

WSL Ubuntu 22.04 LTS

CUDA Install

WINDOWS 11 기준

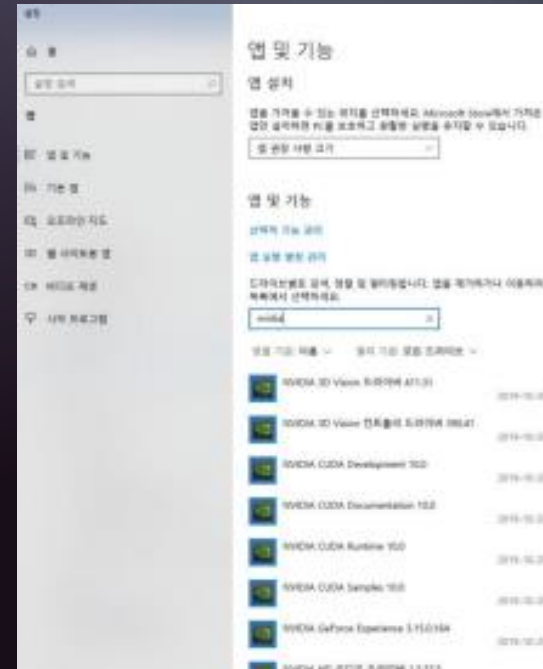
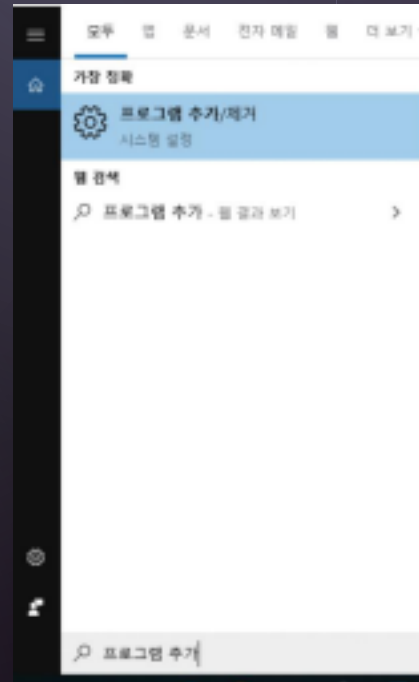
CUDA TOOLKIT 12.6

CUDNN V8.9.7, FOR CUDA 12.X



0. Common

- 기존 엔비디아 드라이버 제거
- 프로그램 추가/제거 -> 이름 검색에서 "NVIDIA"로 검색되는 모든 프로그램 제거
- 재부팅



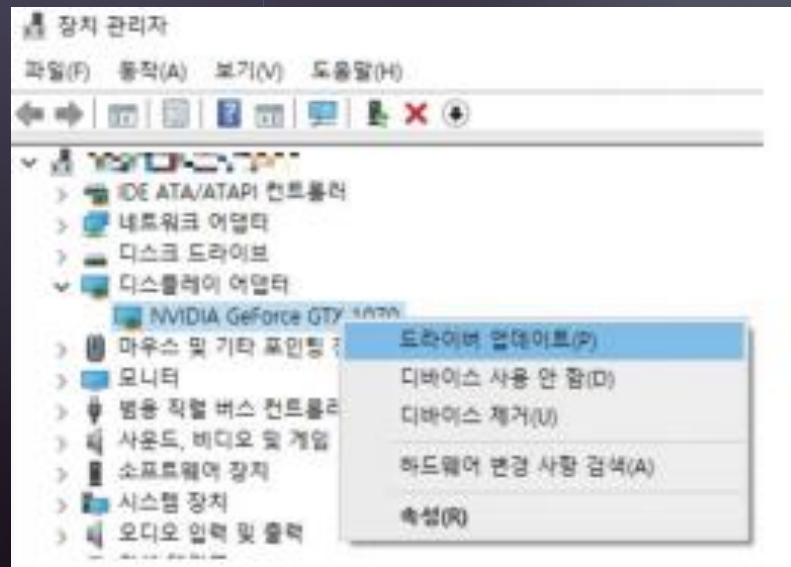
0. Common

- 프로그램 파일 폴더에 남아있는 "NVIDIA" 폴더도 제거



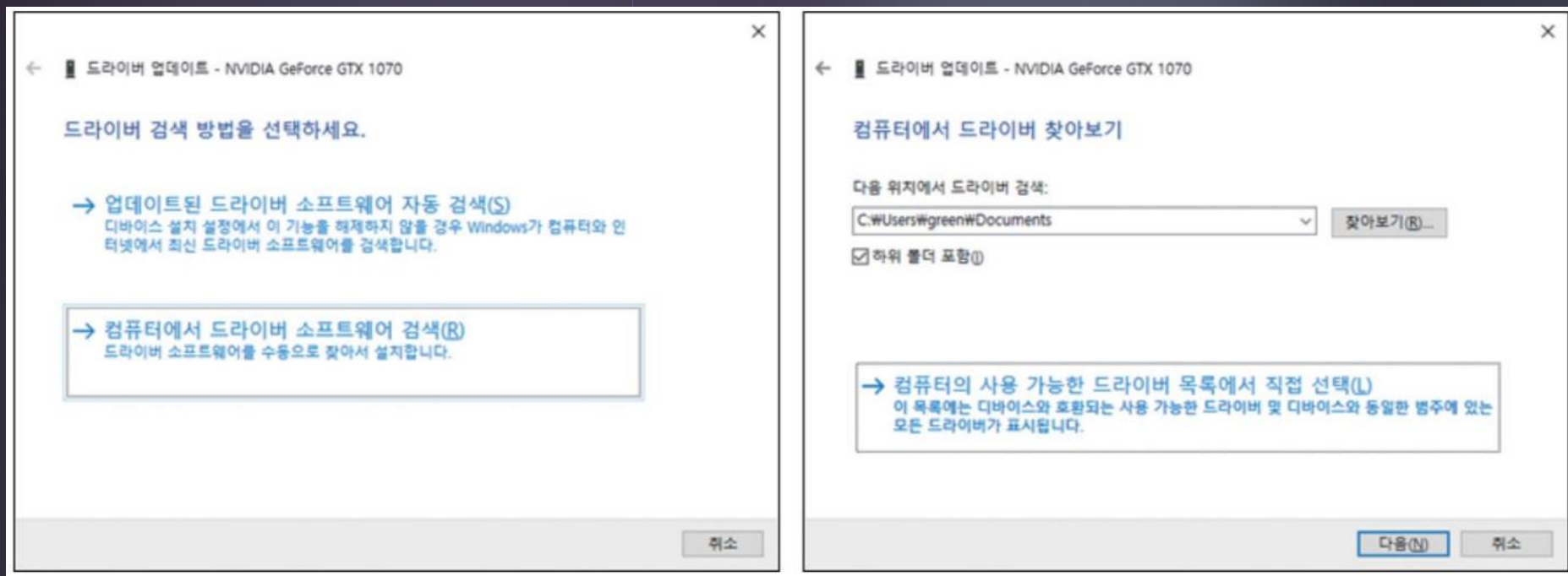
0. Common

- 시작 -> 장치 관리자 열기
- 그래픽 카드 -> 드라이버 업데이트 선택



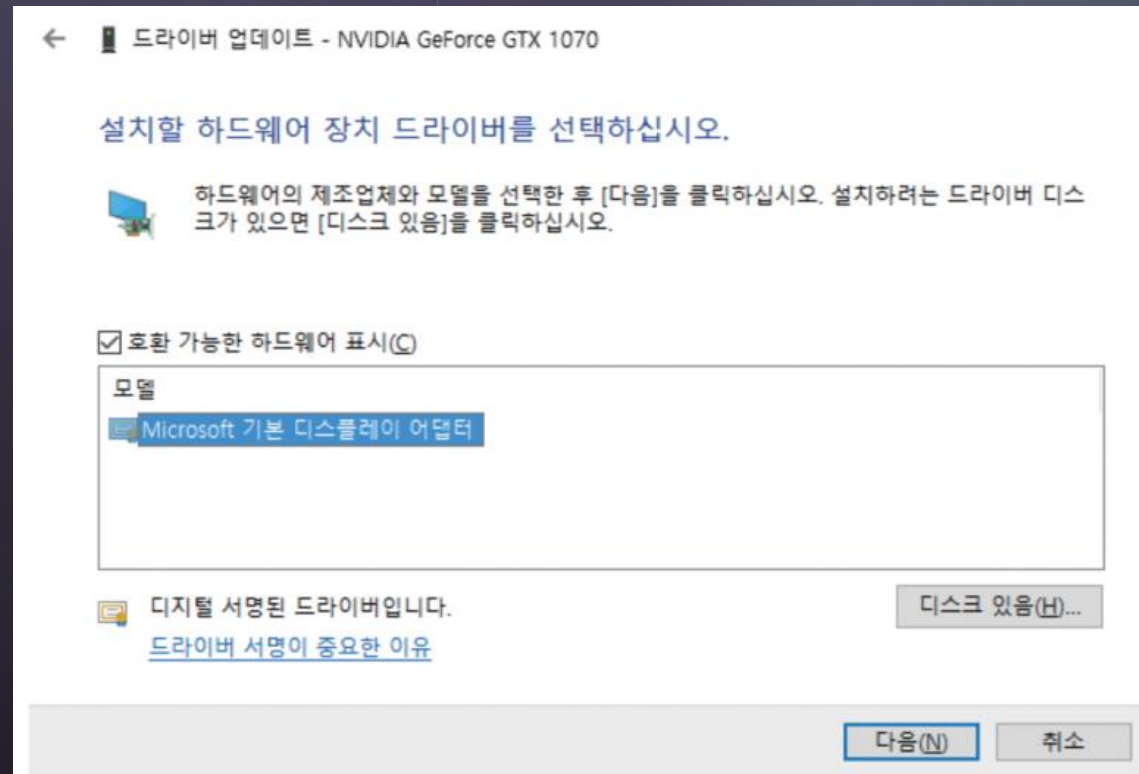
0. Common

- 컴퓨터에서 드라이버 소프트웨어 검색 -> 컴퓨터의 사용 가능한 드라이버 목록에서 직접 선택



0. Common

- Microsoft 기본 디스플레이 어댑터 선택



0. Common

- CUDA TOOLKIT 12.6
- CUDA 설치 파일 다운로드 (<https://developer.nvidia.com/cuda-downloads>)
- Windows 환경 버전

CUDA Toolkit 12.6 Update 3 Downloads

Select Target Platform

Click on the green buttons that describe your target platform. Only supported platforms will be shown. By downloading and using the software, you agree to fully comply with the terms and conditions of the [CUDA EULA](#).

Operating System

Linux

Windows

Architecture

x86_64

Version

10

11

Server 2022

Installer Type

exe (local)

exe (network)

Download Installer for Windows 11 x86_64

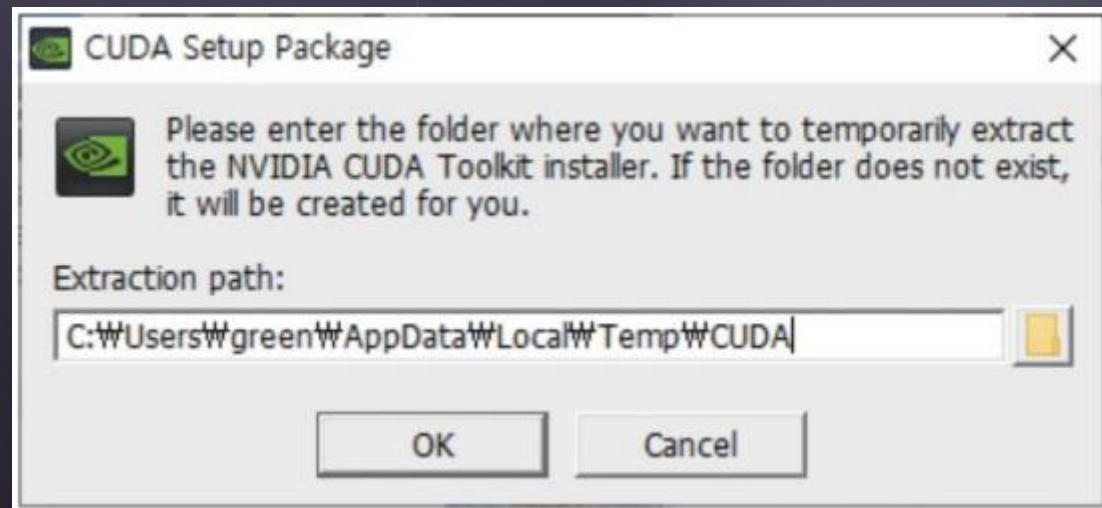
The base installer is available for download below.

> CUDA Toolkit Installer

Download (3.0 GB)

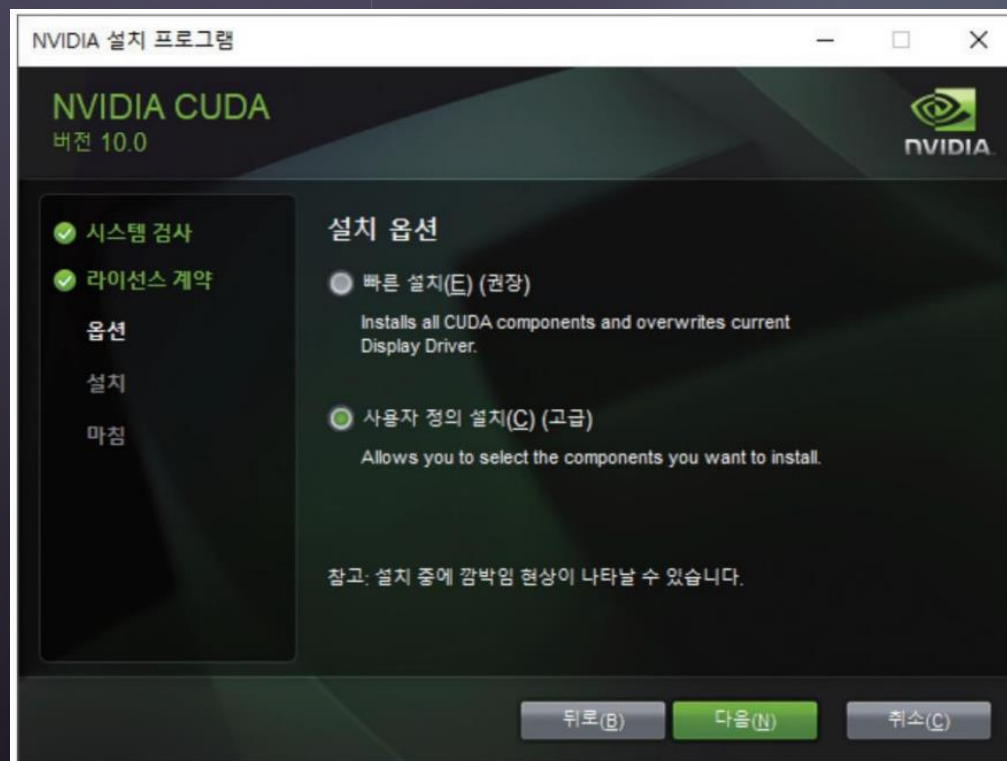
0. Common

- 설치용 임시 파일의 압축을 풀 경로 선택
- 설치가 끝나면 임시 파일은 지워짐



0. Common

- 사용자 정의 설치 선택



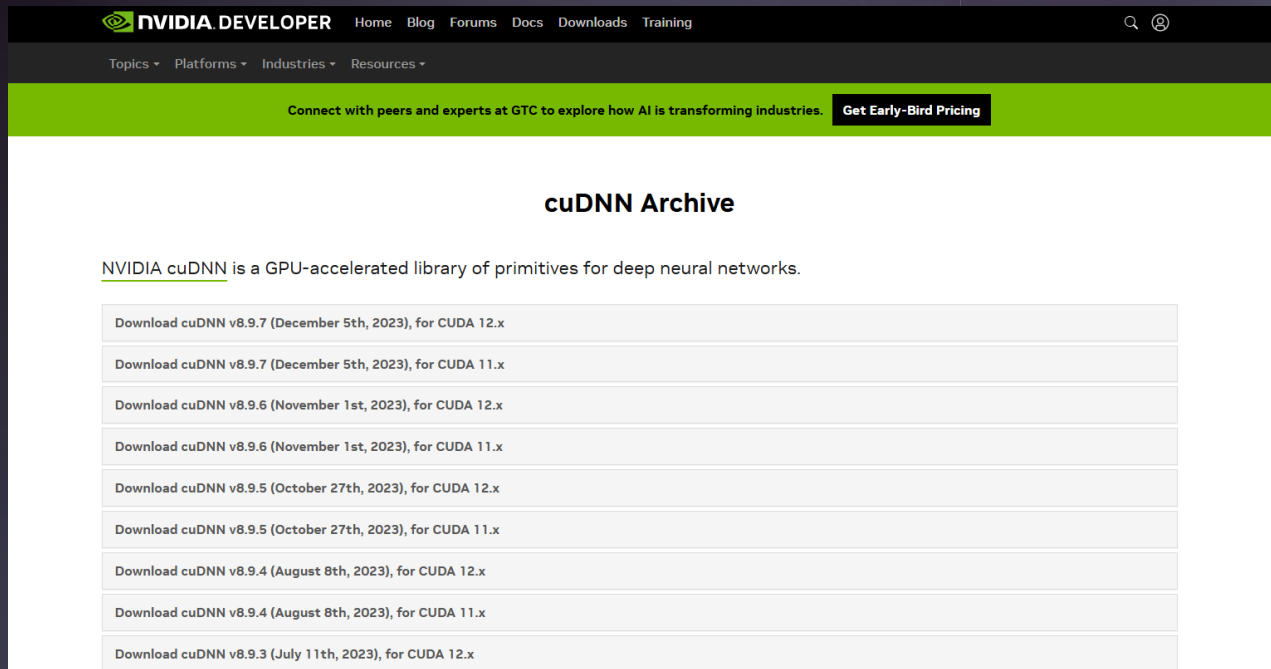
0. Common

- CUDA -> Visual Studio Integration 선택 해제



1. Windows

- [cuDNN\(https://developer.nvidia.com/rdp/cudnn-archive\)](https://developer.nvidia.com/rdp/cudnn-archive)
- 로그인 후, cuDNN Archive에서 CUDA 버전에 맞는 cuDNN 다운로드 링크 선택
- Local Installer for Windows (Zip) 다운



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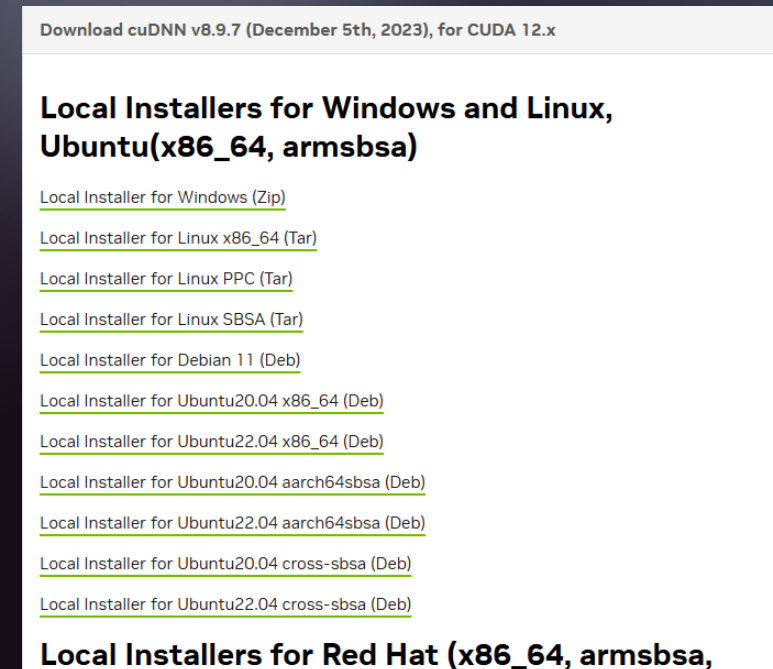
Topics ▾ Platforms ▾ Industries ▾ Resources ▾

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cuDNN Archive

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

Download cuDNN v8.9.7 (December 5th, 2023), for CUDA 12.x
Download cuDNN v8.9.7 (December 5th, 2023), for CUDA 11.x
Download cuDNN v8.9.6 (November 1st, 2023), for CUDA 12.x
Download cuDNN v8.9.6 (November 1st, 2023), for CUDA 11.x
Download cuDNN v8.9.5 (October 27th, 2023), for CUDA 12.x
Download cuDNN v8.9.5 (October 27th, 2023), for CUDA 11.x
Download cuDNN v8.9.4 (August 8th, 2023), for CUDA 12.x
Download cuDNN v8.9.4 (August 8th, 2023), for CUDA 11.x
Download cuDNN v8.9.3 (July 11th, 2023), for CUDA 12.x



Download cuDNN v8.9.7 (December 5th, 2023), for CUDA 12.x

Local Installers for Windows and Linux, Ubuntu(x86_64, armsbsa)

[Local Installer for Windows \(Zip\)](#)

[Local Installer for Linux x86_64 \(Tar\)](#)

[Local Installer for Linux PPC \(Tar\)](#)

[Local Installer for Linux SBSA \(Tar\)](#)

[Local Installer for Debian 11 \(Deb\)](#)

[Local Installer for Ubuntu20.04 x86_64 \(Deb\)](#)

[Local Installer for Ubuntu22.04 x86_64 \(Deb\)](#)

[Local Installer for Ubuntu20.04 aarch64sbsa \(Deb\)](#)

[Local Installer for Ubuntu22.04 aarch64sbsa \(Deb\)](#)

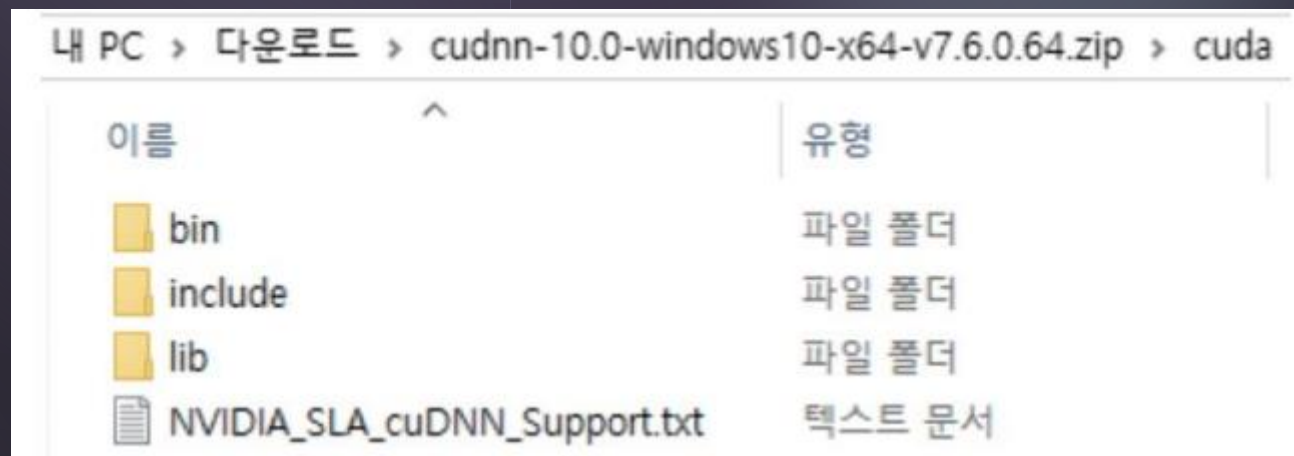
[Local Installer for Ubuntu20.04 cross-sbsa \(Deb\)](#)

[Local Installer for Ubuntu22.04 cross-sbsa \(Deb\)](#)

Local Installers for Red Hat (x86_64, armsbsa,

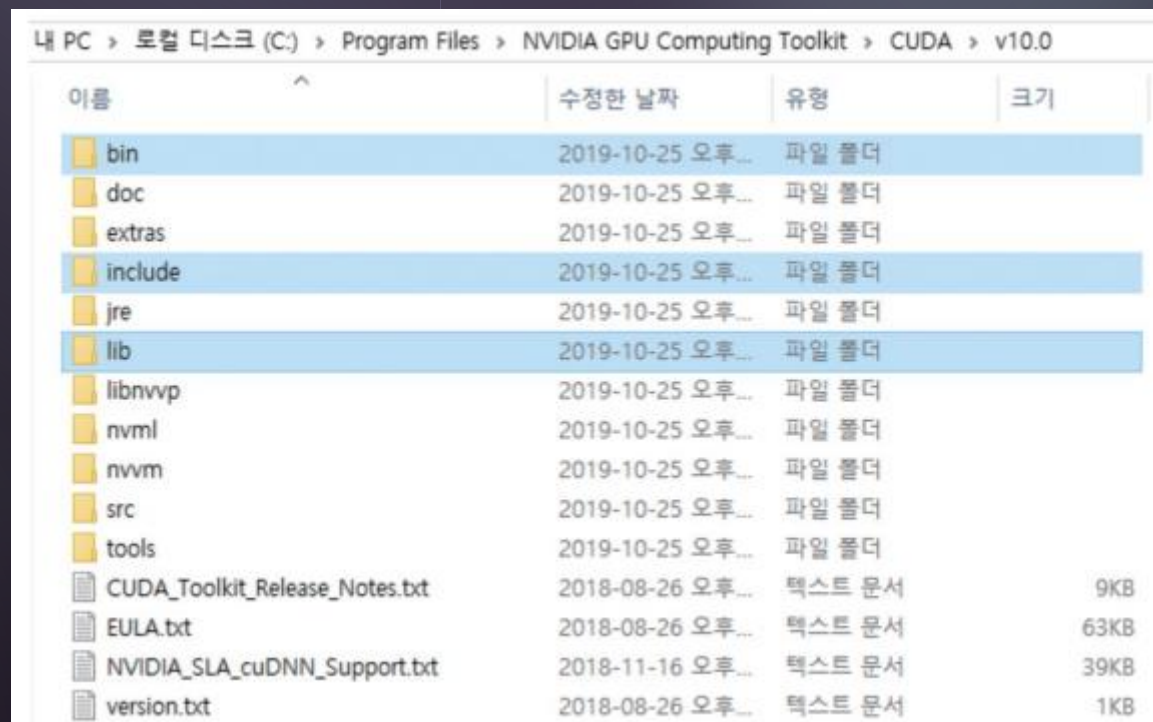
1. Windows

- cuDNN 압축 파일의 내용



1. Windows

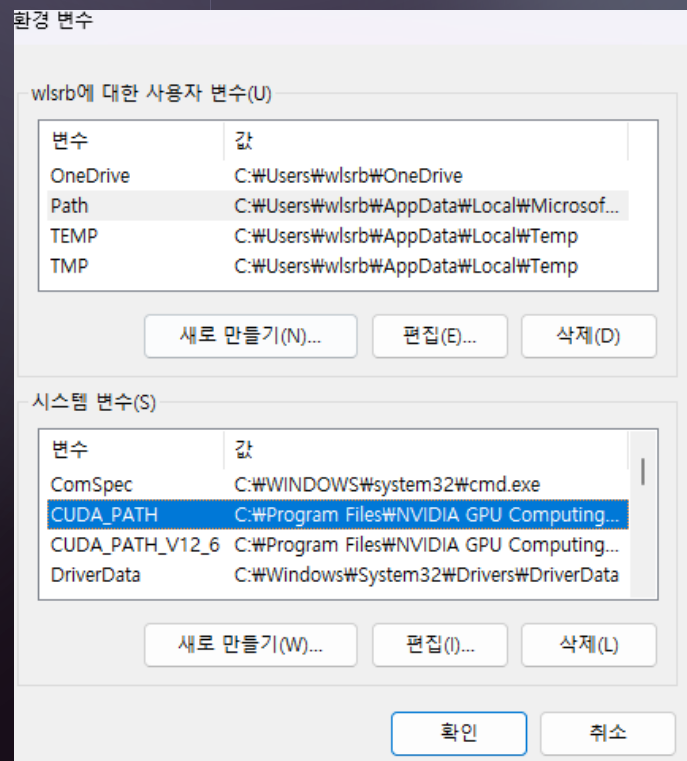
- cuDNN을 CUDA가 설치된 폴더에 붙여넣기
- 덮어쓰기로 붙여 넣으면 됨



이름	수정한 날짜	유형	크기
bin	2019-10-25 오후...	파일 폴더	
doc	2019-10-25 오후...	파일 폴더	
extras	2019-10-25 오후...	파일 폴더	
include	2019-10-25 오후...	파일 폴더	
jre	2019-10-25 오후...	파일 폴더	
lib	2019-10-25 오후...	파일 폴더	
libnvvp	2019-10-25 오후...	파일 폴더	
nvml	2019-10-25 오후...	파일 폴더	
nvvm	2019-10-25 오후...	파일 폴더	
src	2019-10-25 오후...	파일 폴더	
tools	2019-10-25 오후...	파일 폴더	
CUDA_Toolkit_Release_Notes.txt	2018-08-26 오후...	텍스트 문서	9KB
EULA.txt	2018-08-26 오후...	텍스트 문서	63KB
NVIDIA_SLA_cuDNN_Support.txt	2018-11-16 오후...	텍스트 문서	39KB
version.txt	2018-08-26 오후...	텍스트 문서	1KB

1. Windows

- 설정 -> 시스템 -> 정보 -> 고급 시스템 설정 -> 환경 변수 확인



1. Windows

- 명령 프롬프트로 확인
- nvidia-smi
- nvcc -V

```
C:\Users\wlsrb>nvidia-smi
Thu Dec 19 17:22:51 2024

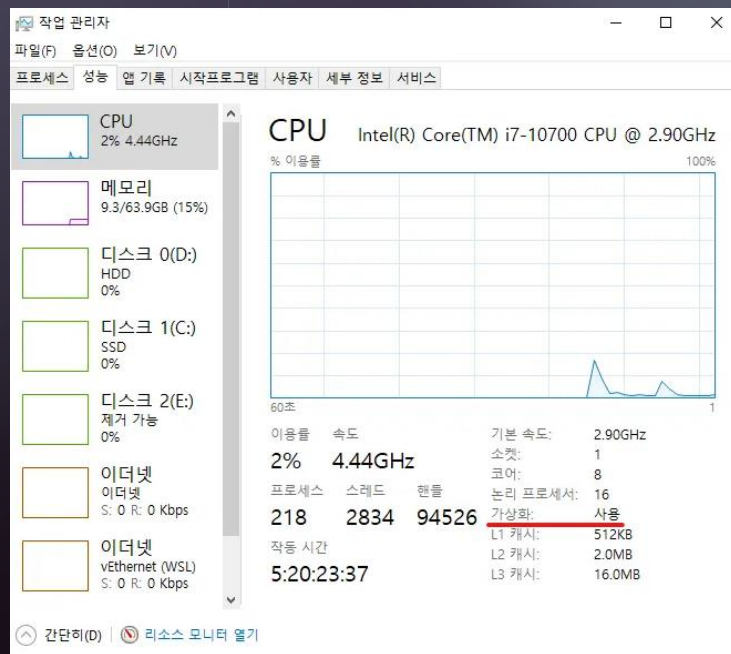
+-----+
| NVIDIA-SMI 561.17                Driver Version: 561.17          CUDA Version: 12.6         |
+-----+-----+
| GPU   Name                               Driver-Model  Bus-Id        Disp.A    Volatile Uncorr. ECC |
| Fan  Temp  Perf              Pwr:Usage/Cap     Memory-Usage GPU-Util  Compute M. |
|              |              |                      |              |      MIG M. |
+-----+-----+
|  0  NVIDIA GeForce RTX 4060 ... WDDM      00000000:01:00:0 Off          N/A |
| N/A   52C    P0              17W /  85W      0MiB /  8188MiB  0%         Default |
|              |              |                      |              |      N/A |
+-----+-----+

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

```
C:\Users\wlsrb>nvcc -V
nvcc: NVIDIA (R) Cuda compiler driver
Copyright (c) 2005-2024 NVIDIA Corporation
Built on Wed_Oct_30_01:18:48_Pacific_Daylight_Time_2024
Cuda compilation tools, release 12.6, V12.6.85
Build cuda_12.6.r12.6/compiler.35059454_0
```

2. WSL-Ubuntu

- Ctrl + Alt + Del 을 눌러 작업 관리자의 성능탭에서 CPU의 가상화가 '사용' 인지 확인
- 가상화가 '사용' 이 아니라면 BIOS에서 설정
 - 바이오스 설정 : Del 또는 F2키를 눌러 BIOS 진입 -> Advanced Mode 클릭 -> Intel Virtualization Technology 활성화 -> 저장 후 재시작



2. WSL-Ubuntu

- <0. Common>까지 동일하게 설치
- Windows PowerShell에서 설치 가능 항목 확인

```
PS C:\Users\wlsrb> wsl -l -o
다음은 설치할 수 있는 유효한 배포판 목록입니다.
'wsl.exe --install <Distro>'를 사용하여 설치합니다.

NAME                                FRIENDLY NAME
Ubuntu                             Ubuntu
Debian                             Debian GNU/Linux
kali-linux                         Kali Linux Rolling
Ubuntu-18.04                       Ubuntu 18.04 LTS
Ubuntu-20.04                       Ubuntu 20.04 LTS
Ubuntu-22.04                       Ubuntu 22.04 LTS
Ubuntu-24.04                       Ubuntu 24.04 LTS
OracleLinux_7_9                    Oracle Linux 7.9
OracleLinux_8_7                    Oracle Linux 8.7
OracleLinux_9_1                    Oracle Linux 9.1
openSUSE-Leap-15.6                 openSUSE Leap 15.6
SUSE-Linux-Enterprise-15-SP5       SUSE Linux Enterprise 15 SP5
SUSE-Linux-Enterprise-15-SP6       SUSE Linux Enterprise 15 SP6
openSUSE-Tumbleweed                openSUSE Tumbleweed
PS C:\Users\wlsrb> |
```

2. WSL-Ubuntu

- Windows PowerShell에서 다음 명령어로 Ubuntu-22.04 설치
- `wsl --install -d Ubuntu-22.04`
- 아이디와 비밀번호 설정
- 이후 `wsl --status` 명령어로 wsl 버전이 2로 뜨는지 확인

```
PS C:\Users\wlsrb> wsl --status
기본 배포: Ubuntu-22.04
기본 버전: 2
현재 컴퓨터 구성에서는 WSL1이 지원되지 않습니다.
WSL1을 사용하려면 "Windows Subsystem for Linux" 선택적 구성 요소를 사용하세요.
PS C:\Users\wlsrb> |
```

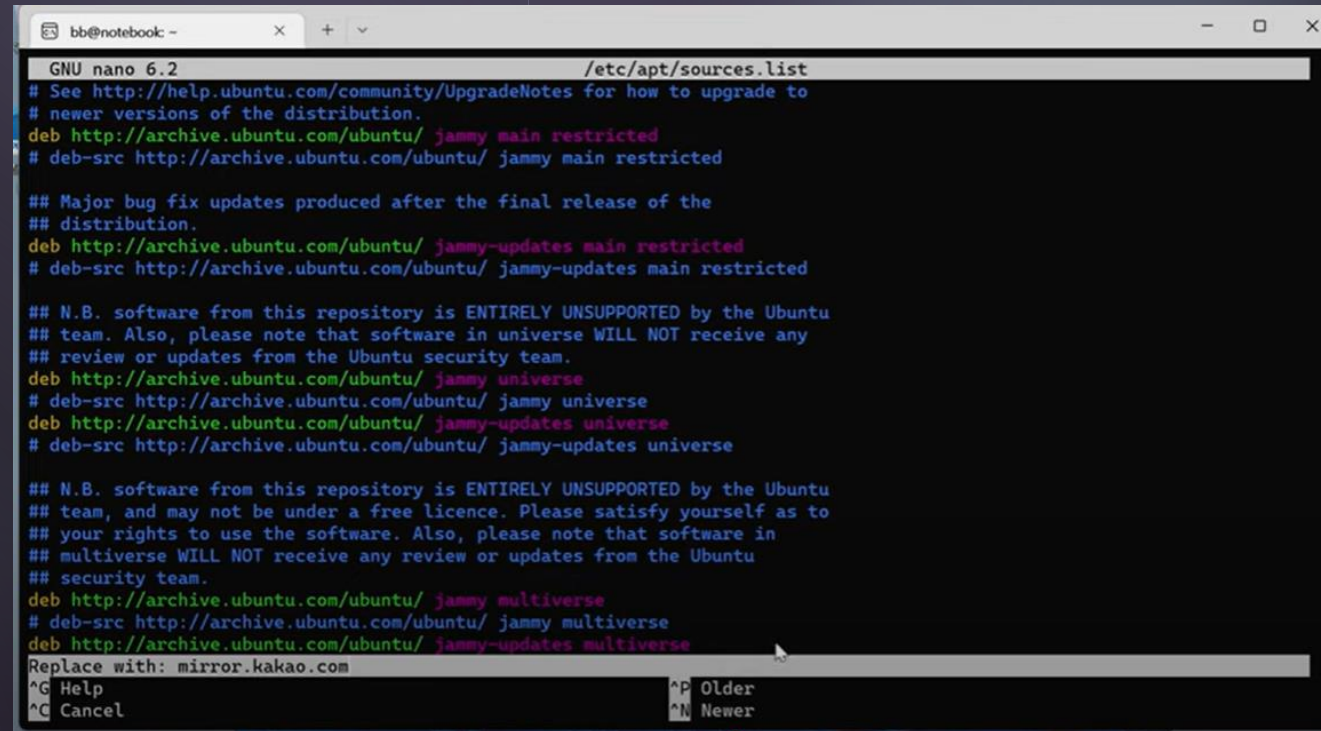

2. WSL-Ubuntu

- 빠른 리포지토리로 변경
- `sudo nano /etc/apt/sources.list`

```
bb@notebook: ~  
Installing, this may take a few minutes...  
Please create a default UNIX user account. The username does not need to match your Windows username.  
For more information visit: https://aka.ms/wslusers  
Enter new UNIX username: bb  
New password:  
Retype new password:  
passwd: password updated successfully  
Installation successful!  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
Welcome to Ubuntu 22.04.1 LTS (GNU/Linux 5.15.79.1-microsoft-standard-WSL2 x86_64)  
  
* Documentation: https://help.ubuntu.com  
* Management: https://landscape.canonical.com  
* Support: https://ubuntu.com/advantage  
  
This message is shown once a day. To disable it please create the  
/home/bb/.hushlogin file.  
bb@notebook:~$ sudo nano /etc/apt/sources.list
```

2. WSL-Ubuntu

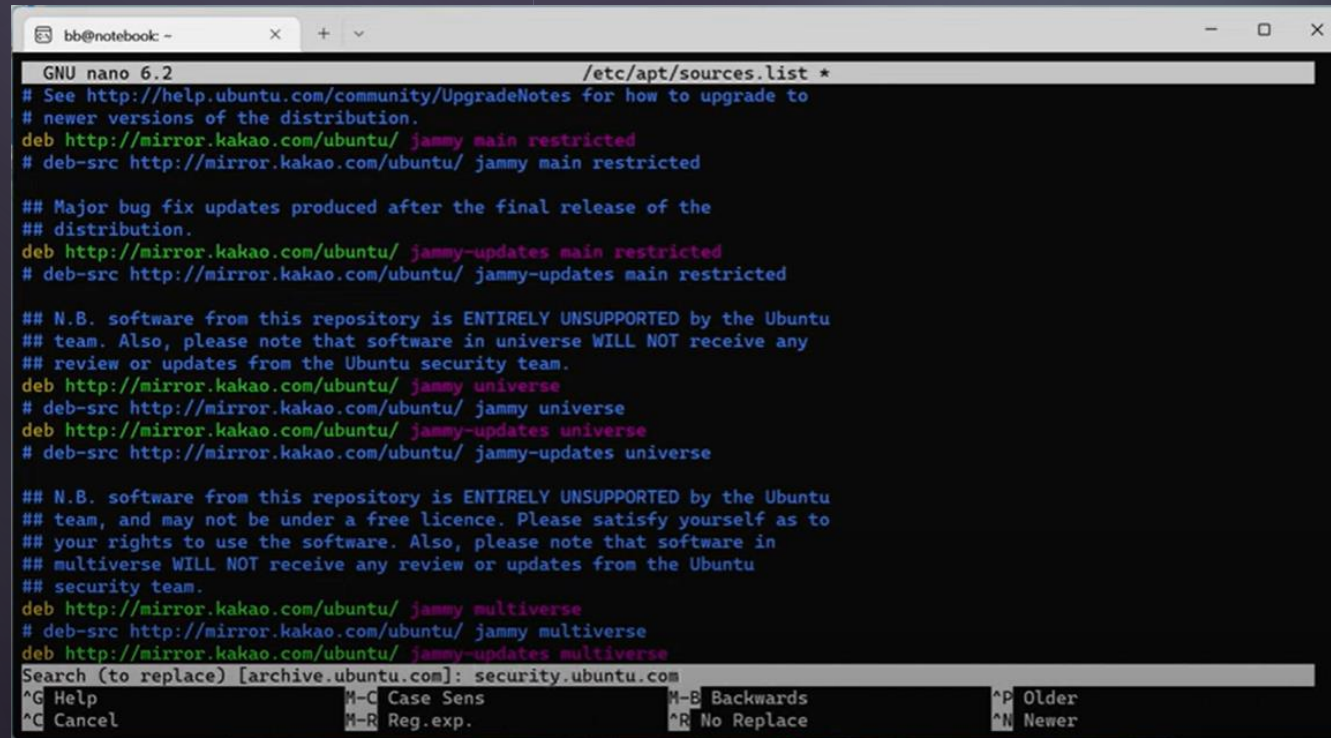
- 빠른 리포지토리로 변경
- Ctrl + W 누르고 archive.ubuntu.com 입력 -> mirror.kakao.com 입력 후, A(all) 눌러서 변경



```
bb@notebook: ~  
GNU nano 6.2 /etc/apt/sources.list  
# See http://help.ubuntu.com/community/UpgradeNotes for how to upgrade to  
# newer versions of the distribution.  
deb http://archive.ubuntu.com/ubuntu/ jammy main restricted  
# deb-src http://archive.ubuntu.com/ubuntu/ jammy main restricted  
  
## Major bug fix updates produced after the final release of the  
## distribution.  
deb http://archive.ubuntu.com/ubuntu/ jammy-updates main restricted  
# deb-src http://archive.ubuntu.com/ubuntu/ jammy-updates main restricted  
  
## N.B. software from this repository is ENTIRELY UNSUPPORTED by the Ubuntu  
## team. Also, please note that software in universe WILL NOT receive any  
## review or updates from the Ubuntu security team.  
deb http://archive.ubuntu.com/ubuntu/ jammy universe  
# deb-src http://archive.ubuntu.com/ubuntu/ jammy universe  
deb http://archive.ubuntu.com/ubuntu/ jammy-updates universe  
# deb-src http://archive.ubuntu.com/ubuntu/ jammy-updates universe  
  
## N.B. software from this repository is ENTIRELY UNSUPPORTED by the Ubuntu  
## team, and may not be under a free licence. Please satisfy yourself as to  
## your rights to use the software. Also, please note that software in  
## multiverse WILL NOT receive any review or updates from the Ubuntu  
## security team.  
deb http://archive.ubuntu.com/ubuntu/ jammy multiverse  
# deb-src http://archive.ubuntu.com/ubuntu/ jammy multiverse  
deb http://archive.ubuntu.com/ubuntu/ jammy-updates multiverse  
# deb-src http://archive.ubuntu.com/ubuntu/ jammy-updates multiverse  
Replace with: mirror.kakao.com  
^G Help      ^P Older  
^C Cancel    ^N Newer
```

2. WSL-Ubuntu

- 빠른 리포지토리로 변경
- 다시 Ctrl + W 누르고 이번엔 security.ubuntu.com 입력
- mirror.kakao.com 입력 후, A(all) 눌러서 변경 -> Ctrl+o -> Y -> Ctrl+x로 저장하고 나감



```
bb@notebook: ~  
GNU nano 6.2 /etc/apt/sources.list *  
# See http://help.ubuntu.com/community/UpgradeNotes for how to upgrade to  
# newer versions of the distribution.  
deb http://mirror.kakao.com/ubuntu/ jammy main restricted  
# deb-src http://mirror.kakao.com/ubuntu/ jammy main restricted  
  
## Major bug fix updates produced after the final release of the  
## distribution.  
deb http://mirror.kakao.com/ubuntu/ jammy-updates main restricted  
# deb-src http://mirror.kakao.com/ubuntu/ jammy-updates main restricted  
  
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## team. Also, please note that software in universe WILL NOT receive any  
## review or updates from the Ubuntu security team.  
deb http://mirror.kakao.com/ubuntu/ jammy universe  
# deb-src http://mirror.kakao.com/ubuntu/ jammy universe  
deb http://mirror.kakao.com/ubuntu/ jammy-updates universe  
# deb-src http://mirror.kakao.com/ubuntu/ jammy-updates universe  
  
## N.B. software from this repository is ENTIRELY UNSUPPORTED by the Ubuntu  
## team, and may not be under a free licence. Please satisfy yourself as to  
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## multiverse WILL NOT receive any review or updates from the Ubuntu  
## security team.  
deb http://mirror.kakao.com/ubuntu/ jammy multiverse  
# deb-src http://mirror.kakao.com/ubuntu/ jammy multiverse  
deb http://mirror.kakao.com/ubuntu/ jammy-updates multiverse  
# deb-src http://mirror.kakao.com/ubuntu/ jammy-updates multiverse  
Search (to replace) [archive.ubuntu.com]: security.ubuntu.com  
^G Help      ^M-C Case Sens  ^M-B Backwards  ^P Older  
^C Cancel    ^M-R Reg.exp.   ^R No Replace    ^N Newer
```

2. WSL-Ubuntu

- `sudo apt update`
- `sudo apt upgrade`
- `sudo nano /etc/wsl.conf` 명령어로 아래 사진과 같은 코드가 있는지 확인 (없으면 저장)



```
bb@notebook: ~  
GNU nano 6.2 /etc/wsl.conf *  
[boot]  
systemd = true  
  
Save modified buffer?  
Y Yes  
N No ^C Cancel
```


2. WSL-Ubuntu

- CUDA TOOLKIT 12.6
- CUDA 설치 파일 다운로드(https://developer.nvidia.com/cuda-downloads?target_os=Linux&target_arch=x86_64&Distribution=WSL-Ubuntu&target_version=2.0&target_type=deb_local)

CUDA Toolkit 12.6 Update 3 Downloads

Select Target Platform

Click on the green buttons that describe your target platform. Only supported platforms will be shown. By downloading and using the software, you agree to fully comply with the terms and conditions of the [CUDA EULA](#).

Operating System	Linux	Windows						
Architecture	x86_64	arm64-sbsa	aarch64-jetson					
Distribution	Amazon-Linux	Azure-Linux	Debian	Fedora	KylinOS	OpenSUSE	RHEL	Rocky
	SLES	Ubuntu	WSL-Ubuntu					
Version	2.0							
Installer Type	deb (local)	deb (network)	runfile (local)					

Windows 정품 인증

2. WSL-Ubuntu

- 한 줄씩 그대로 설치

Download Installer for Linux WSL-Ubuntu 2.0 x86_64

The base installer is available for download below.

> CUDA Toolkit Installer

Installation Instructions:

```
$ wget https://developer.download.nvidia.com/compute/cuda/repos/wsl-ubuntu/x86_64/cuda-wsl-ubuntu.pin
$ sudo mv cuda-wsl-ubuntu.pin /etc/apt/preferences.d/cuda-repository-pin-600
$ wget https://developer.download.nvidia.com/compute/cuda/12.6.3/local_installers/cuda-repo-wsl-ubuntu-12-6-local_12.6.3-1_amd64.deb
$ sudo dpkg -i cuda-repo-wsl-ubuntu-12-6-local_12.6.3-1_amd64.deb
$ sudo cp /var/cuda-repo-wsl-ubuntu-12-6-local/cuda-*keyring.gpg /usr/share/keyrings/
$ sudo apt-get update
$ sudo apt-get -y install cuda-toolkit-12-6
```

Additional installation options are detailed [here](#).

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](#).

2. WSL-Ubuntu

- [cuDNN\(https://developer.nvidia.com/rdp/cudnn-archive\)](https://developer.nvidia.com/rdp/cudnn-archive)
- 로그인 후, cuDNN Archive에서 CUDA 버전에 맞는 cuDNN 다운로드 링크 선택
- Local Installer for Ubuntu22.04 x86_64 (Deb) 다운

cuDNN Archive

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Download cuDNN v8.9.7 (December 5th, 2023), for CUDA 12.x

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- [Local Installer for Linux x86_64 \(Tar\)](#)
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- [Local Installer for Linux SBSA \(Tar\)](#)
- [Local Installer for Debian 11 \(Deb\)](#)
- [Local Installer for Ubuntu20.04 x86_64 \(Deb\)](#)
- [Local Installer for Ubuntu22.04 x86_64 \(Deb\)](#)
- [Local Installer for Ubuntu20.04 aarch64sbsa \(Deb\)](#)
- [Local Installer for Ubuntu22.04 aarch64sbsa \(Deb\)](#)
- [Local Installer for Ubuntu20.04 cross-sbsa \(Deb\)](#)
- [Local Installer for Ubuntu22.04 cross-sbsa \(Deb\)](#)

Local Installers for Red Hat (x86_64, armsbsa, Power architecture)

2. WSL-Ubuntu

1. Ubuntu에서 다음 명령어로 현재 경로 이동한다.

- `cd /mnt/c/Users/[컴퓨터 폴더 사용자명]/Downloads`
- (.deb)파일이 다운로드 되어있는 경로로 바꿔주면 된다.

2. 다운받은 cuDNN을 wsl의 /home/[Ubuntu 사용자명]으로 이동한다.

- `mv '다운받은 cuDNN 파일' /home/[ubuntu 사용자명]`

3. Ubuntu 사용자명이 있는 경로로 들어와서 cuDNN 설치한다.

- `sudo dpkg -i '파일명'`

2. WSL-Ubuntu

1. GPG key가 나타나지 않으면 프롬프트 창에서 주어지는 명령어 입력 후, 다시 설치한다.

- ex.) `sudo cp /var/cudnn-local-repo-ubuntu2204-8.9.0.13/cudnn-local-FAED14DD-keyring.gpg /usr/share/keyrings/`

2. 본인이 deb 파일이 아닌, 압축파일을 받았다면 다음 명령어를 입력하여 설치한다.

`tar -xvf '다운받은 cudnn 파일'`

`sudo cp cudnn-*-archive/include/cudnn*.h /usr/local/cuda/include`

`sudo cp -P cudnn-*-archive/lib/libcudnn* /usr/local/cuda/lib64`

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

nano 편집기를 이용하여 환경변수 수정

`sudo nano ~/.bashrc`

bashrc 마지막 줄에 추가 후 `ctrl+o -> enter -> ctrl+x`

`export PATH=/usr/local/cuda-11.8/bin:$PATH`

`export LD_LIBRARY_PATH=/usr/local/cuda-11.8/lib64:$LD_LIBRARY_PATH`

bashrc에 수정된 내용 바로적용

`source ~/.bashrc`

2. WSL-Ubuntu

- 그래도 설치가 안되면 홈페이지(<https://docs.nvidia.com/cuda/cuda-installation-guide-linux/#post-installation-actions>)에서
- `export PATH=/usr/local/cuda-12.6/bin${PATH:+:${PATH}}` 복사
- 코드에서 'cuda-12.6'은 toolkit 버전이니 설치한 버전이 다르다면 변경해서 진행



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10. Post-installation Actions

The post-installation actions must be manually performed. These actions are split into mandatory, recommended, and optional sections.

10.1. Mandatory Actions

Some actions must be taken after the installation before the CUDA Toolkit can be used.

10.1.1. Environment Setup

The `PATH` variable needs to include `export PATH=/usr/local/cuda-12.6/bin${PATH:+:${PATH}}`. Nsight Compute has moved to `/opt/nvidia/nsight-compute/` only in rpm/deb installation method. When using `.run` installer it is still located under `/usr/local/cuda-12.6/`.

To add this path to the `PATH` variable:

```
export PATH=/usr/local/cuda-12.6/bin${PATH:+:${PATH}}
```

In addition, when using the runfile installation method, the `LD_LIBRARY_PATH` variable needs to contain `/usr/local/cuda-12.6/lib64` on a 64-bit system, or `/usr/local/cuda-12.6/lib` on a 32-bit system

> To change the environment variables for 64-bit operating systems:

```
export LD_LIBRARY_PATH=/usr/local/cuda-12.6/lib64\
${LD_LIBRARY_PATH:+:${LD_LIBRARY_PATH}}
```

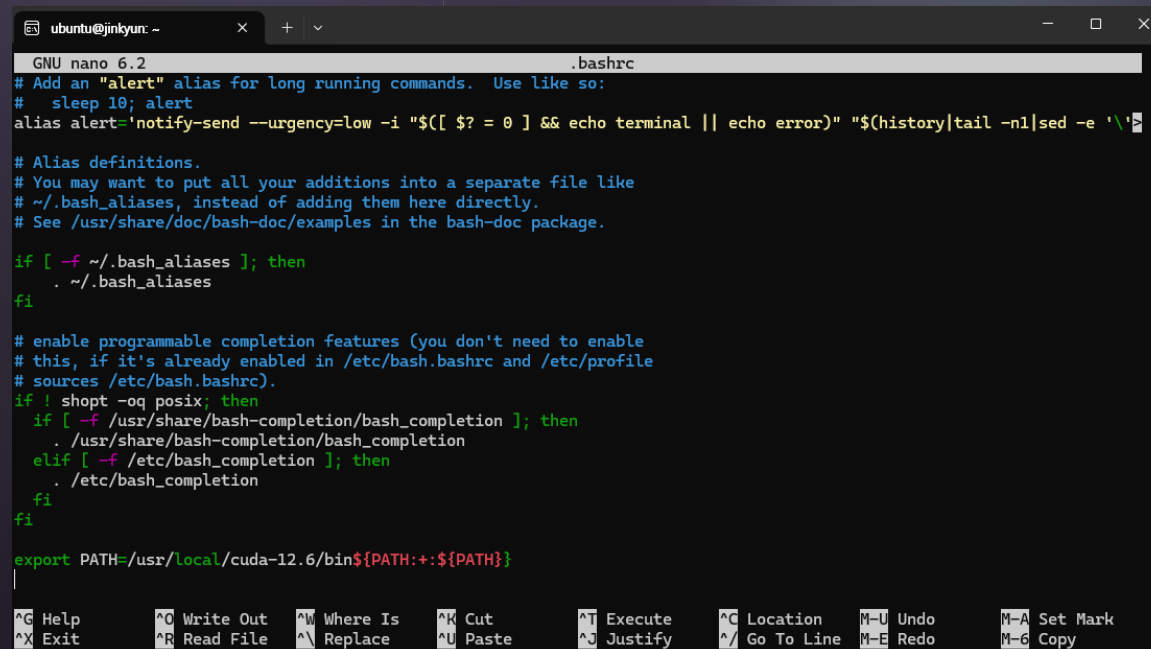
> To change the environment variables for 32-bit operating systems:

```
export LD_LIBRARY_PATH=/usr/local/cuda-12.6/lib\
${LD_LIBRARY_PATH:+:${LD_LIBRARY_PATH}}
```

Note that the above paths change when using a custom install path with the runfile installation method.

2. WSL-Ubuntu

- `cd ~`
- `nano .bashrc`
- 맨 아래 코드에 복사한 `export PATH=/usr/local/cuda-12.6/bin${PATH:+:${PATH}}` 붙여넣기
- `Ctrl + o -> Y -> Ctrl + x` 로 저장하고 나가기



```
ubuntu@jinkyun: ~
GNU nano 6.2 .bashrc
# Add an "alert" alias for long running commands. Use like so:
#   sleep 10; alert
alias alert='notify-send --urgency=low -i "${[ $? = 0 ]} && echo terminal || echo error" "$(history|tail -n1|sed -e '\''
```

export PATH=/usr/local/cuda-12.6/bin\${PATH:+:\${PATH}}

^G Help ^O Write Out ^W Where Is ^K Cut ^T Execute ^C Location M-U Undo M-A Set Mark
^X Exit ^R Read File ^N Replace ^U Paste ^J Justify ^_ Go To Line M-E Redo M-G Copy

2. WSL-Ubuntu

- source ~/.bashrc
- echo \$PATH
- 이곳에 cuda toolkit이 저장되었다면 Ubuntu 재시작

```
ubuntu@jinkyun: ~  
ubuntu@jinkyun:~$ source ~/.bashrc  
ubuntu@jinkyun:~$ echo $PATH  
/usr/local/cuda-12.6/bin:/usr/local/cuda-12.6/bin:/usr/local/cuda-12.6/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr  
/bin:/sbin:/bin:/usr/games:/usr/local/games:/usr/lib/wsl/lib:/mnt/c/Program Files/NVIDIA GPU Computing Toolkit/CUDA/v12.  
6/bin:/mnt/c/Program Files/NVIDIA GPU Computing Toolkit/CUDA/v12.6/libnvvp:/mnt/c/WINDOWS/system32:/mnt/c/WINDOWS:/mnt/c  
/WINDOWS/System32/Wbem:/mnt/c/WINDOWS/System32/WindowsPowerShell/v1.0:/mnt/c/WINDOWS/System32/OpenSSH:/mnt/c/Program F  
iles/NVIDIA Corporation/Nsight Compute 2024.3.2:/mnt/c/Program Files (x86)/NVIDIA Corporation/PhysX/Common:/mnt/c/Progr  
am Files/NVIDIA Corporation/NVIDIA NvDLISR:/mnt/c/Users/wlsrb/AppData/Local/Microsoft/WindowsApps:/mnt/c/Users/wlsrb/App  
Data/Local/Programs/Microsoft VS Code/bin:/snap/bin  
ubuntu@jinkyun:~$ |
```

2. WSL-Ubuntu

- `sudo apt install nvidia-cuda-toolkit`
- 비밀번호 입력 후, 설치
- 다시 Ubuntu를 재시작 하여 'nvidia-smi'와 'nvcc -V' 명령어로 설치 확인

```
ubuntu@jinkyun: ~  
ubuntu@jinkyun:~$ nvidia-smi  
Thu Dec 19 18:32:31 2024  
+-----+  
| NVIDIA-SMI 560.35.04                  Driver Version: 561.17          CUDA Version: 12.6          |  
+-----+-----+  
| GPU   Name                               Persistence-M   Bus-Id       Disp.A     Volatile Uncorr. ECC      |  
| Fan   Temp   Perf           Pwr:Usage/Cap     Memory-Usage   GPU-Util  Compute M.  |  
|                               Pwr:Usage/Cap     Memory-Usage   GPU-Util  Compute M.  |  
|                               Pwr:Usage/Cap     Memory-Usage   GPU-Util  Compute M.  |  
+-----+-----+  
| 0      NVIDIA GeForce RTX 4060 ...      On           00000000:01:00:00 Off      0%          N/A          |  
| N/A    52C    P0              16W / 85W           0MiB / 8188MiB      0%          Default    |  
|                               Pwr:Usage/Cap     Memory-Usage   GPU-Util  Compute M.  |  
|                               Pwr:Usage/Cap     Memory-Usage   GPU-Util  Compute M.  |  
+-----+-----+  
+-----+  
| Processes:                               GPU Memory                               |  
| GPU   GI   CI          PID    Type    Process name                               GPU Memory                               |  
| ID   ID   ID                                   Usage                               |  
+-----+-----+  
| No running processes found               |  
+-----+  
ubuntu@jinkyun:~$ nvcc -V  
nvcc: NVIDIA (R) Cuda compiler driver  
Copyright (c) 2005-2024 NVIDIA Corporation  
Built on Tue_Oct_29_23:50:19_PDT_2024  
Cuda compilation tools, release 12.6, V12.6.85  
Build cuda_12.6.r12.6/compiler.35059454_0  
ubuntu@jinkyun:~$ |
```