

# How to use Pytorch on GPU?

## Reference:

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

- Setup
- Install Cuda
- Install Anaconda
- Install Packages

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

```
sudo apt update && sudo apt upgrade
```

```
ramonarhm07@instance-1:~$ sudo apt update && sudo apt upgrade
Hit:1 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic InRelease
Get:2 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
Get:3 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-backports InRelease [74.6 kB]
Get:4 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Get:5 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic/universe amd64 Packages [8570 kB]
Get:6 http://archive.canonical.com/ubuntu bionic InRelease [10.2 kB]
Get:7 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic/universe Translation-en [4941 kB]
Get:8 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic/multiverse amd64 Packages [151 kB]
Get:9 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic/multiverse Translation-en [108 kB]
Get:10 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates/main amd64 Packages [729 kB]
Get:11 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates/universe amd64 Packages [1003 kB]
Get:12 http://archive.canonical.com/ubuntu bionic/partner amd64 Packages [2324 B]
Get:13 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates/universe Translation-en [308 kB]
Get:14 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates/multiverse amd64 Packages [7312 B]
The following packages were automatically installed and are no longer required:
  grub-pc-bin libnuma1
```

```

The following packages will be upgraded:
  apt apt-utils libapt-inst2.0 libapt-pkg5.0 libexpat1
5 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Need to get 2349 kB of archives.
After this operation, 44.0 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates/main
]
Get:2 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates/main
kB]
Get:3 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates/main
Get:4 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates/main
Get:5 http://us-central1.gce.archive.ubuntu.com/ubuntu bionic-updates/main
80.5 kB]
Fetched 2349 kB in 1s (2116 kB/s)
(Reading database ... 60204 files and directories currently installed.)
Preparing to unpack .../libapt-pkg5.0_1.6.12_amd64.deb ...
Unpacking libapt-pkg5.0:amd64 (1.6.12) over (1.6.11) ...
Setting up libapt-pkg5.0:amd64 (1.6.12) ...
(Reading database ... 60204 files and directories currently installed.)
Preparing to unpack .../libapt-inst2.0_1.6.12_amd64.deb ...
Unpacking libapt-inst2.0:amd64 (1.6.12) over (1.6.11) ...
Preparing to unpack .../archives/apt_1.6.12_amd64.deb ...
Unpacking apt (1.6.12) over (1.6.11) ...
Setting up apt (1.6.12) ...
(Reading database ... 60210 files and directories currently installed.)
Preparing to unpack .../apt-utils_1.6.12_amd64.deb ...
Unpacking apt-utils (1.6.12) over (1.6.11) ...
Preparing to unpack .../libexpat1_2.2.5-3ubuntu0.2_amd64.deb ...
Unpacking libexpat1:amd64 (2.2.5-3ubuntu0.2) over (2.2.5-3ubuntu0.1) ...
Setting up libapt-inst2.0:amd64 (1.6.12) ...
Setting up libexpat1:amd64 (2.2.5-3ubuntu0.2) ...
Setting up apt-utils (1.6.12) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
ramonarhm07@instance-1:~$

```

```

sudo apt install dkms build-essential linux-headers-$(uname
-r)

```

```

sudo mkdir -p /var/cache/swap/
sudo dd if=/dev/zero of=/var/cache/swap/myswap bs=1M
count=4096
sudo chmod 0600 /var/cache/swap/myswap
sudo mkswap /var/cache/swap/myswap
sudo swapon /var/cache/swap/myswap

```

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)

```

## 2. Download and install cuda\_10.1

```

cd ~ # go back home directory

```

developer.nvidia.com/cuda-downloads?target\_os=Linux&target\_arch=x86\_64&target\_distro=Ubuntu&target\_version=1804&target\_type=runfilelocal

UrbanJupyter Life WPI Kaggle PhDRsearch Autoencoder GAN denoising Adversarial TrajAno RL

home target performance computing cuda toolkit cuda toolkit for update cuda toolkit

### Select Target Platform

Click on the green buttons that describe your target platform. Only supported platforms will be shown.

Operating System	Windows	Linux	Mac OSX
Architecture	x86_64	ppc64le	
Distribution	Fedora	OpenSUSE	RHEL CentOS SLES Ubuntu
Version	18.04	16.04	14.04
Installer Type	runfile (local)	deb (local)	deb (network) cluster (local)

### 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](#).

wget

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

```

ramonarhm07@instance-1: ~
ssh.cloud.google.com/projects/ds595-rl/zones/us-central1-a/instances/instance-1?authuser=0&hl=en_US&proj
lqk
x End User License Agreement x
x - x
x x x
x x x
x Preface x
x - x
x x x
x The Software License Agreement in Chapter 1 and the Supplement x
x in Chapter 2 contain license terms and conditions that govern x
x the use of NVIDIA software. By accepting this agreement, you x
x agree to comply with all the terms and conditions applicable x
x to the product(s) included herein. x
x x x
x NVIDIA Driver x
x x x
x x x
x Description x
x x x
x This package contains the operating system driver and x
xq x
x Do you accept the above EULA? (accept/decline/quit): x
x accept x
mgj

```



```
make
./vectorAdd
```

```
ramonarhm07@instance-1:~/NVIDIA_CUDA-10.1_Samples/0_Simple/vectorAdd$ make
/usr/local/cuda/bin/nvcc -cbin 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 -cbin 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.o -c vectorAdd.cu
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

```
cd ~ # go back home directory
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

<https://pytorch.org/>



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			

## 5. Install pytorch-gpu

```
python
import torch
torch.cuda.current_device()
torch.cuda.device(0)
torch.cuda.device_count()
torch.cuda.get_device_name(0)
torch.cuda.is_available()
```

```
(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
>>> █
```

## 6. Upload and download file to GCP

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

ramonarhm07@instance-1: ~/DQN

ssh.cloud.google.com/projects/ds595-rl/zones/us-central1-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)
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
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:~$ ls
Anaconda3-2019.07-Linux-x86_64.sh  NVIDIA_CUDA-10.1_Linux_Versions.txt
(base) ramonarhm07@instance-1:~$ mkdir DQN
(base) ramonarhm07@instance-1:~$ ls
Anaconda3-2019.07-Linux-x86_64.sh  DQN  NVIDIA_CUDA-10.1_Linux_Versions.txt
(base) ramonarhm07@instance-1:~$ cd DQN
(base) ramonarhm07@instance-1:~/DQN$ ls
(base) ramonarhm07@instance-1:~/DQN$

```

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

**File Transfer**

mnist.py Finished

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]) (1.3.2)
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]) (1.11.0)
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]) (7.0.0)
Collecting atari-py~=0.2.0; extra == "atari" (from gym[atari])
  Downloading https://files.pythonhosted.org/packages/8f/ba/1d22e9d2f332f07aaa57041f5dd569c2cb40a92bd6374a0b743ec3d5/
  | 2.8MB 3.4MB/s
Collecting opencv-python; extra == "atari" (from gym[atari])
  Downloading https://files.pythonhosted.org/packages/44/35/6db0fa2e644922533ddc2a3c41d1a86dabefce89d9db85ec31dcc69c/
  | 28.7MB 36.9MB/s
Requirement already satisfied: future in /home/ramonarhm07/anaconda3/lib/python3.7/site-packages (from pygame<=1.3.2) (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-headless

```
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/c2/18fdc40a4e696e55600448b56fc0f281274223c02dd320ccacc70ec/
  683e3/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
```