PyTorch and CUDA installation

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Brief introduction:

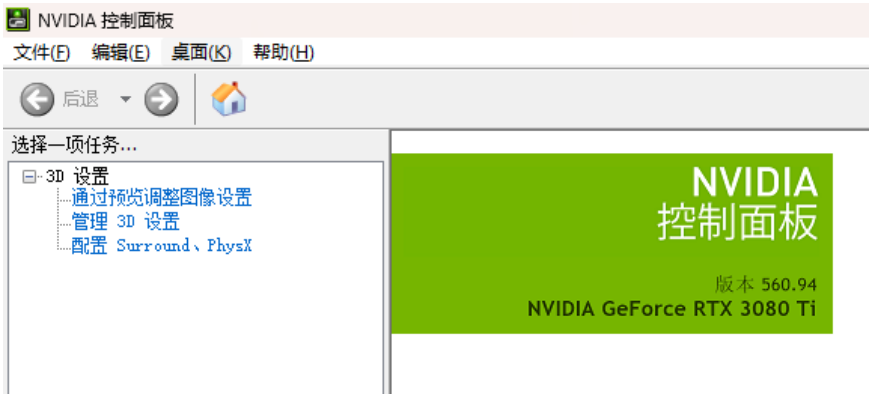
For Windows, Mac, & Linux systems, PyTorch framework can be installed with the respective version based on your machine GPU type. However, NVIDIA GPUs currently don't support Macbook and IOS systems. Hence, if you are using Mac, you may use CPU instead of GPU to conduct computational tasks.

However, using the CPU is a bit tough to execute deep learning codes elegantly for its low efficiency. For students without NVIDIA GPUs, students are encouraged to use the **Colab platform** with free resources of the **T4 GPU** to use.

CUDA

CUDA is a parallel computing platform and programming model created by NVIDIA. It allows developers to utilize the power of NVIDIA GPUs for general-purpose computing. By offloading computationally intensive tasks from the CPU to the GPU, CUDA can significantly speed up data processing. It provides a set of tools and libraries that enable developers to write programs in languages like C, C++, and Fortran to run on GPUs. In the context of deep learning, frameworks like PyTorch can integrate with CUDA to accelerate the training and inference of neural networks, leveraging the GPU's parallel processing capabilities to achieve faster results.

First, you need to check your NVIDIA GPU support CUDA version by right-clicking your desktop and choosing the NVIDIA control panel (NVIDIA 控制面板) shown below to check your GPU Driver version and use the command **nvidia-smi** to check the corresponding CUDA version.




```
(CIVL3141) C:\Users\Administrator>nvidia-smi
Thu Mar  6 23:18:43 2025
+-----------------------------------------------------------------------------------------+
| NVIDIA-SMI 560.94                 Driver Version: 560.94         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 3080 Ti   WDDM  |   00000000:01:00.0 Off |                  N/A |
|  0%   42C    P8             26W /  350W |   10679MiB /  12288MiB |      5%      Default |
|                                         |                        |                  N/A |
+-----------------------------------------+------------------------+----------------------+

+-----------------------------------------------------------------------------------------+
| Processes:                                                                              |
|  GPU   GI   CI        PID   Type   Process name                              GPU Memory |
|        ID   ID                                                               Usage      |
|=========================================================================================|
```

To install CUDA for your personal computer with a GPU which is capable of the CUDA framework, you need to visit NVIDIA official website: https://developer.nvidia.com/cuda-toolkit-archive and download the CUDA packages which is compatible with your GPU driver and CUDA version.

PyTorch

PyTorch is an open-source deep-learning framework developed by Facebook's AI Research lab. It offers a dynamic computational graph, which means the graph is built during runtime, providing high flexibility for researchers to experiment with new models and algorithms. With a Pythonic and intuitive API, it simplifies the process of building and training neural networks. PyTorch also supports automatic differentiation, which automatically computes gradients for efficient backpropagation. It includes pre - built neural network layers and optimization algorithms, making it suitable for various applications such as image recognition, natural language processing, and reinforcement learning.

To install PyTorch, please visit the official website https://pytorch.org/ and copy the command that is recommended for your machine type such as operating system: Linux, Mac, or Windows; Compute Platform etc.