

# Windows10 安装 CUDA + cuDNN + pyTorch

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在 windows10 上面安装 CUDA 和 cuDNN

## 0、简单了解一下 CUDA 和 cuDNN

### 1) 什么是 CUDA

CUDA(Compute Unified Device Architecture), 是显卡厂商NVIDIA推出的运算平台。CUDA是一种由NVIDIA推出的通用并行计算架构, 该架构使GPU能够解决复杂的计算问题。

### 2) 什么是cuDNN

NVIDIA cuDNN是用于深度神经网络的GPU加速库。它强调性能、易用性和低内存开销。NVIDIA cuDNN可以集成到更高级别的机器学习框架中, 如谷歌的Tensorflow、加州大学伯克利分校的流行caffe软件。简单的插入式设计可以让开发人员专注于设计和实现神经网络模型, 而不是简单调整性能, 同时还可以在GPU上实现高性能现代并行计算。

### 3) CUDA 和 cuDNN 的关系

CUDA看作是一个工作台, 上面配有很多工具, 如锤子、螺丝刀等。cuDNN是基于CUDA的深度学习GPU加速库, 有了它才能在GPU上完成深度学习的计算。它就相当于工作的工具, 比如它就是个扳手。但是CUDA这个工作台买来的时候, 并没有送扳手。想要在CUDA上运行深度神经网络, 就要安装cuDNN, 就像你想要拧个螺帽就要把扳手买回来。这样才能使GPU进行深度神经网络的工作, 工作速度相较CPU快很多。

## 1.显卡

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我的显卡如下:

产品类型: GeForce

产品系列: GeForce 10 Series ?

产品: GeForce GTX 1060

操作系统: Windows 10 64-bit

语言: English (UK)

下载类型: All ?

## 2.驱动下载

官网下载<https://www.geforce.cn/drivers>,直接下载GeForce Experience,它会根据你机器的显卡自动匹配和安装最适合的驱动。

**自动驱动程序更新**

 GeForce Experience 自动保持您的驱动程序为更新状态，并使您的游戏获得强劲优化。 [了解更多信息 >](#)

**手动搜索驱动程序**

 提供您的系统信息并搜索包括WHQL认证版、测试版以及早期版本在内的全部GeForce驱动程序。

GeForce

GeForce 10 Series

GeForce GTX 1050

Windows 10 64-bit

Chinese (Simplified)

全部 ?

开始搜索

### 3.显卡驱动版本查看

桌面右键打开英伟达控制面板， 点击帮助->系统信息->显示



### 4.显卡驱动支持的CUDA版本查看

桌面右键打开英伟达控制面板， 点击帮助->系统信息->组件



NVIDIA 硬件及运行该硬件的系统的详细信息。

显示

组件

文件名	文件版本	产品名称
<b>3D 设置</b>		
nvGameS.dll	27.21.14...	NVIDIA 3D Settings Server
nvGameSR.dll	27.21.14...	NVIDIA 3D Settings Server
NVCUDA64.DLL	27.21.14...	NVIDIA CUDA 11.0.208 driver
PhysX	09.19.0218	NVIDIA PhysX
<b>工作站</b>		
nvWSS.dll	27.21.14...	NVIDIA Workstation Server
nvWSSR.dll	27.21.14...	NVIDIA Workstation Server
<b>开发者</b>		
nvDevToolS.dll	27.21.14...	NVIDIA 3D Settings Server
nvDevToolSR.dll	27.21.14...	NVIDIA Licensing Server
<b>显示</b>		
nvDispS.dll	27.21.14...	NVIDIA Display Server
NVMCTRAY.DLL	24.21.13...	NVIDIA Media Center Library
nvDispSR.dll	27.21.14...	NVIDIA Display Server
<b>视频</b>		
nvViTvS.dll	27.21.14...	NVIDIA Video Server
nvViTvSR.dll	27.21.14...	NVIDIA Video Server

保存(S)

关闭

可以看到本机支持的是CUDA 11.0 版本，表示是不支持更高版本的。如果你升级驱动，可能会支持更高版本，也可能不会提升。所以就必须安装 11.0 及以下的版本。

## 5.参考显卡驱动的Release Notes

<https://docs.nvidia.com/cuda/cuda-toolkit-release-notes/index.html>

More information on compatibility can be found at <https://docs.nvidia.com/cuda/cuda-c-best-practices-guide/index.html#cuda-runtime-and-driver-api-version>.

**Note:** Starting with CUDA 11.0, the toolkit components are individually versioned, and the toolkit itself is versioned as shown in the table below.

Table 2. CUDA Toolkit and Compatible Driver Versions

CUDA Toolkit	Linux x86_64 Driver Version	Windows x86_64 Driver Version
CUDA 11.1	>=455.23	>=456.38
CUDA 11.0.3 Update 1	>= 450.51.06	>= 451.82
CUDA 11.0.2 GA	>= 450.51.05	>= 451.48
CUDA 11.0.1 RC	>= 450.36.06	>= 451.22
CUDA 10.2.89	>= 440.33	>= 441.22
CUDA 10.1 (10.1.105 general release, and updates)	>= 418.39	>= 418.96
CUDA 10.0.130	>= 410.48	>= 411.31
CUDA 9.2 (9.2.148 Update 1)	>= 396.37	>= 398.26
CUDA 9.2 (9.2.88)	>= 396.26	>= 397.44
CUDA 9.1 (9.1.85)	>= 390.46	>= 391.29
CUDA 9.0 (9.0.76)	>= 384.81	>= 385.54
CUDA 8.0 (8.0.61 GA2)	>= 375.26	>= 376.51
CUDA 8.0 (8.0.44)	>= 367.48	>= 369.30
CUDA 7.5 (7.5.16)	>= 352.31	>= 353.66
CUDA 7.0 (7.0.28)	>= 346.46	>= 347.62

## 6、CUDA 各个历史版本下载链接

## Latest Release

CUDA Toolkit 10.2 (Nov 2019), [Versioned Online Documentation](#)

## Archived Releases

CUDA Toolkit 10.1 update2 (Aug 2019), [Versioned Online Documentation](#)

CUDA Toolkit 10.1 update1 (May 2019), [Versioned Online Documentation](#)

CUDA Toolkit 10.1 (Feb 2019), [Online Documentation](#)

CUDA Toolkit 10.0 (Sept 2018), [Online Documentation](#)

CUDA Toolkit 9.2 (May 2018), [Online Documentation](#)

CUDA Toolkit 9.1 (Dec 2017), [Online Documentation](#)

CUDA Toolkit 9.0 (Sept 2017), [Online Documentation](#)

CUDA Toolkit 8.0 GA2 (Feb 2017), [Online Documentation](#)

CUDA Toolkit 8.0 GA1 (Sept 2016), [Online Documentation](#)

那根据第一步里面我自己的机器支持，我就下载10.1（Feb 2019）这个版本。

**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					
Version	10	8.1	7	Server 2019	Server 2016	Server 2012 R2
Installer Type ⓘ	exe [network]	exe [local]				

**Download Installer for Windows 10 x86\_64**

The base installer is available for download below.

> Base Installer

Download [2.4 GB] ⬇️

Installation Instructions:

1. Double click cuda\_10.1.105\_418.96\_win10.exe
2. Follow on-screen prompts

可以看到版本号是10.1.105，低于第一步里面的10.1.120，应该是没问题的。我的下载速度还是很快的：

**当前下载项**

cuda\_10.1.105\_418.96\_win10.exe

5%

developer.download

剩余 6 分钟 51 秒

118 MB/2.3 GB - 正在下载

5.4 MB/秒

取消

||

## 7、下载 cuDNN

地址: <https://developer.nvidia.com/rdp/cudnn-download>

下载cuDNN是需要登录英伟达开发者账户的, 注册一个并填写问卷就行了, 很简单。

注意: 必须选择和你安装的CUDA匹配的版本。

这个账号密码要求有大写字母, 有字符: G\*\_

Download cuDNN v7.6.5 (November 18th, 2019), for CUDA 10.2

Download cuDNN v7.6.5 (November 5th, 2019), for CUDA 10.1

Download cuDNN v7.6.5 (November 5th, 2019), for CUDA 10.0

Download cuDNN v7.6.5 (November 5th, 2019), for CUDA 9.2

Download cuDNN v7.6.5 (November 5th, 2019), for CUDA 9.0

Archived cuDNN Releases

## Library for Windows, Mac, Linux, Ubuntu and RedHat/Centos(x86\_64architecture)

cuDNN Library for Windows 7

cuDNN Library for Windows 10

上面选择 10.1版本, 然后选择 windows10 , 接着开始下载。

两百多兆的压缩包, 不过这次下载速度很慢。

## 8、安装 CUDA 和 cuDNN

1) 安装 CUDA

找到你下载的CUDA, 无脑安装就行了。当然如果你想自定义的话要记住你选择的安装路径。

CUDA安装完成后, 打开命令行输入 `nvcc -V` , 成功的话会返回 cuda 版本号:

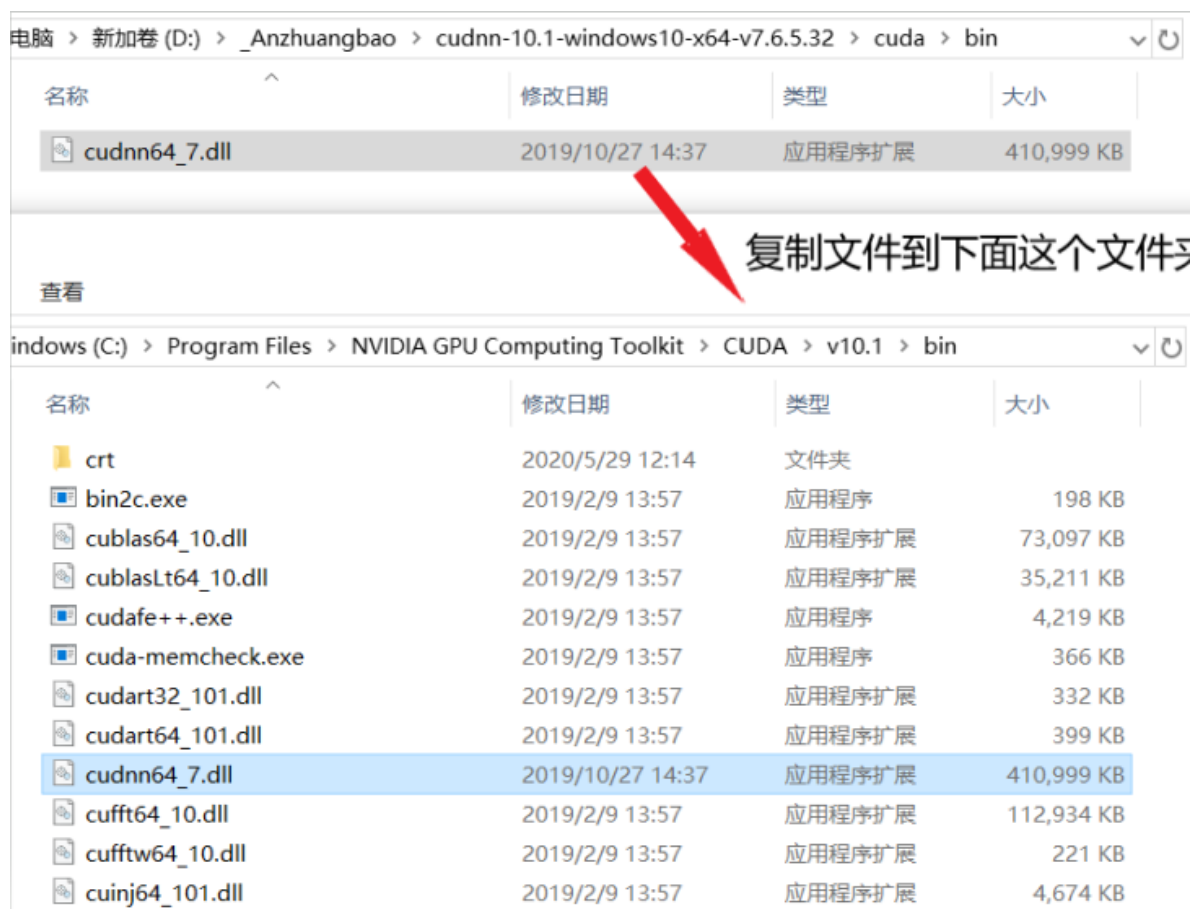
```
(base) C:\Users\Hasee>nvcc -V
nvcc: NVIDIA (R) Cuda compiler driver
Copyright (c) 2005-2019 NVIDIA Corporation
Built on Fri_Feb__8_19:08:26_Pacific_Standard_Time_2019
Cuda compilation tools, release 10.1, V10.1.105
```

## 2) cuDNN

解压cuDNN压缩包，可以看到bin、include、lib目录：

bin	2020/5/29 12:19	文件夹	
include	2020/5/29 12:19	文件夹	
lib	2020/5/29 12:19	文件夹	
NVIDIA_SLA_cuDNN_Support.txt	2019/10/27 0:16	文本文档	39 KB

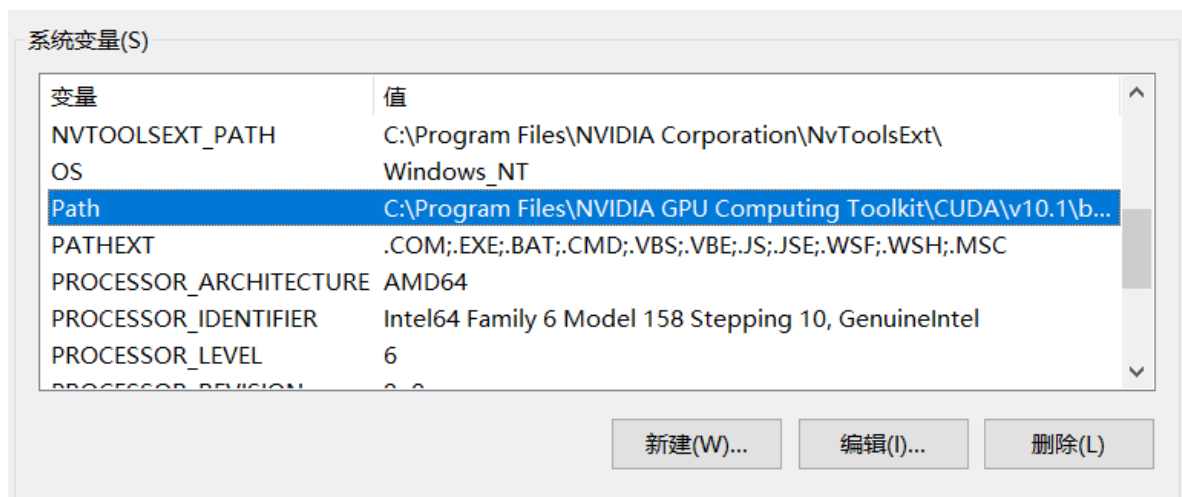
将 bin 目录里面的内容复制，然后粘贴到 C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA 对应的 bin 目录里面：



同样的，include 和 lib 目录里面的文件也复制到相应的文件夹里面。

## 9、添加环境变量

在系统环境变量的Path项下添加几个路径



点击 编辑 --> 新建，需要添加下面两个路径（安装目录）：

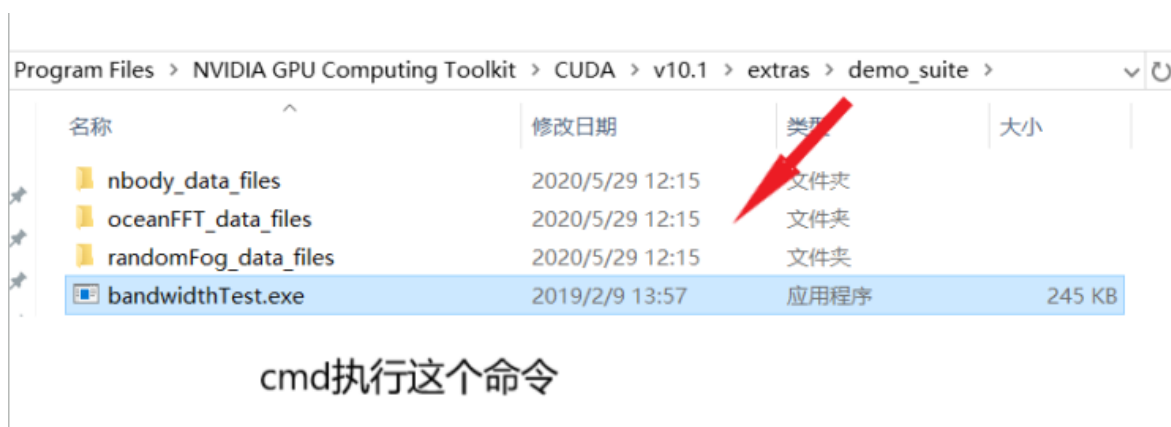
C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v10.1

C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v10.1\lib\x64

C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v10.2\bin

C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v10.2\libnvvp

## 6、查看安装结果





```
(base) C:\Users\Hasee>cd C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v10.1\extras\demo_suite
(base) C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v10.1\extras\demo_suite>.\bandwidthTest.exe
[CUDA Bandwidth Test] - Starting...
Running on...

Device 0: GeForce GTX 1660 Ti
Quick Mode

Host to Device Bandwidth, 1 Device(s)
PINNED Memory Transfers
  Transfer Size (Bytes)      Bandwidth(MB/s)
  33554432                  12516.6

Device to Host Bandwidth, 1 Device(s)
PINNED Memory Transfers
  Transfer Size (Bytes)      Bandwidth(MB/s)
  33554432                  12822.6

Device to Device Bandwidth, 1 Device(s)
PINNED Memory Transfers
  Transfer Size (Bytes)      Bandwidth(MB/s)
  33554432                  249804.8

Result = PASS
```

## 7、安装 pyTorch (<https://pytorch.org/>)

### INSTALL PYTORCH

Select your preferences and run the install command. Stable represents the most currently tested and supported version of PyTorch. This should be suitable for many users. Preview is available if you want the latest, not fully tested and supported, 1.7 builds that are generated nightly. Please ensure that you have **met the prerequisites below (e.g., numpy)**, depending on your package manager. Anaconda is our recommended package manager since it installs all dependencies. You can also **install previous versions of PyTorch**. Note that LibTorch is only available for C++.

PyTorch Build	Stable (1.6.0)		Preview (Nightly)	
Your OS	Linux	Mac	Windows	
Package	Conda	Pip	LibTorch	Source
Language	Python		C++ / Java	
CUDA	9.2	10.1	10.2	None
Run this Command:	<pre>pip install torch==1.6.0 torchvision==0.7.0 -f https://download.pytorch.org/whl/torch_stable.html</pre>			

```
C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v10.2\extras\demo_suite>pip install torch==1.6.0 torchvision==0.7.0 -f https://download.pytorch.org/whl/torch_stable.html
Looking in links: https://download.pytorch.org/whl/torch_stable.html
Collecting torch==1.6.0
  Downloading https://download.pytorch.org/whl/cu102/torch-1.6.0-cp37-cp37m-win_amd64.whl (1077.4 MB)
    1077.4 MB 26 kB/s
Collecting torchvision==0.7.0
  Downloading https://download.pytorch.org/whl/cu102/torchvision-0.7.0-cp37-cp37m-win_amd64.whl (1.1 MB)
    1.1 MB 3.3 MB/s
Collecting future
  Downloading future-0.18.2.tar.gz (829 kB)
    829 kB 328 kB/s
Requirement already satisfied: mumpy in d:\python\python37\lib\site-packages (from torch==1.6.0) (1.19.2)
Requirement already satisfied: pillow==4.1.1 in d:\python\python37\lib\site-packages (from torchvision==0.7.0) (7.2.0)
Using legacy 'setup.py install' for future, since package 'wheel' is not installed.
Installing collected packages: future, torch, torchvision
  Running setup.py install for future ... done
Successfully installed future-0.18.2 torch-1.6.0 torchvision-0.7.0
```

## (4) 安装完成测试 PyTorch GPU 版本是否安装成功

运行以下命令：

```
python
import torch
```

```
(pytorch) C:\Users\Hasee>python
Python 3.7.7 (default, May 6 2020, 12:06:46) [AMD64]
Type "help", "copyright", "credits" or "license()" for more
>>> import torch
```

```
x = torch.rand(5,5)
print(x)
```

输出类似下面内容，则pytorch安装成功

```
>>> x=torch.rand(5,5)
>>> print(x)
tensor([[0.1251, 0.1558, 0.4601, 0.3431, 0.7774],
        [0.3689, 0.9450, 0.8401, 0.7179, 0.2082],
        [0.6381, 0.5111, 0.8299, 0.6388, 0.6842],
        [0.9141, 0.6139, 0.4805, 0.9241, 0.2487],
        [0.8975, 0.2650, 0.8733, 0.9790, 0.9771]])
```

再执行torch.cuda.is\_available()

如果返回True，GPU版Pytorch成功安装完毕

```
>>> torch.cuda.is_available()
True
>>> _
```