fstab so that the swap will get loaded upon system startup

```
cd etc/
sudo vi fstab # edit the file with root
"/var/cache/swap/myswap    none        swap        sw          0          0"
(copy paste the above line without quotation marks)
:wq # write and quit
```

2. Download and install cuda_10.1

```
wget
http://developer.download.nvidia.com/compute/cuda/10.1/Prod/local\_installers/cuda\_10.1.243\_418.87.00\_linux.run

sudo sh cuda_10.1.243_418.87.00_linux.run
```

Download Installer for Linux Ubuntu 18.04 x86_64

The base installer is available for download below.

Base Installer

Installation Instructions:

```
$ wget http://developer.download.nvidia.com/compute/cuda/10.1/Prod/local_installers/cuda_10.1.243_418.87.00_linux.run
$ sudo sh cuda_10.1.243_418.87.00_linux.run
```

The CUDA Toolkit contains Open-Source Software. The source code can be found [here](#).
The checksums for the installer and patches can be found in [Installer Checksums](#).
For further information, see the [Installation Guide for Linux](#) and the [CUDA Quick Start Guide](#).

```

ramonarhm07@instance-1: ~
ssh.cloud.google.com/projects/ds595-rl/zones/us-central1-c/instances/instance-1?authuser=0&hl=en_US
lqk
x  CUDA Installer se Agreement                                x
x  - [X] Driver                                                x
x    [X] 418.87.00                                             x
x  + [X] CUDA Toolkit 10.1                                    x
x    [X] CUDA Samples 10.1                                    x
x    [X] CUDA Demo Suite 10.1                                 x
x    [X] CUDA Documentation 10.1                             x
x  Options                                                    x
x  Install                                                    x
x                                                            x
x                                                            x
x                                                            x
x                                                            x
x  VIDIA Driver                                              x
x                                                            x
x                                                            x
x  escription                                                x
x                                                            x
x                                                            x
x                                                            x
x Up/Down: Move | Left/Right: Expand | 'Enter': Select | 'A': Advanced options x
mqj

```

```

ramonarhm07@instance-1:~$ wget http://developer.download.nvidia.com/compute/cuda/10.1/Prod/local_installers/cuda_10.1.243_418.87.00_linux.run
--2019-08-21 17:52:17-- http://developer.download.nvidia.com/compute/cuda/10.1/Prod/local_installers/cuda_10.1.243_418.87.00_linux.run
Resolving developer.download.nvidia.com (developer.download.nvidia.com)... 192.229.211.70, 2606:2800:21f:3aa:dcf:37b:led6:1fb
Connecting to developer.download.nvidia.com (developer.download.nvidia.com)|192.229.211.70|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 2572375299 (2.4G) [application/octet-stream]
Saving to: 'cuda_10.1.243_418.87.00_linux.run'

cuda_10.1.243_418.87.00_linu 100%[=====>] 2.40G 121MB/s in 12s

2019-08-21 17:52:29 (197 MB/s) - 'cuda_10.1.243_418.87.00_linux.run' saved [2572375299/2572375299]

ramonarhm07@instance-1:~$ ls
cuda_10.1.243_418.87.00_linux.run
ramonarhm07@instance-1:~$ sudo sh cuda_10.1.243_418.87.00_linux.run
=====
= Summary =
=====

Driver: Installed
Toolkit: Installed in /usr/local/cuda-10.1/
Samples: Installed in /home/ramonarhm07/, but missing recommended libraries

Please make sure that
- PATH includes /usr/local/cuda-10.1/bin
- LD_LIBRARY_PATH includes /usr/local/cuda-10.1/lib64, or, add /usr/local/cuda-10.1/lib64 to /etc/ld.so.conf and run ldconfig as root

To uninstall the CUDA Toolkit, run cuda-uninstaller in /usr/local/cuda-10.1/bin
To uninstall the NVIDIA Driver, run nvidia-uninstall

Please see CUDA_Installation_Guide_Linux.pdf in /usr/local/cuda-10.1/doc/pdf for detailed information on setting up CUDA.
Logfile is /var/log/cuda-installer.log
ramonarhm07@instance-1:~$ 

```

Test Nvidia

```

cd ~/NVIDIA_CUDA-10.1_Samples/0_Simple/vectorAdd
make
./vectorAdd

```

```

ramonarhm07@instance-1:~/NVIDIA_CUDA-10.1_Samples/0_Simple/vectorAdd$ make
/usr/local/cuda/bin/nvcc -ccbin g++ -I../common/inc -m64 -gencode arch=compute_30,code=sm_30 -gencode arch=compute_35,code=sm_35 -gencode arch=compute_37,code=sm_37 -gencode arch=compute_50,code=sm_50 -gencode arch=compute_52,code=sm_52 -gencode arch=compute_60,code=sm_60 -gencode arch=compute_61,code=sm_61 -gencode arch=compute_70,code=sm_70 -gencode arch=compute_75,code=sm_75 -gencode arch=compute_75,code=compute_75 -o vectorAdd.o -c vectorAdd.cu
/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_37,code=sm_37 -gencode arch=compute_50,code=sm_50 -gencode arch=compute_52,code=sm_52 -gencode arch=compute_60,code=sm_60 -gencode arch=compute_61,code=sm_61 -gencode arch=compute_70,code=sm_70 -gencode arch=compute_75,code=sm_75 -gencode arch=compute_75,code=compute_75 -o vectorAdd vectorAdd.o
mkdir -p ../bin/x86_64/linux/release
cp vectorAdd ../bin/x86_64/linux/release
ramonarhm07@instance-1:~/NVIDIA_CUDA-10.1_Samples/0_Simple/vectorAdd$ ./vectorAdd
[Vector addition of 50000 elements]
Copy input data from the host memory to the CUDA device
CUDA kernel launch with 196 blocks of 256 threads
Copy output data from the CUDA device to the host memory
Test PASSED
Done

```

3. Download and install anaconda

```

wget
https://repo.continuum.io/archive/Anaconda3-2019.07-Linux-x86_64.sh
bash Anaconda3-2019.07-Linux-x86_64.sh

```

```

ramonarhm07@instance-1:~$ wget https://repo.continuum.io/archive/Anaconda3-2019.07-Linux-x86_64.sh
--2019-08-21 18:05:54-- https://repo.continuum.io/archive/Anaconda3-2019.07-Linux-x86_64.sh
Resolving repo.continuum.io (repo.continuum.io)... 104.18.201.79, 104.18.200.79, 2606:4700::6812:c84f, ...
Connecting to repo.continuum.io (repo.continuum.io)|104.18.201.79|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 541906131 (517M) [application/x-sh]
Saving to: 'Anaconda3-2019.07-Linux-x86_64.sh'

Anaconda3-2019.07-Linux-x86_ 100%[=====] 516.80M 104MB/s in 5.4s

2019-08-21 18:05:59 (96.3 MB/s) - 'Anaconda3-2019.07-Linux-x86_64.sh' saved [541906131/541906131]

ramonarhm07@instance-1:~$ bash Anaconda3-2019.07-Linux-x86_64.sh

Welcome to Anaconda3 2019.07

In order to continue the installation process, please review the license
agreement.
Please, press ENTER to continue
>>>

```

```
source ~/.bashrc
```

```

ramonarhm07@instance-1:~$ source ~/.bashrc
(base) ramonarhm07@instance-1:~$

```

4. Install pytorch-gpu

PyTorch Build	Stable (1.2)		Preview (Nightly)	
Your OS	Linux	Mac	Windows	
Package	Conda	Pip	LibTorch	Source
Language	Python 2.7	Python 3.5	Python 3.6	Python 3.7 C++
CUDA	9.2	10.0	None	
Run this Command:	conda install pytorch torchvision cudatoolkit=10.0 -c pytorch			

```
conda install pytorch torchvision cudatoolkit=10.0 -c pytorch
```

5. Install pytorch-gpu

```

python
import torch
torch.cuda.current_device()
torch.cuda.device(0)
torch.cuda.device_count()

```

```
(base) ramonarhm07@instance-1:~$ python
Python 3.7.3 (default, Mar 27 2019, 22:11:17)
[GCC 7.3.0] :: Anaconda, Inc. on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import torch
>>> torch.cuda.current_device()
0
>>>
>>> torch.cuda.device(0)
<torch.cuda.device object at 0x7f9cb98504e0>
>>> torch.cuda.device_count()
1
>>> torch.cuda.get_device_name(0)
'Tesla K80'
>>> torch.cuda.is_available()
True
>>>
```

<https://cloud.google.com/compute/docs/instances/transfer-files>

The screenshot displays a Google Cloud Shell terminal window with the following content:

```
ssh.cloud.google.com/projects/ds595-rl/zones/us-central-1-c/instances/instance-1?authuser=0&hl=en_US&projectNumber=52...
NameError: name 'torch' is not defined
>>> torch.cuda.device_count()
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
NameError: name 'torch' is not defined
>>> torch.cuda.get_device_name(0)
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
NameError: name 'torch' is not defined
>>> torch.cuda.is_available()
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
NameError: name 'torch' is not defined
>>>
>>> exit()
(base) ramonarhm07@instance-1:~$ python
Python 3.7.3 (default, Mar 27 2019, 22:11:17)
[GCC 7.3.0] :: Anaconda, Inc. on linux
Type "help", "copyright", "credits" or "license()" for more information.
>>> import torch
>>> torch.cuda.current_device()
0
>>>
>>> torch.cuda.device(0)
<torch.cuda.device object at 0x7f9cb98504e0>
>>> torch.cuda.device_count()
1
>>> torch.cuda.get_device_name(0)
'Tesla K80'
>>> torch.cuda.is_available()
True
>>> exit()
(base) ramonarhm07@instance-1:~$ ls
Anaconda3-2019.07-Linux-x86_64.sh  NVIDIA_CUDA-10.1
(base) ramonarhm07@instance-1:~$ mkdir DQN
(base) ramonarhm07@instance-1:~$ ls
Anaconda3-2019.07-Linux-x86_64.sh  DQN  NVIDIA_CUDA
(base) ramonarhm07@instance-1:~$ cd DQN
(base) ramonarhm07@instance-1:~/DQN$ ls
(base) ramonarhm07@instance-1:~/DQN$
```

On the right side of the terminal, there is a sidebar menu with the following options:

- Color Themes
- Text Size
- Font
- Copy Settings
- Keyboard Settings
- Upload file** (highlighted with a red box)
- Download file** (highlighted with a red box)
- Instance Details
- New Connection to instance-1
- Change Linux Username
- How to copy / paste
- Send Feedback

At the bottom of the terminal window, there is a "File Transfer" section showing:

mnist.py Finished

Below this, it states: "File upload destination: /home/ramonarhm07"

Install Packages

1. Install gym

```
pip install gym==0.10.4
```

```
(base) ramonarhm07@instance-1:~/DQN$ pip install gym==0.10.4
Collecting gym==0.10.4
  Downloading https://files.pythonhosted.org/packages/3d/e5/4dae1de6534221f74895c8a95ae4eedc816a5fa003db1d4d608cbdc28b35/gym-0.10.4.tar.gz (1.5MB)
    | 1.5MB 3.5MB/s
Requirement already satisfied: numpy>=1.10.4 in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from gym==0.10.4) (1.16.4)
Requirement already satisfied: requests>=2.0 in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from gym==0.10.4) (2.22.0)
Requirement already satisfied: six in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from gym==0.10.4) (1.12.0)
Requirement already satisfied: pygame>=1.2.0 in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from gym==0.10.4) (1.2.4)
Requirement already satisfied: idna<2.9,>=2.5 in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from requests>=2.0->gym==0.10.4) (2.8)
Requirement already satisfied: urllib3!=1.25.0,!1.25.1,<1.26,>=1.21.1 in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from requests>=2.0->gym==0.10.4) (1.24.2)
Requirement already satisfied: certifi>=2017.4.17 in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from requests>=2.0->gym==0.10.4) (2019.6.16)
Requirement already satisfied: chardet<3.1.0,>=3.0.2 in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from requests>=2.0->gym==0.10.4) (3.0.4)
Building wheels for collected packages: gym
  Building wheel for gym (setup.py) ... done
  Stored in directory: /home/ramonarhm07/.cache/pip/wheels/63/41/49/1581815cc493e09e494ba013c2f6f29108b8e2adf40db4b21d
Successfully built gym
Installing collected packages: gym
  Found existing installation: gym 0.14.0
  Uninstalling gym-0.14.0:
    Successfully uninstalled gym-0.14.0
Successfully installed gym-0.10.4
```

2. Install gym[atari]

```
pip install gym[atari]
```

```
(base) ramonarhm07@instance-1:~/DQN$ pip install gym[atari]
Requirement already satisfied: gym[atari] in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (0.14.0)
Requirement already satisfied: numpy>=1.10.4 in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from gym[atari]) (1.16.4)
Requirement already satisfied: pygame<1.3.2,>=1.2.0 in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from gym[atari]) (1.2.4)
Requirement already satisfied: scipy in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from gym[atari]) (1.3.2)
Requirement already satisfied: six in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from gym[atari]) (1.12.0)
Requirement already satisfied: cloudpickle~=1.2.0 in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from gym[atari]) (1.2.0)
Requirement already satisfied: Pillow; extra == "atari" in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from gym[atari]) (6.2.0)
Collecting atari-py==0.2.0; extra == "atari" (from gym[atari])
  Downloading https://files.pythonhosted.org/packages/8f/ba/1d22e9d2f332f07aaa57041f5dd569c2cb40a92bd6374a0b743ec3dc0/atari_py-0.2.0.tar.gz (2.8MB)
    | 2.8MB 3.4MB/s
Collecting opencv-python; extra == "atari" (from gym[atari])
  Downloading https://files.pythonhosted.org/packages/44/35/6db0fa2e644922533ddc2a3c41d1a86dabefce89d9db85ec31dcc696/opencv-python-4.1.1.26-cp37-cp37m-manylinux1_x86_64.whl (22.1MB)
    | 22.1MB 36.9MB/s
Requirement already satisfied: future in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from pygame<=1.3.2->gym[atari]) (0.16.0)
Installing collected packages: atari-py, opencv-python
Successfully installed atari-py-0.2.6 opencv-python-4.1.1.26
(base) ramonarhm07@instance-1:~/DQN$
```

3. Install opencv-python

```
pip install opencv-python-headless
```

```
(base) ramonarhm07@instance-1:~/DQN$ pip install opencv-python-headless
Collecting opencv-python-headless
  Downloading https://files.pythonhosted.org/packages/50/c2/18fdc40a4e696e55600448b56fc0f281274223c02dd320ccacc70ec683e3/opencv_python_headless-4.1.1.26-cp37-cp37m-manylinux1_x86_64.whl (22.1MB)
    | 22.1MB 3.5MB/s
Requirement already satisfied: numpy>=1.14.5 in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from opencv-python-headless) (1.16.4)
Installing collected packages: opencv-python-headless
Successfully installed opencv-python-headless-4.1.1.26
```