NVIDIA Driver, CUDA 11.4, cuDNN v8.2.4 installation on Ubuntu 20.04

Uninstall previous versions

- First of all remove all related versions of NVIDIA driver, CUDA and cuDNN by executing the following commands.

```
sudo apt-get --purge remove "*cublas*" "cuda*" "nsight*"
sudo apt-get --purge remove "*nvidia*"
sudo rm -rf /usr/local/cuda*
sudo apt autoremove
```

Installation of NVIDIA Drivers, CUDA and cuDNN

NVIDIA Drivers

- Check driver version for the CUDA version you are going to install.
  https://docs.nvidia.com/cuda/cuda-toolkit-release-notes/index.html

- After confirming the suitable version, go to this page and download appropriate driver for your GPU:
  https://www.nvidia.com/download/index.aspx?lang=en-us
  In my case, for example, I downloaded `NVIDIA-Linux-x86_64-470.82.01.run`
  Run the following command:
  `sudo sh NVIDIA-Linux-x86_64-470.82.01.run --no-x-check`
  Replace `NVIDIA-Linux-*` with the file you downloaded.

- You just need to approve and accept the prompts. Installation is pretty straightforward.

Install CUDA matching NVIDIA Driver version

- In this tutorial, I am going to install `CUDA 11.4.3` (Although 11.5 is the latest one at the time of writing this tutorial).

`wget`
`https://developer.download.nvidia.com/compute/cuda/11.4.3/local_installers/cuda_11.4.3_470.82.01_linux.run`

- After running the below command, make sure that you uncheck NVIDIA Driver option (as shown below) as we have already installed it in the previous step.

`sudo sh cuda_11.4.3_470.82.01_linux.run`

```
┌──────────────────────────────────────────────────────────────────────┐
│  CUDA Installer                                                        │
│  - [ ] Driver                                                          │
│        [ ] 470.82.01                                                   │
│  + [X] CUDA Toolkit 11.4                                               │
│    [X] CUDA Samples 11.4                                               │
│    [X] CUDA Demo Suite 11.4              2 / 4                         │
│    [X] CUDA Documentation 11.4                                         │
│    Options                                                             │
│    Install                                                             │
│                                                                        │
│                                                                        │
│  Up/Down: Move | Left/Right: Expand | 'Enter': Select | 'A': Advanced options │
└──────────────────────────────────────────────────────────────────────┘
```

- After successful installation, you will get a warning message (as shown below) that it did not install CUDA Driver, just ignore it as we had installed it separately before.

```
===========
= Summary =
===========

Driver:   Not Selected
Toolkit:  Installed in /usr/local/cuda-11.4/
Samples:  Installed in /home,          , but missing recommended libraries

Please make sure that
 -   PATH includes /usr/local/cuda-11.4/bin
 -   LD_LIBRARY_PATH includes /usr/local/cuda-11.4/lib64, or, add /usr/local/cuda-11.4/lib64 to /etc/ld.so.conf and run ldconfig as root

To uninstall the CUDA Toolkit, run cuda-uninstaller in /usr/local/cuda-11.4/bin
***WARNING: Incomplete installation! This installation did not install the CUDA Driver. A driver of version at least 470.00 is required for CUDA 11.4 functionality to work.
To install the driver using this installer, run the following command, replacing <CudaInstaller> with the name of this run file:
    sudo <CudaInstaller>.run --silent --driver

Logfile is /var/log/cuda-installer.log
```

Add CUDA path to the bashrc file

- For programs to be able to recognize the location of CUDA, we must add PATH to the `bashrc` file. Execute the following commands to add CUDA path.

```
echo 'export PATH=/usr/local/cuda-11.4/bin:$PATH' >> ~/.bashrc
echo 'export LD_LIBRARY_PATH=/usr/local/cuda-11.4/lib64:$LD_LIBRARY_PATH' >> ~/.bashrc
source ~/.bashrc
sudo ldconfig
```

Installation of cuDNN matching CUDA version

- Installation of cuDNN is highly recommended to speed up calculations further. You must have an NVIDIA account to download cuDNN. Please create your account before downloading.

- Download cuDNN from here: https://developer.nvidia.com/rdp/cudnn-archive

Home

cuDNN Archive

NVIDIA cuDNN is a GPU-accelerated library of primitives for deep neural networks.

Download cuDNN v8.3.0 (November 3rd, 2021), for CUDA 11.5

Download cuDNN v8.3.0 (November 3rd, 2021), for CUDA 10.2

Download cuDNN v8.2.4 (September 2nd, 2021), for CUDA 11.4

Library for Windows and Linux, Ubuntu(x86_64, armsbsa, PPC architecture)

cuDNN Library for Linux (aarch64sbsa)

cuDNN Library for Linux (x86_64)

cuDNN Library for Linux (PPC)

cuDNN Library for Windows (x64)

cuDNN Runtime Library for Ubuntu20.04 x86_64 (Deb)

cuDNN Developer Library for Ubuntu20.04 x86_64 (Deb)

cuDNN Code Samples and User Guide for Ubuntu20.04 x86_64 (Deb)

cuDNN Runtime Library for Ubuntu20.04 aarch64sbsa (Deb)

cuDNN Developer Library for Ubuntu20.04 aarch64sbsa (Deb)

cuDNN Code Samples and User Guide for Ubuntu20.04 aarch64sbsa (Deb)

- In this tutorial, I am going to install `cuDNN v8.2.4` for `CUDA 11.4`.

- There are several ways to install cuDNN but the simplest is to download the compressed file and extract to relevant CUDA directory.

```
tar -xzvf ${CUDNN_TAR_FILE}
```

```
sudo cp -P cuda/include/cudnn.h /usr/local/cuda-11.4/include
sudo cp -P cuda/lib64/libcudnn* /usr/local/cuda-11.4/lib64/
sudo chmod a+r /usr/local/cuda-11.4/lib64/libcudnn*
```

Verify Installation

- If you followed the above steps correctly, NVIDIA drivers, CUDA and cuDNN should have installed correctly.

- Execute `nvidia-smi` and `nvcc --version` to see if everything is working as expected and the CUDA versions match for them.

```
Wed Dec  8 01:43:18 2021
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 470.82.01   Driver Version: 470.82.01   CUDA Version: 11.4       |
|-------------------------------+----------------------+----------------------+
| GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|                               |                      |               MIG M. |
|===============================+======================+======================|
|   0  NVIDIA A100-SXM...  Off  | 00000000:03:00.0 Off |                    0 |
| N/A   25C    P0    47W / 400W |      0MiB / 40536MiB  |      0%      Default |
|                               |                      |             Disabled |
+-------------------------------+----------------------+----------------------+
|   1  NVIDIA A100-SXM...  Off  | 00000000:05:00.0 Off |                    0 |
| N/A   25C    P0    49W / 400W |      0MiB / 40536MiB  |      0%      Default |
|                               |                      |             Disabled |
+-------------------------------+----------------------+----------------------+
|   2  NVIDIA A100-SXM...  Off  | 00000000:0D:00.0 Off |                    0 |
| N/A   26C    P0    50W / 400W |      0MiB / 40536MiB  |      0%      Default |
|                               |                      |             Disabled |
+-------------------------------+----------------------+----------------------+
|   3  NVIDIA A100-SXM...  Off  | 00000000:0F:00.0 Off |                    0 |
| N/A   26C    P0    49W / 400W |      0MiB / 40536MiB  |      0%      Default |
|                               |                      |             Disabled |
+-------------------------------+----------------------+----------------------+
|   4  NVIDIA A100-SXM...  Off  | 00000000:17:00.0 Off |                    0 |
| N/A   26C    P0    49W / 400W |      0MiB / 40536MiB  |      0%      Default |
|                               |                      |             Disabled |
+-------------------------------+----------------------+----------------------+
|   5  NVIDIA A100-SXM...  Off  | 00000000:19:00.0 Off |                    0 |
| N/A   27C    P0    51W / 400W |      0MiB / 40536MiB  |      0%      Default |
|                               |                      |             Disabled |
+-------------------------------+----------------------+----------------------+
|   6  NVIDIA A100-SXM...  Off  | 00000000:21:00.0 Off |                    0 |
| N/A   24C    P0    51W / 400W |      0MiB / 40536MiB  |      0%      Default |
|                               |                      |             Disabled |
+-------------------------------+----------------------+----------------------+
|   7  NVIDIA A100-SXM...  Off  | 00000000:23:00.0 Off |                    0 |
| N/A   25C    P0    50W / 400W |      0MiB / 40536MiB  |      0%      Default |
|                               |                      |             Disabled |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                                  |
|  GPU   GI   CI        PID   Type   Process name                  GPU Memory |
|        ID   ID                                                   Usage      |
|=============================================================================|
|  No running processes found                                                 |
+-----------------------------------------------------------------------------+
```

```
          ubuntu-2004:~/Downloads/cuda_11_4$ nvcc --version
nvcc: NVIDIA (R) Cuda compiler driver
Copyright (c) 2005-2021 NVIDIA Corporation
Built on Mon_Oct_11_21:27:02_PDT_2021
Cuda compilation tools, release 11.4, V11.4.152
Build cuda_11.4.r11.4/compiler.30521435_0
```