지능화 캡스톤 프로젝트

CUDA + TensorFlow 설치

2023. 5. 24

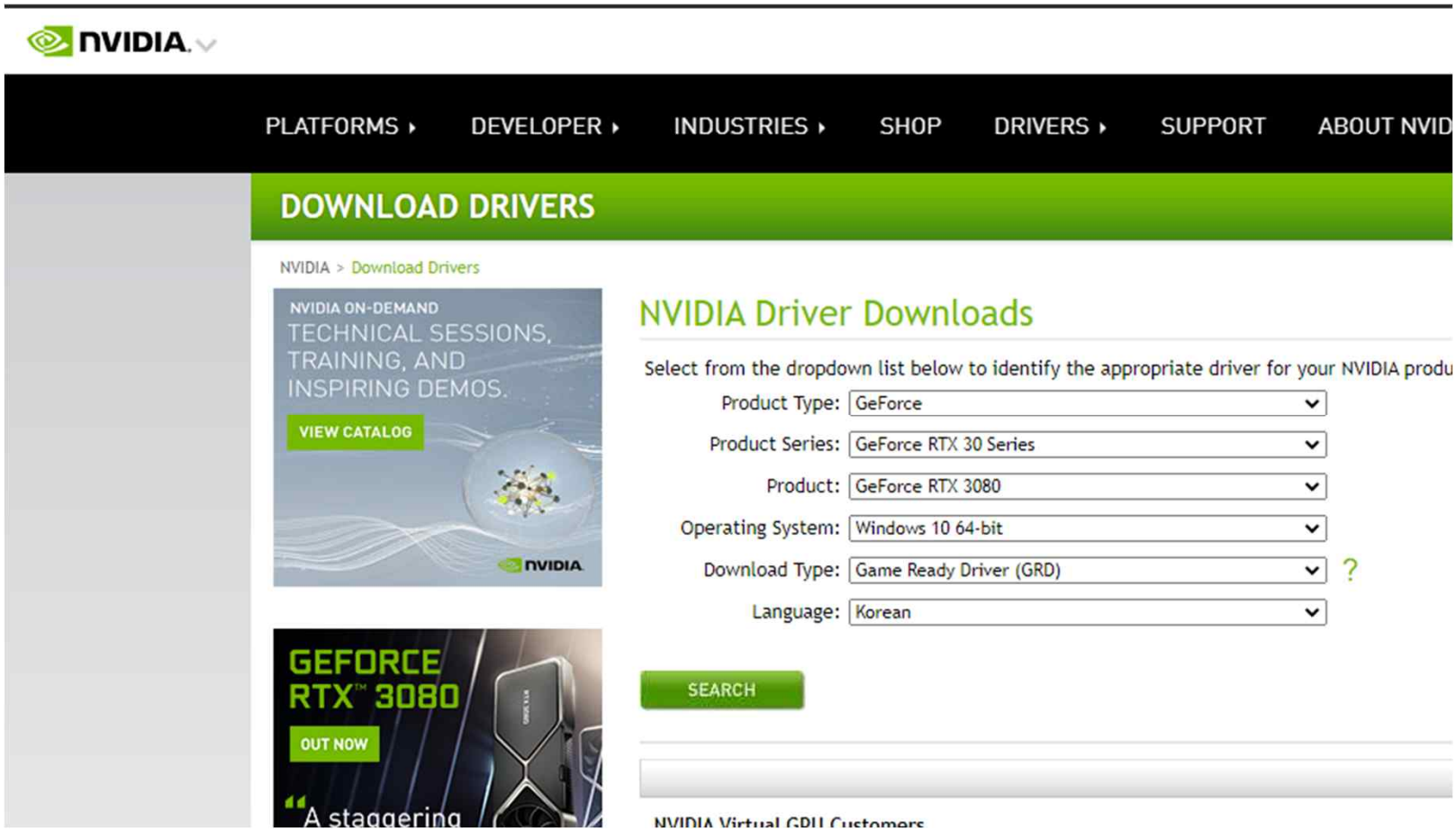
충북대학교 산업인공지능학과

한병엽

INDUSTRIAL AI RESEARCH CENTER

1. 소개

2. 그래픽 드라이버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Product: GeForce RTX 3080
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Download Type: Game Ready Driver (GRD)
Language: Korean
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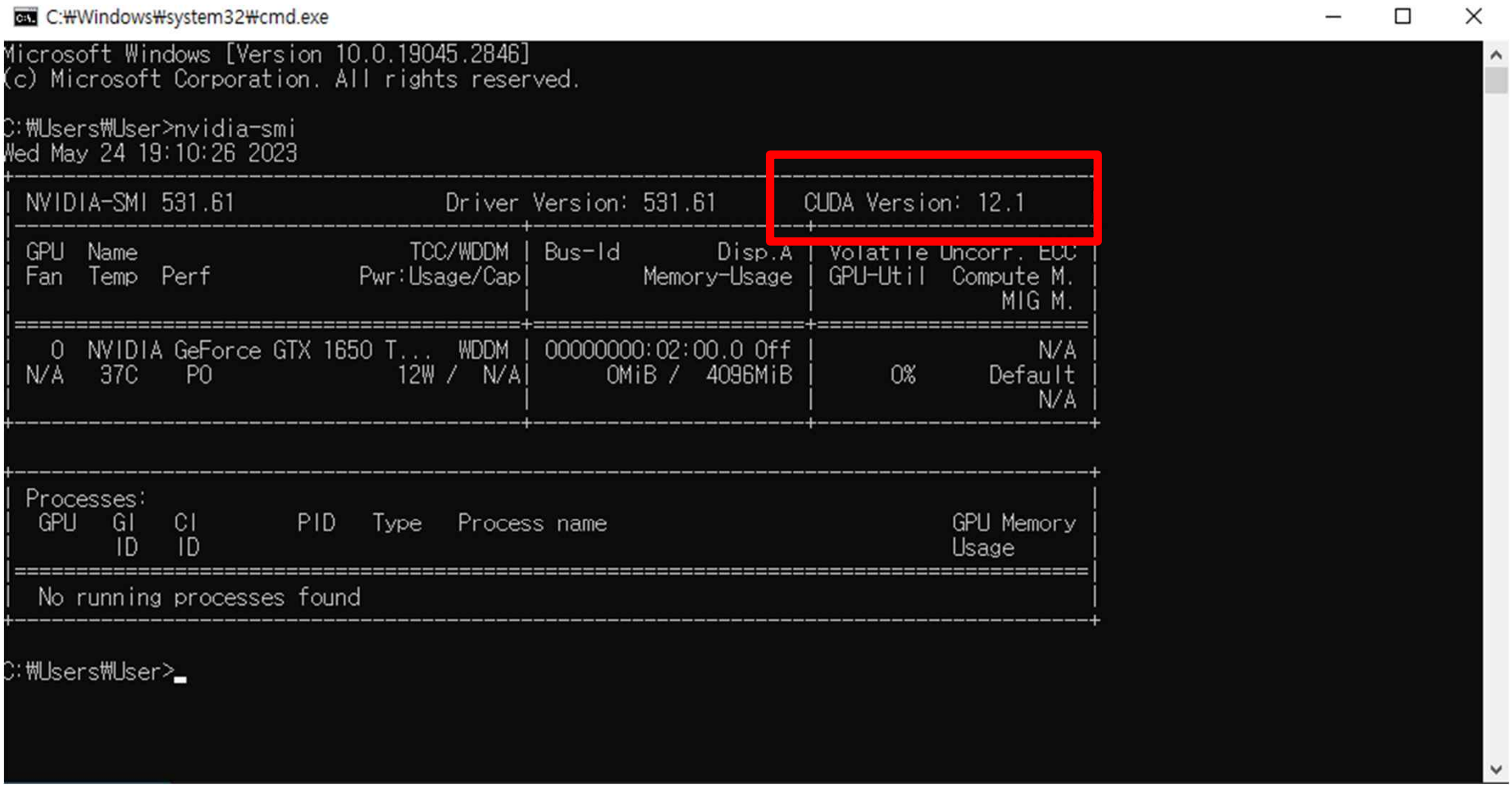
3. 그래픽 드라이버 설치 확인

nvidia-smi



4. CUDA Toolkit 1

https://www.tensorflow.org/install/source_windows?hl=ko

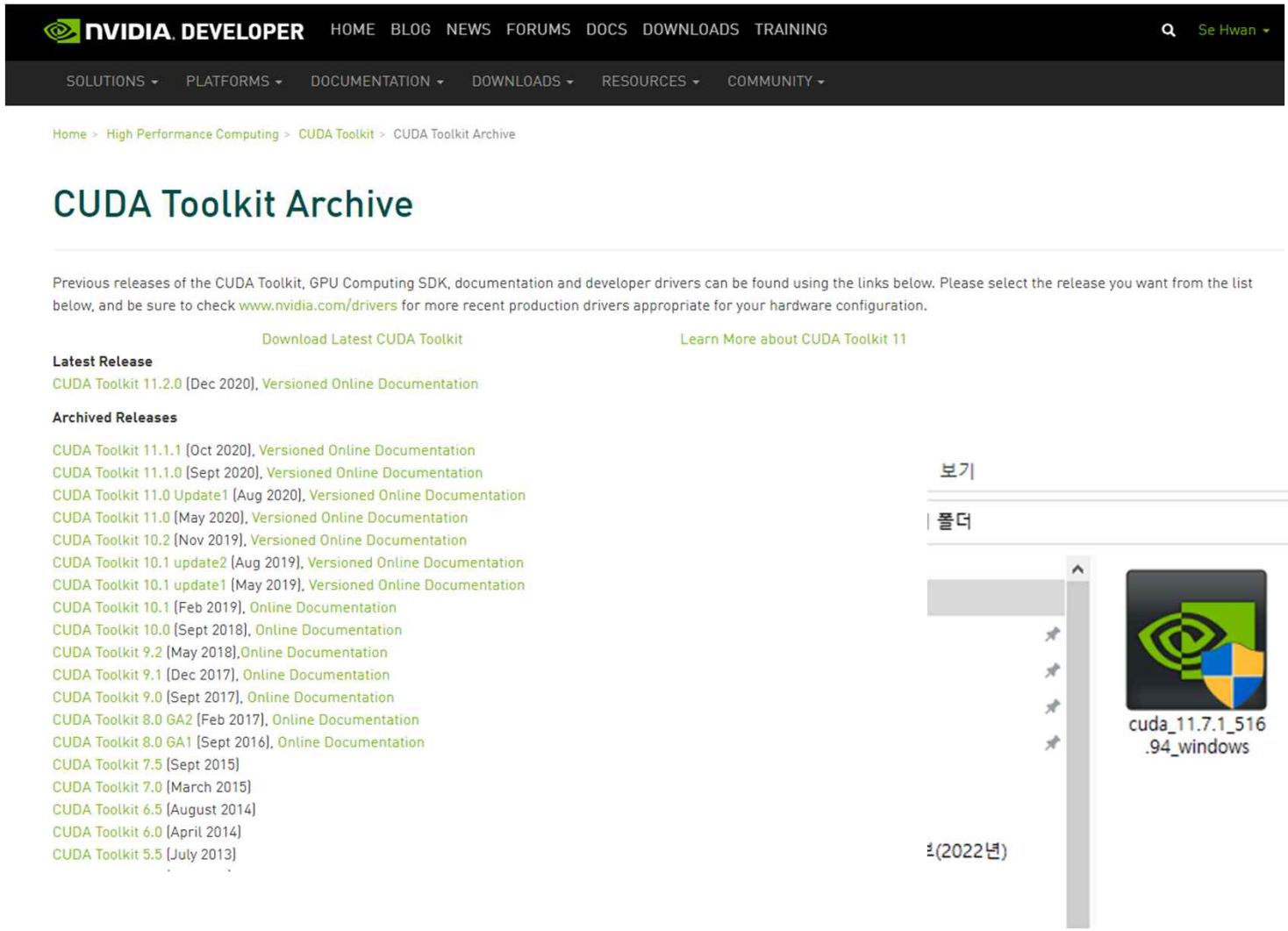
GPU

★ **참고:** 기본 Windows에서 GPU 지원은 2.10 이하 버전에서만 사용할 수 있으며, TF 2.11부터는 CUDA 빌드가 Windows에서 지원되지 않습니다. Windows에서 TensorFlow GPU를 사용하려면 WSL2에서 TensorFlow를 빌드/설치하거나 TensorFlow-DirectML-Plugin과 함께 tensorflow-cpu를 사용해야 합니다.

버전	파이썬 버전	컴파일러	빌드 도구	cuDNN	쿠다
tensorflow_gpu-2.10.0	3.7-3.10	MSVC 2019	바젤 5.1.1	8.1	11.2
tensorflow_gpu-2.9.0	3.7-3.10	MSVC 2019	바젤 5.0.0	8.1	11.2
tensorflow_gpu-2.8.0	3.7-3.10	MSVC 2019	바젤 4.2.1	8.1	11.2
tensorflow_gpu-2.7.0	3.7-3.9	MSVC 2019	바젤 3.7.2	8.1	11.2
tensorflow_gpu-2.6.0	3.6-3.9	MSVC 2019	바젤 3.7.2	8.1	11.2
tensorflow_gpu-2.5.0	3.6-3.9	MSVC 2019	바젤 3.7.2	8.1	11.2
tensorflow_gpu-2.4.0	3.6-3.8	MSVC 2019	바젤 3.1.0	8.0	11.0
tensorflow_gpu-2.3.0	3.5-3.8	MSVC 2019	바젤 3.1.0	7.6	10.1
tensorflow_gpu-2.2.0	3.5-3.8	MSVC 2019	바젤 2.0.0	7.6	10.1
tensorflow_gpu-2.1.0	3.5-3.7	MSVC 2019	바젤 0.27.1-0.29.1	7.6	10.1
tensorflow_gpu-2.0.0	3.5-3.7	MSVC 2017	바젤 0.26.1	7.4	10
tensorflow_gpu-1.15.0	3.5-3.7	MSVC 2017	바젤 0.26.1	7.4	10
tensorflow_gpu-1.14.0	3.5-3.7	MSVC 2017	바젤 0.24.1-0.25.2	7.4	10
tensorflow_gpu-1.13.0	3.5-3.7	MSVC 2015 업데이트 3	바젤 0.19.0-0.21.0	7.4	10
tensorflow_gpu-1.12.0	3.5-3.6	MSVC 2015 업데이트 3	바젤 0.15.0	7.2	9.0
tensorflow_gpu-1.11.0	3.5-3.6	MSVC 2015 업데이트 3	바젤 0.15.0	7	9
tensorflow_gpu-1.10.0	3.5-3.6	MSVC 2015 업데이트 3	씨메이크 v3.6.3	7	9
tensorflow_gpu-1.9.0	3.5-3.6	MSVC 2015 업데이트 3	씨메이크 v3.6.3	7	9
tensorflow_gpu-1.8.0	3.5-3.6	MSVC 2015 업데이트 3	씨메이크 v3.6.3	7	9
tensorflow_gpu-1.7.0	3.5-3.6	MSVC 2015 업데이트 3	씨메이크 v3.6.3	7	9
tensorflow_gpu-1.6.0	3.5-3.6	MSVC 2015 업데이트 3	씨메이크 v3.6.3	7	9
tensorflow_gpu-1.5.0	3.5-3.6	MSVC 2015 업데이트 3	씨메이크 v3.6.3	7	9
tensorflow_gpu-1.4.0	3.5-3.6	MSVC 2015 업데이트 3	씨메이크 v3.6.3	6	8
tensorflow_gpu-1.3.0	3.5-3.6	MSVC 2015 업데이트 3	씨메이크 v3.6.3	6	8
tensorflow_gpu-1.2.0	3.5-3.6	MSVC 2015 업데이트 3	씨메이크 v3.6.3	5.1	8

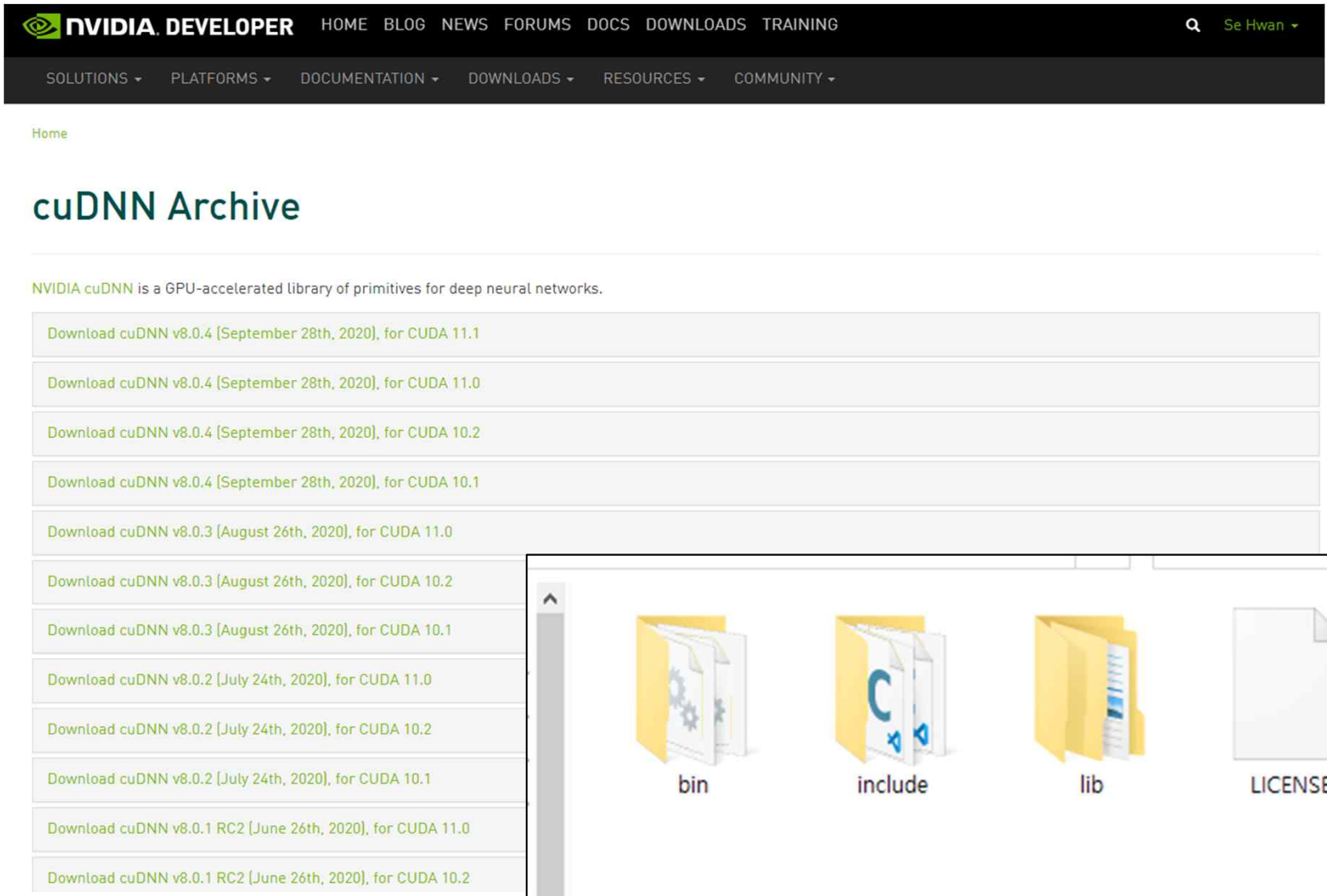
5. CUDA Toolkit 2

https://developer.nvidia.com/cuda-toolkit-archive



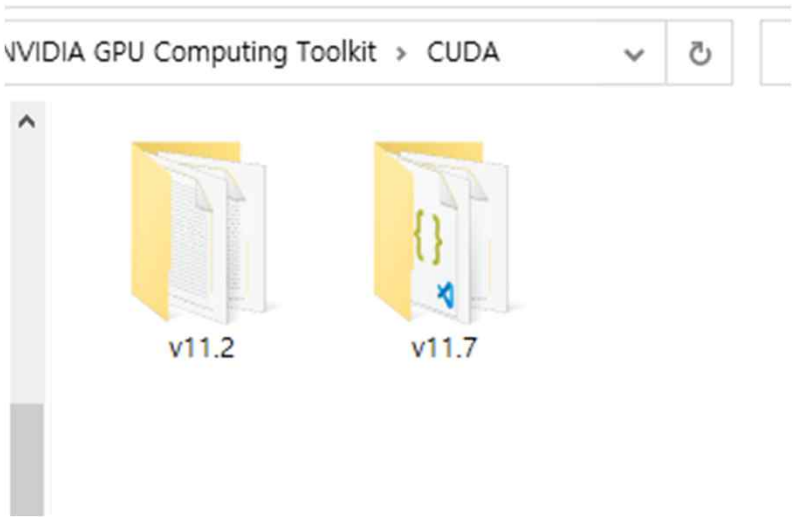
6. cuDNN 1

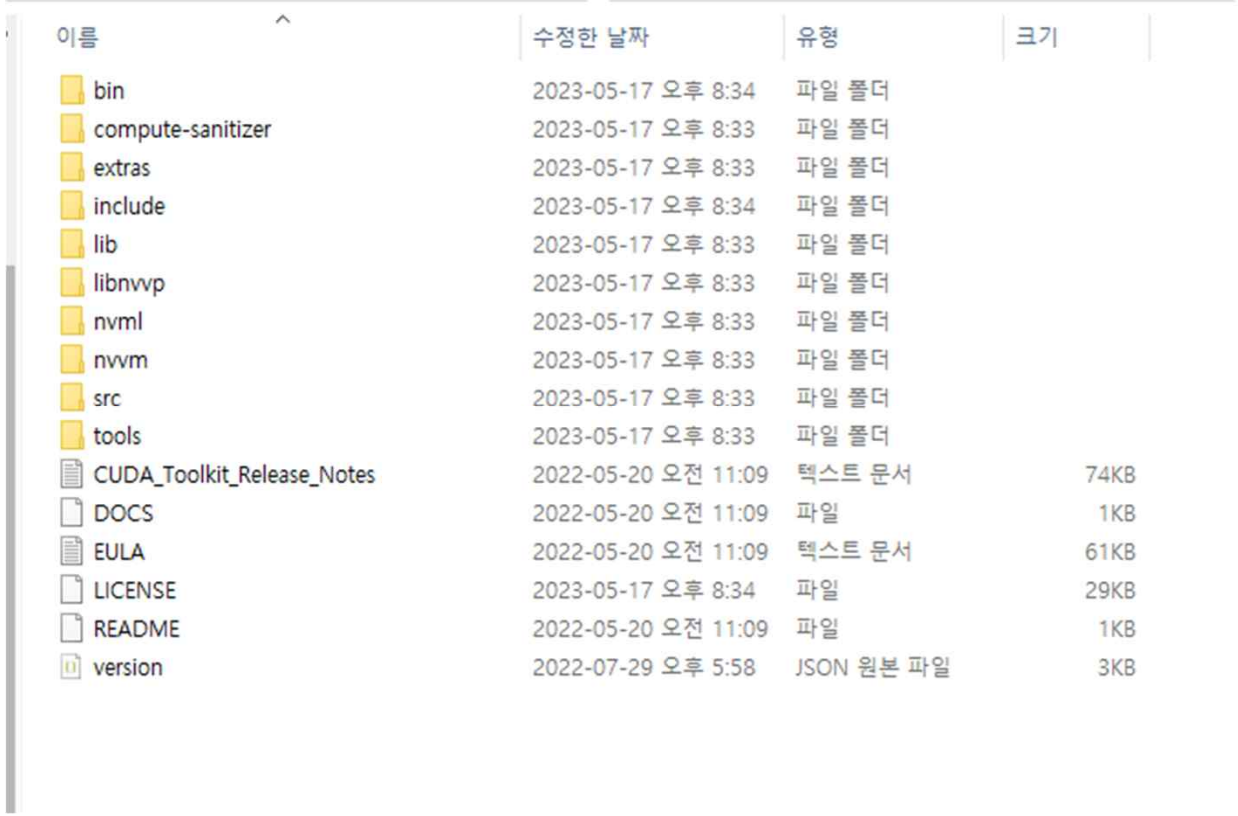
https://developer.nvidia.com/rdp/cudnn-archive
지포스 로그인 필요



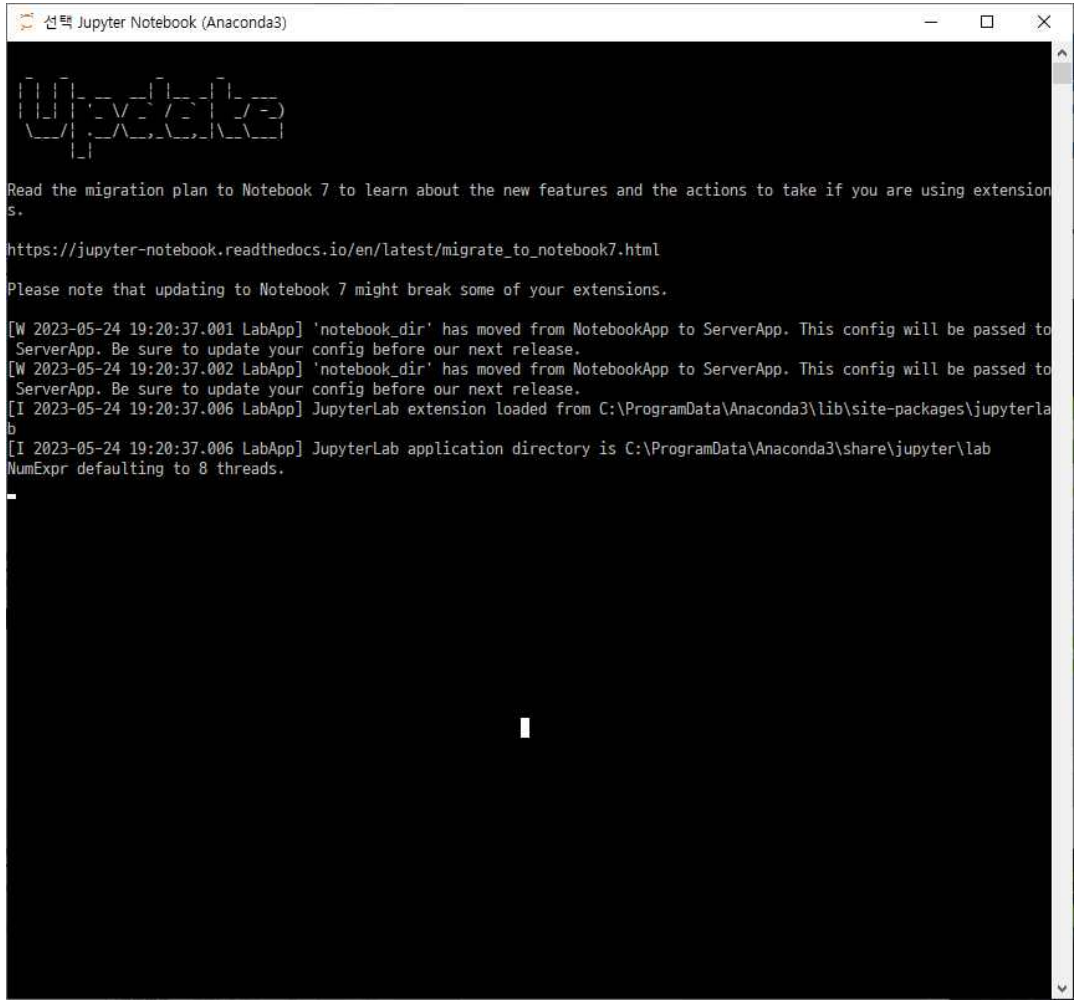
7. cuDNN 2

C:₩Program Files₩NVIDIA GPU Computing Toolkit₩CUDA





8. 가상환경 생성



conda create -n [가상환경이름] python=3.7

conda activate [가상환경이름]

pip install tensorflow-gpu==2.4.0

pip install keras

pip install jupyter notebook
pip install ipykernel

python -m ipykernel install --user --name [가상환경이름]

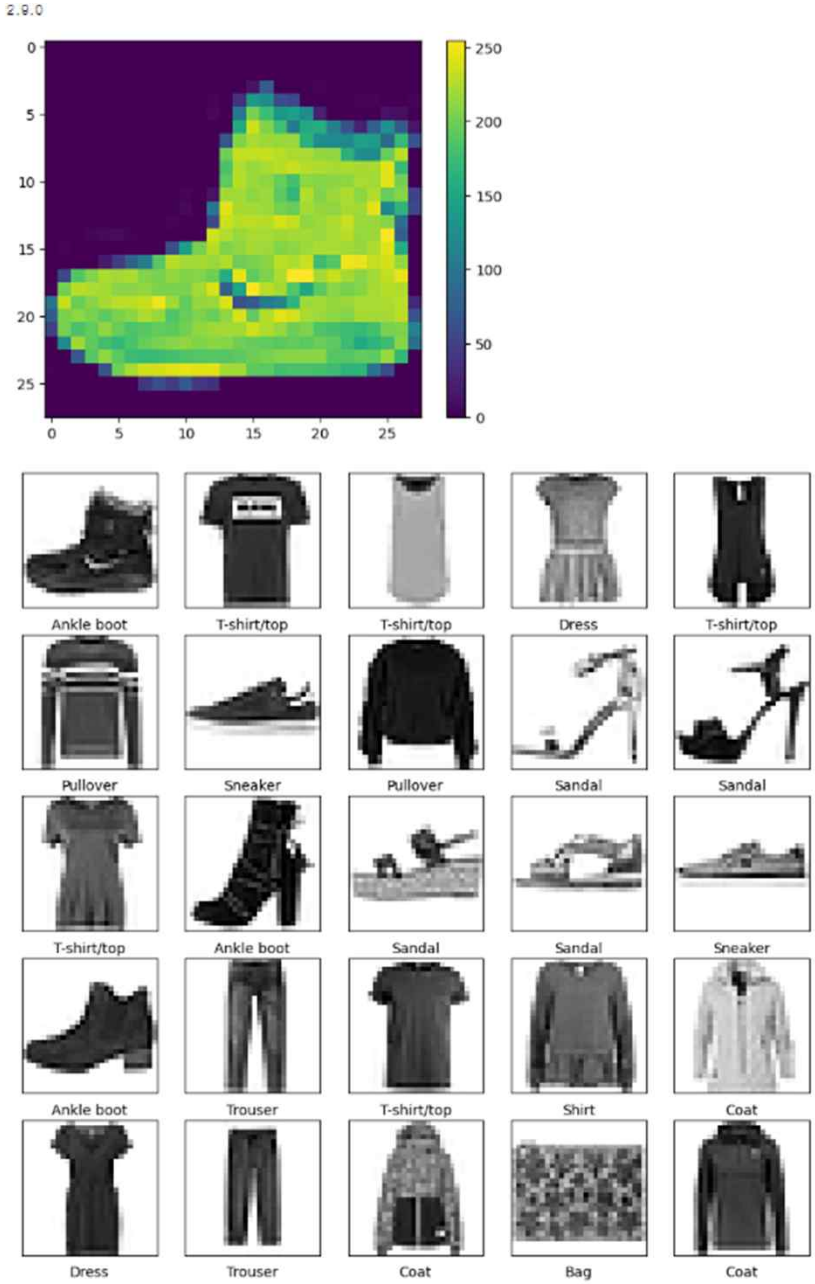
9. GPU 연동 확인 1

from tensorflow.python.client import device_lib
print(device_lib.list_local_devices())

```
In [1]: from tensorflow.python.client import device_lib
        print(device_lib.list_local_devices())

[name: "/device:CPU:0"
device_type: "CPU"
memory_limit: 268435456
locality {
}
incarnation: 16569114874829537099
xla_global_id: -1
, name: "/device:GPU:0"
device_type: "GPU"
memory_limit: 2236245607
locality {
  bus_id: 1
  links {
  }
}
incarnation: 6774070776413944580
physical_device_desc: "device: 0, name: NVIDIA GeForce GTX 1650 Ti with Max-Q Design, pci bus id: 0000:02:00.0, compute capability: 7.5"
xla_global_id: 416903419
]
```

10. GPU 연동 확인 2

```
import tensorflow as tf
from tensorflow import keras

import numpy as np
import matplotlib.pyplot as plt

print(tf.__version__)

fashion_mnist = keras.datasets.fashion_mnist
(train_images, train_labels), (test_images, test_labels) = fashion_mnist.load_data()

class_names = ['T-shirt/top', 'Trouser', 'Pullover', 'Dress', 'Coat',
               'Sandal', 'Shirt', 'Sneaker', 'Bag', 'Ankle boot']

plt.figure()
plt.imshow(train_images[0])
plt.colorbar()
plt.grid(False)
plt.show()

train_images = train_images / 255.0
test_images = test_images / 255.0

plt.figure(figsize=(10,10))
for i in range(25):
    plt.subplot(5,5,i+1)
    plt.xticks([])
    plt.yticks([])
    plt.grid(False)
    plt.imshow(train_images[i], cmap=plt.cm.binary)
    plt.xlabel(class_names[train_labels[i]])
plt.show()

model = keras.Sequential([
    keras.layers.Flatten(input_shape=(28, 28)),
    keras.layers.Dense(128, activation='relu'),
    keras.layers.Dense(10, activation='softmax')
])

model.compile(optimizer='adam',
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])

model.fit(train_images, train_labels, epochs=5)

test_loss, test_acc = model.evaluate(test_images,  test_labels, verbose=2)

print('₩n테스트 정확도:', test_acc)
```



11. GPU 연동 확인 3

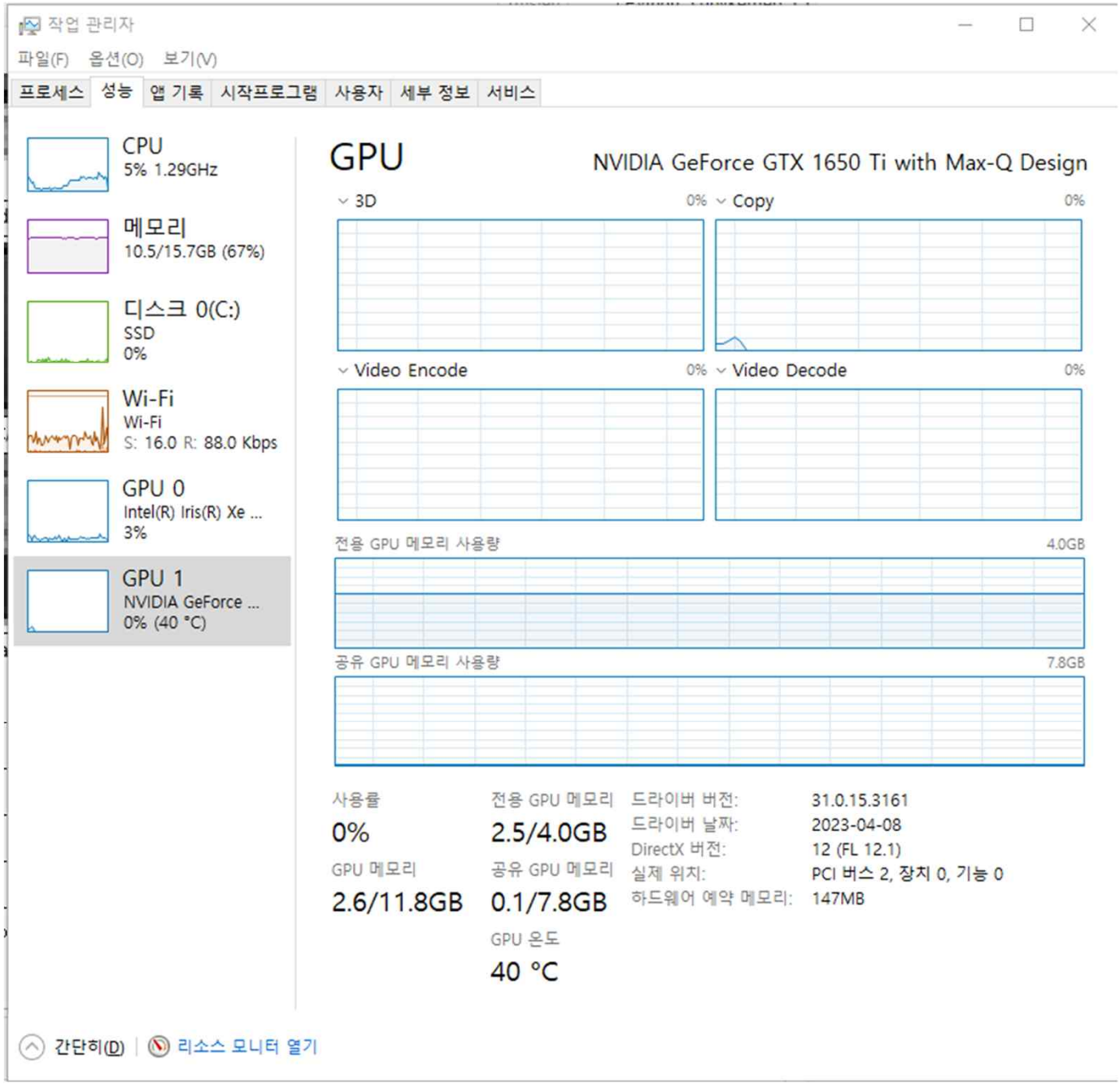
GPU

```
Epoch 1/5
1875/1875 [==============================] - 5s 2ms/step - loss: 0.5002 - accuracy: 0.8245
Epoch 2/5
1875/1875 [==============================] - 4s 2ms/step - loss: 0.3769 - accuracy: 0.8637
Epoch 3/5
1875/1875 [==============================] - 5s 3ms/step - loss: 0.3360 - accuracy: 0.8776
Epoch 4/5
1875/1875 [==============================] - 5s 3ms/step - loss: 0.3130 - accuracy: 0.8845
Epoch 5/5
1875/1875 [==============================] - 5s 3ms/step - loss: 0.2946 - accuracy: 0.8910
313/313 - 1s - loss: 0.3648 - accuracy: 0.8676 - 702ms/epoch - 2ms/step

테스트 정확도: 0.8676000237464905
```

CPU

```
Epoch 1/5
1875/1875 [==============================] - 7s 3ms/step - loss: 0.4998 - accuracy: 0.8253
Epoch 2/5
1875/1875 [==============================] - 5s 3ms/step - loss: 0.3740 - accuracy: 0.8643
Epoch 3/5
1875/1875 [==============================] - 5s 3ms/step - loss: 0.3371 - accuracy: 0.8766
Epoch 4/5
1875/1875 [==============================] - 5s 3ms/step - loss: 0.3128 - accuracy: 0.8846
Epoch 5/5
1875/1875 [==============================] - 5s 3ms/step - loss: 0.2949 - accuracy: 0.8913
313/313 - 1s - loss: 0.3513 - accuracy: 0.8762 - 1s/epoch - 4ms/step

테스트 정확도: 0.8762000203132629
```

12. GPU 연동 확인 4


작업 관리자
파일(F) 옵션(O) 보기(V)
프로세스 성능 앱 기록 시작프로그램 사용자 세부 정보 서비스
CPU
5% 1.29GHz
메모리
10.5/15.7GB (67%)
디스크 0(C:)
SSD
0%
Wi-Fi
Wi-Fi
S: 16.0 R: 88.0 Kbps
GPU 0
Intel(R) Iris(R) Xe ...
3%
GPU 1
NVIDIA GeForce ...
0% (40 °C)
GPU
NVIDIA GeForce GTX 1650 Ti with Max-Q Design
3D 0%
Copy 0%
Video Encode 0%
Video Decode 0%
전용 GPU 메모리 사용량 4.0GB
공유 GPU 메모리 사용량 7.8GB
사용률
0%
전용 GPU 메모리
2.5/4.0GB
드라이버 버전: 31.0.15.3161
드라이버 날짜: 2023-04-08
DirectX 버전: 12 (FL 12.1)
실제 위치: PCI 버스 2, 장치 0, 기능 0
하드웨어 예약 메모리: 147MB
GPU 메모리
2.6/11.8GB
공유 GPU 메모리
0.1/7.8GB
GPU 온도
40 °C
간단히(D)
리소스 모니터 열기

감사합니다