

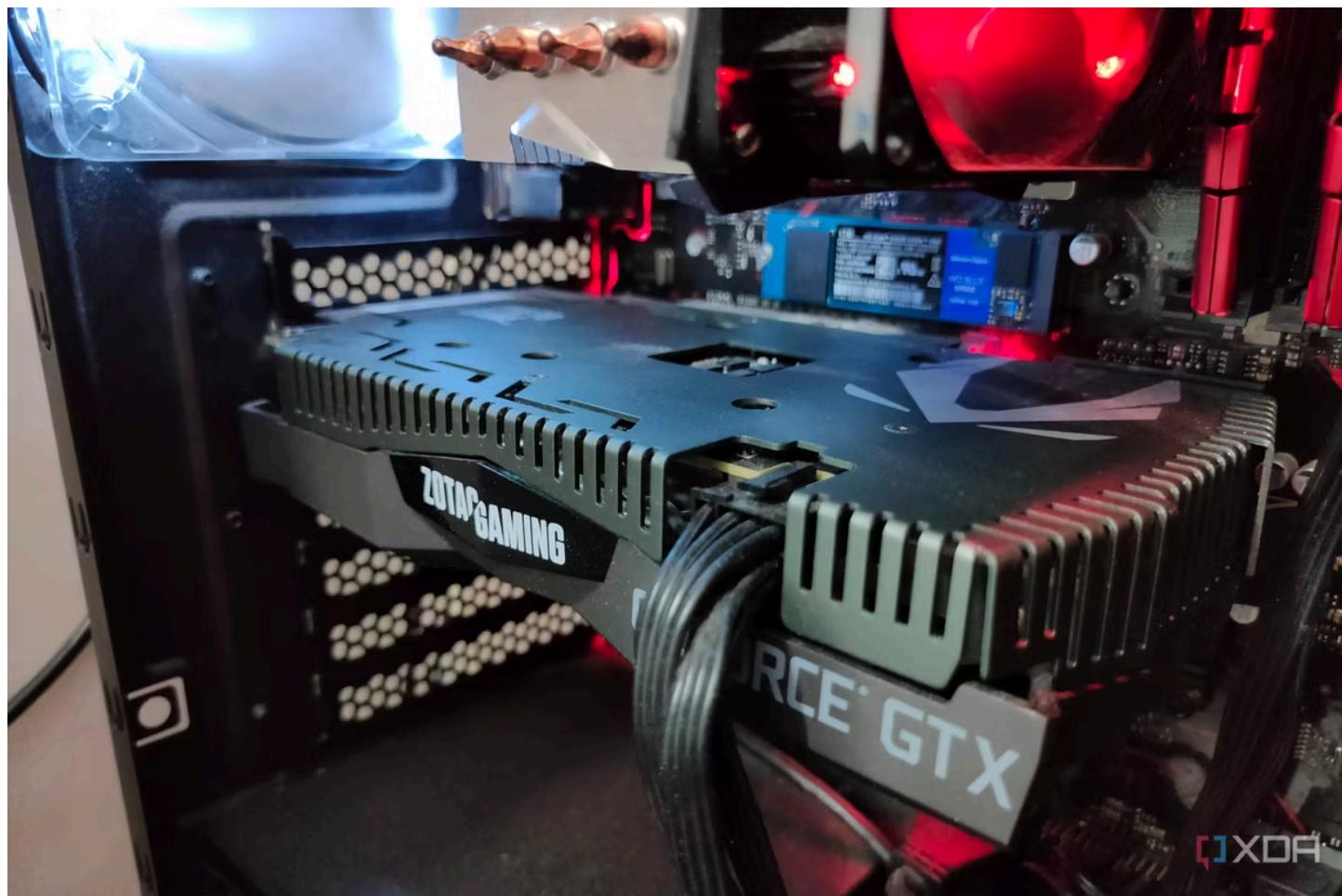
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# How to use your GPU in Jupyter Notebook

Speed up your machine learning algorithms by running them on your graphics card in Jupyter Notebook

BY AYUSH PANDE

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If you're unfamiliar with it, Jupyter Notebook is a powerful IDE that lets you create scripts for data analysis, web scraping, machine learning, and tons of other use cases. For the average coder who's into data science, Jupyter Notebook serves as the perfect companion as it lets you create interactive documents for everything from jotting down notes to compiling complex codes. While this IDE can be installed on pretty much any [modern laptop](#), you're going to have a tough time if you try to train AI algorithms on a CPU.

As such, you can configure Jupyter Notebook to relegate the demanding deep-learning workloads to your powerful graphics card instead of the processor. However, you'll have to go through several steps, including setting up Python libraries, creating coding environments, and installing drivers before you can run Jupyter Notebook on your graphics card.

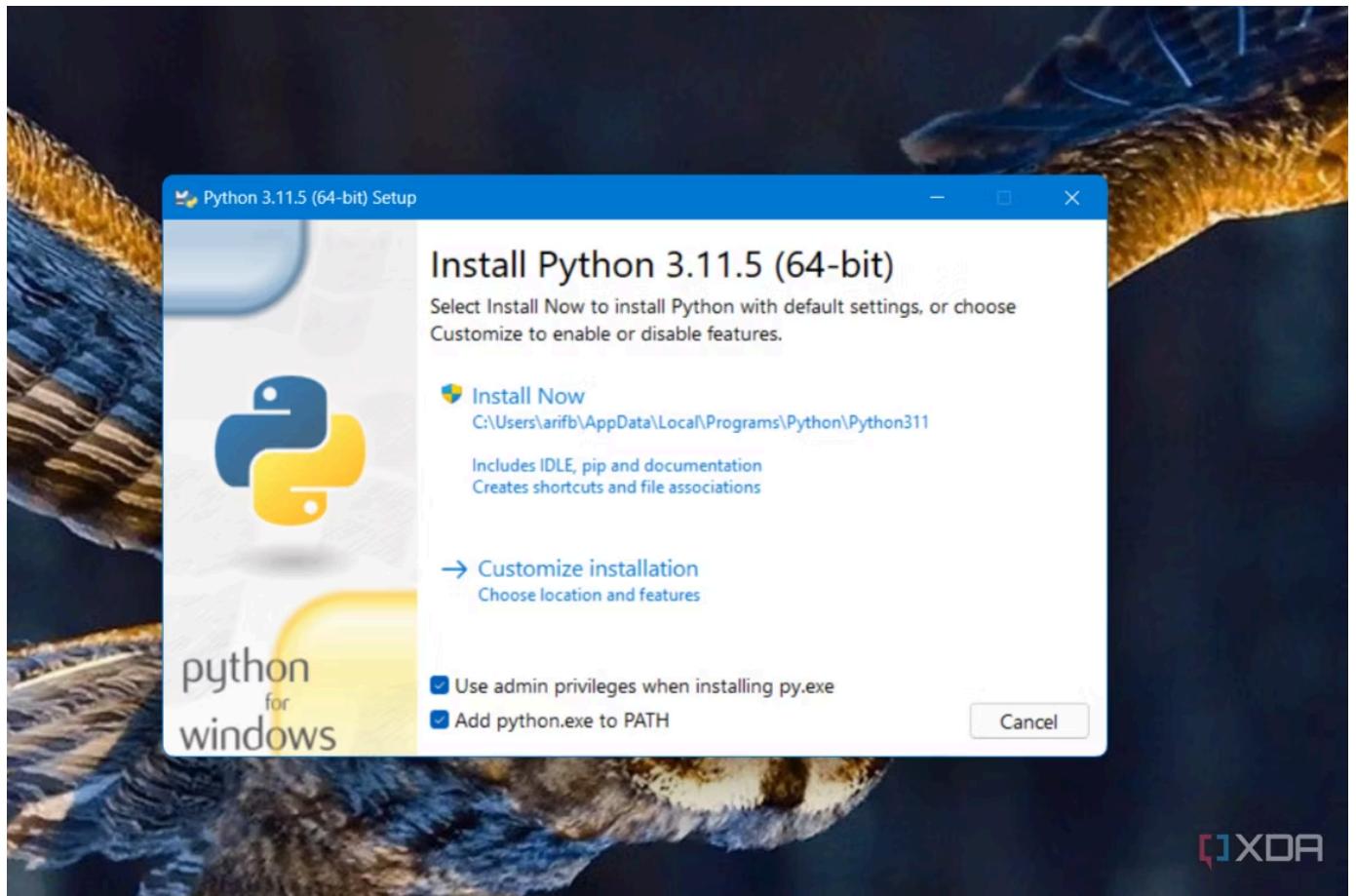
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#### How to use Jupyter Notebook on Windows, Linux, and macOS

## Installing Python



This step may sound redundant if you're already knee-deep into programming, but you'll need to install Python on your PC to use GPU-accelerated AI in Jupyter Notebook. Simply download the Python.exe file from the official website and click on the install button after granting admin privileges to the installer.

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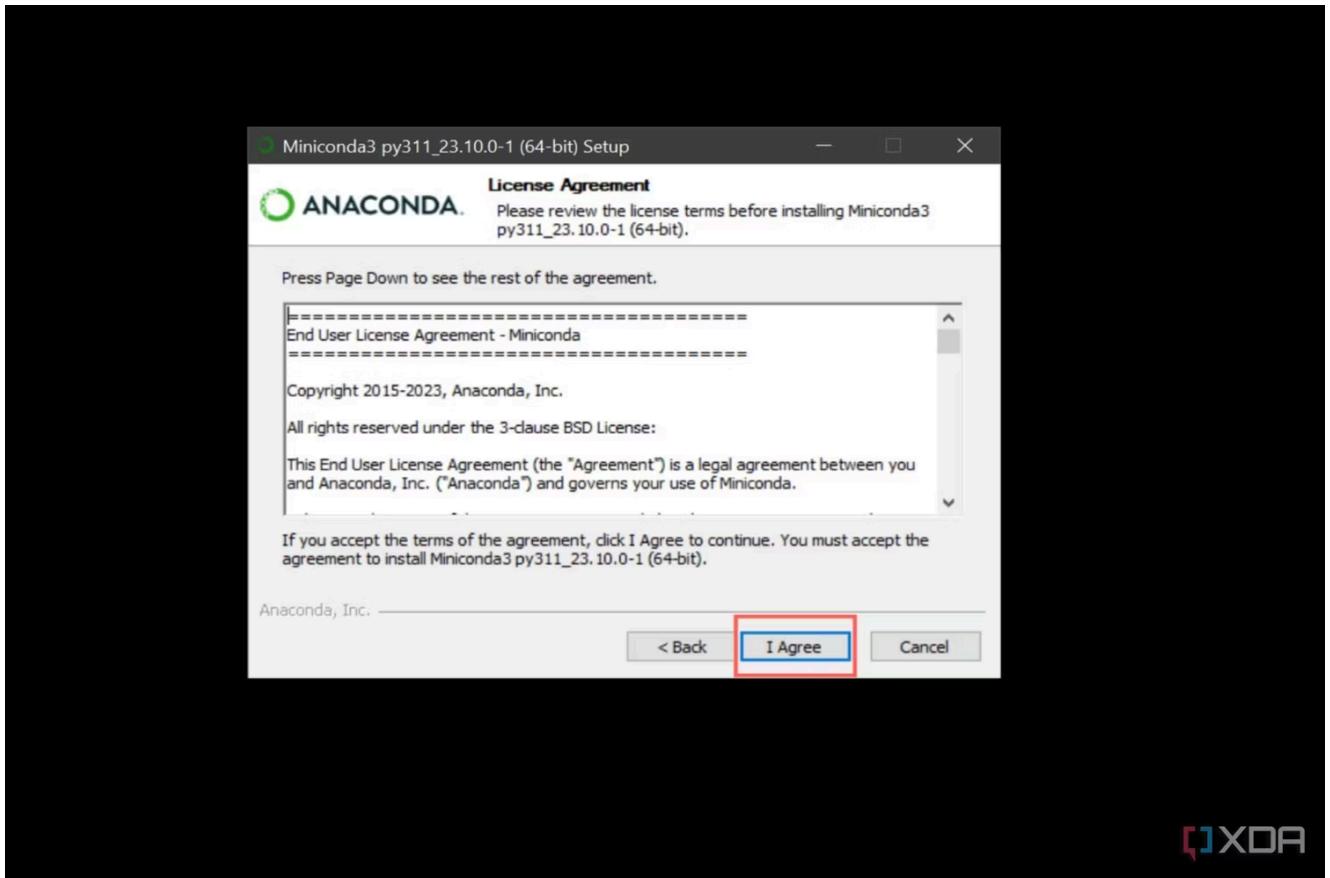
## How to install Python on Windows, Linux, and macOS

For most users, I recommend choosing the Disable Path Length Limit to avoid future headaches caused by the 260-character limit on the length of file paths set by [Windows 11](#).

## Installing Miniconda

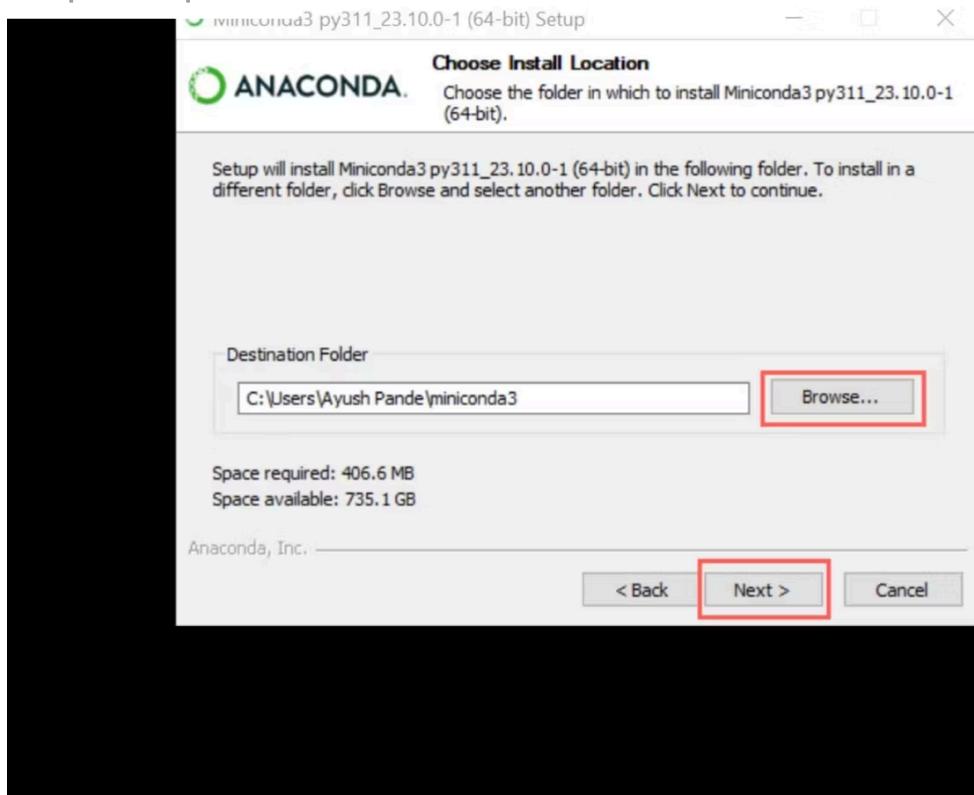
Miniconda is a toolkit that contains important Python libraries, environments, and packages necessary to enable your GPU. It also lets you create a Jupyter Notebook.

1. Download the setup.exe file from the [official website](#) and run it with admin privileges.
2. Choose the **I Agree** option when the installer asks you to agree to the licensing terms and hit **Next**.



3. Choose the directory where you wish to install Miniconda, and click on the **Next** button.

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XDA

4. Hit the **Install** button and press **Finish** once the installation is complete.

## Setting up a Conda environment

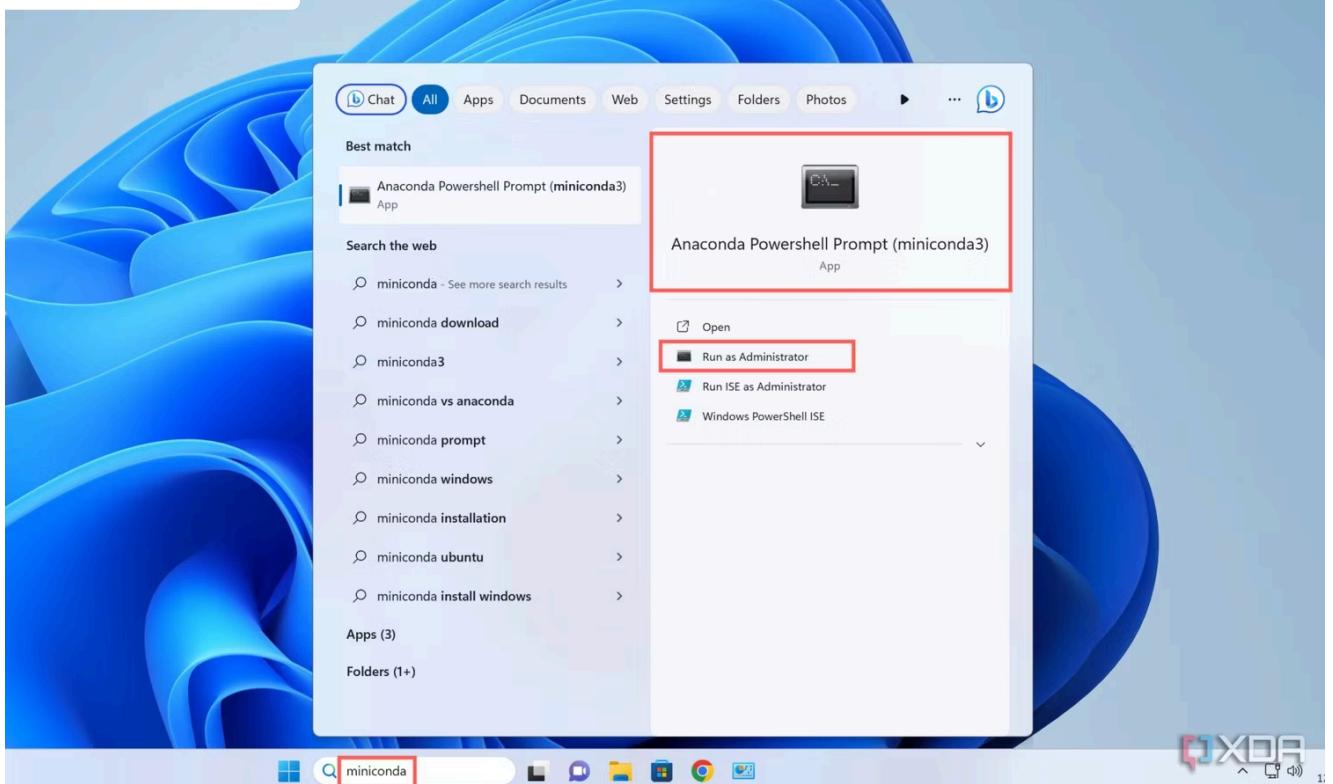
Now that you've installed Python and Miniconda, it's time to configure a coding environment for your machine learning projects. I recommend creating a separate environment as we'll be using older packages in this tutorial.

### Note

Since the latest version of TensorFlow doesn't work on Windows 11 systems that don't have WSL pre-configured, you'll have to install a build that's older than TensorFlow v2.11. The same goes for Python, so you'll have to downgrade to Python 3.9 in the new Conda environment.

1. Type **miniconda** in the **Windows Search Bar** and pick the **Run as Administrator** option under the **Anaconda Powershell Prompt**.

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2. Paste the following code into the terminal and press enter:

```
conda create --name my_env python=3.9 -y
```

A screenshot of the Anaconda Powershell Prompt window. The command `conda create --name my_env python=3.9 -y` is entered in the terminal. A red arrow points to the command line. The output shows the package creation process, including the environment location, added packages (python=3.9), and the list of packages to be downloaded. The table at the bottom details the package names, build numbers, and file sizes.

```
(base) PS C:\Users\Ayush> conda create --name my_env python=3.9 -y
Channels:
- defaults
Platform: win-64
Collecting package metadata (repodata.json): done
Solving environment: done

## Package Plan ##

environment location: C:\Users\Ayush\miniconda3\envs\my_env

added / updated specs:
- python=3.9

The following packages will be downloaded:

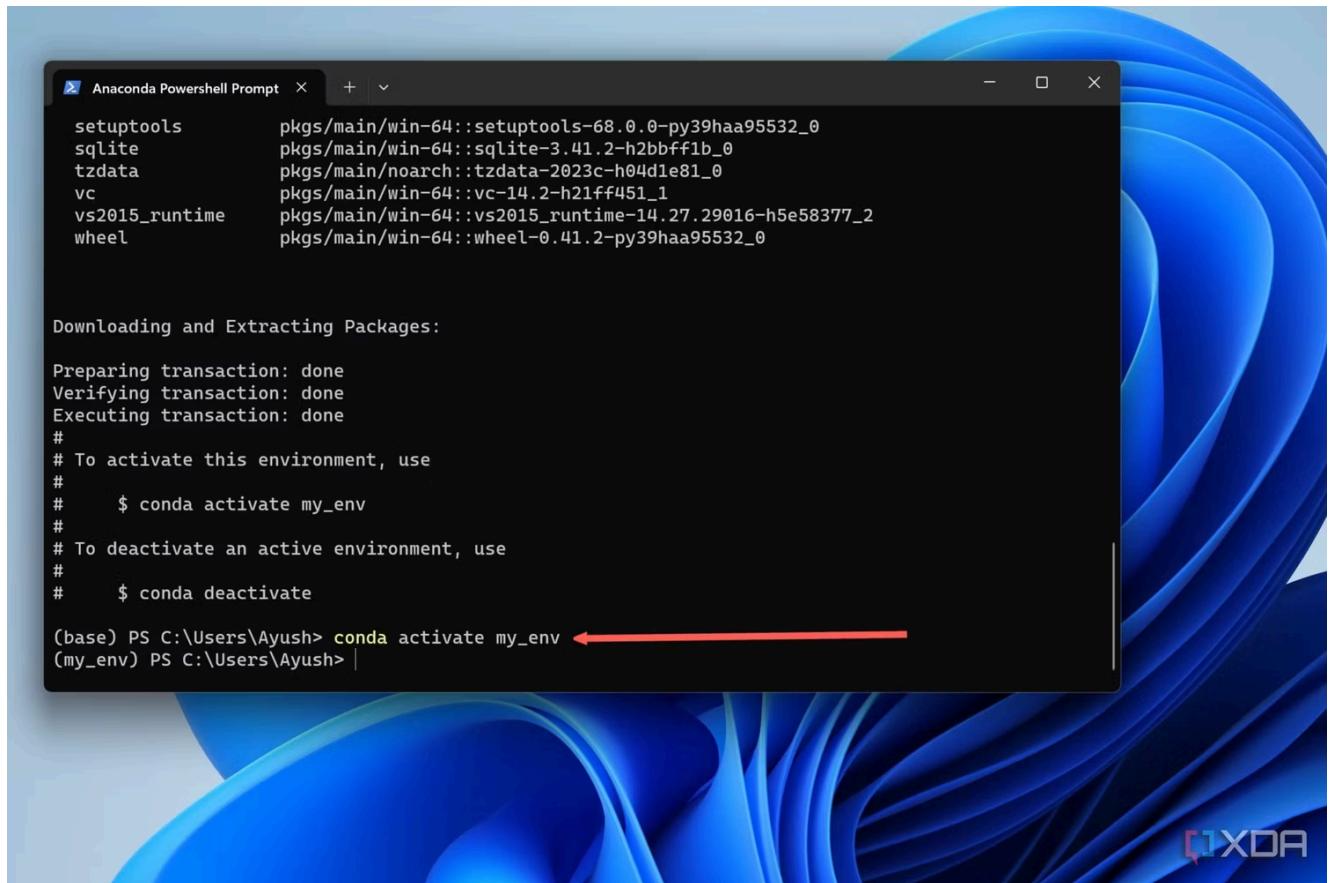
  package          | build
  -----|-----
  pip-23.3.1      | py39haa95532_0      2.8 MB
  python-3.9.18   | h1aa4202_0        19.4 MB
  setuptools-68.0.0| py39haa95532_0      925 KB
  wheel-0.41.2    | py39haa95532_0      126 KB

Total:           23.2 MB
```

3. Activate the newly created environment using the following command:

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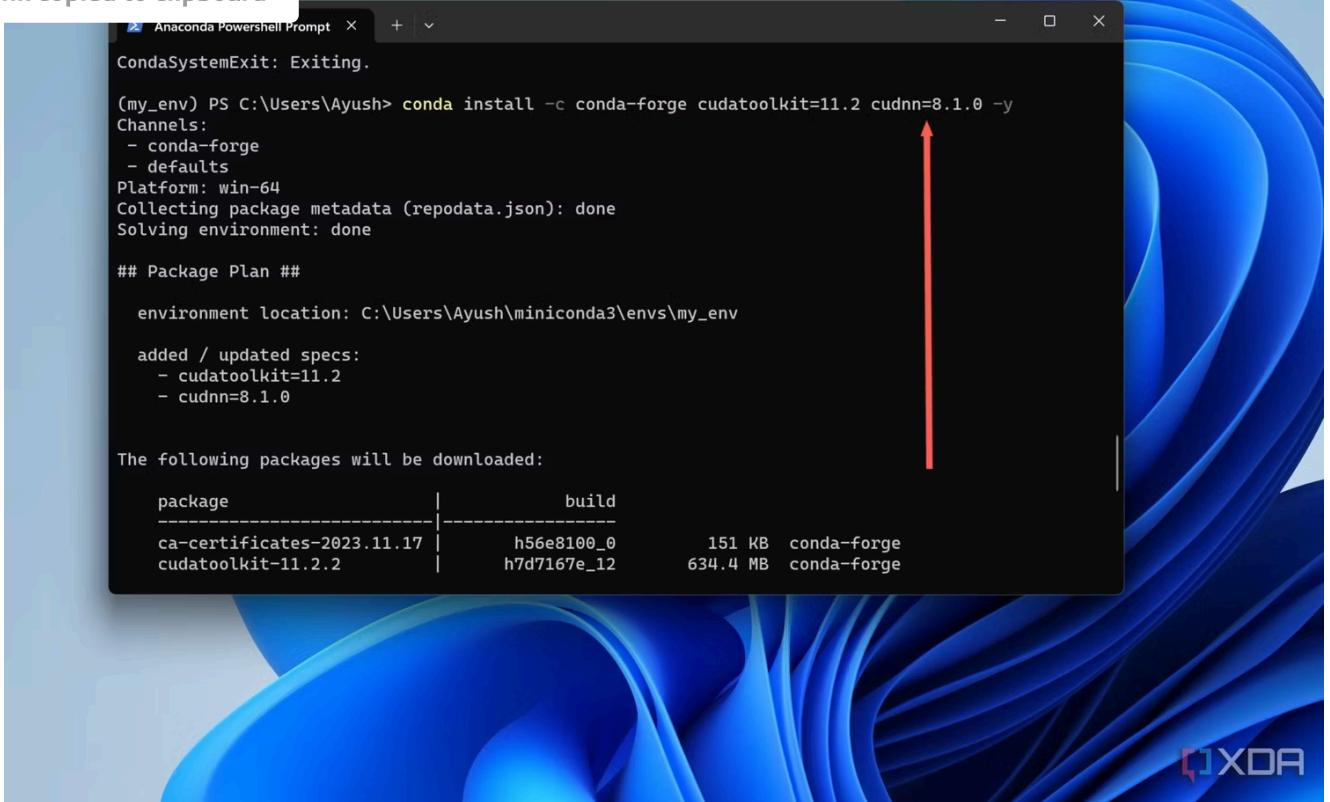
```
conda activate my_env
```



4. Run this command to install the cuDNN library and CUDA drivers:

```
conda install -c conda-forge cudatoolkit=11.2 cudnn=8.1.0 -y
```

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```
Anaconda Powershell Prompt + - □ ×

CondaSystemExit: Exiting.

(my_env) PS C:\Users\Ayush> conda install -c conda-forge cudatoolkit=11.2 cudnn=8.1.0 -y
Channels:
- conda-forge
- defaults
Platform: win-64
Collecting package metadata (repodata.json): done
Solving environment: done

## Package Plan ##

environment location: C:\Users\Ayush\miniconda3\envs\my_env

added / updated specs:
- cudatoolkit=11.2
- cudnn=8.1.0

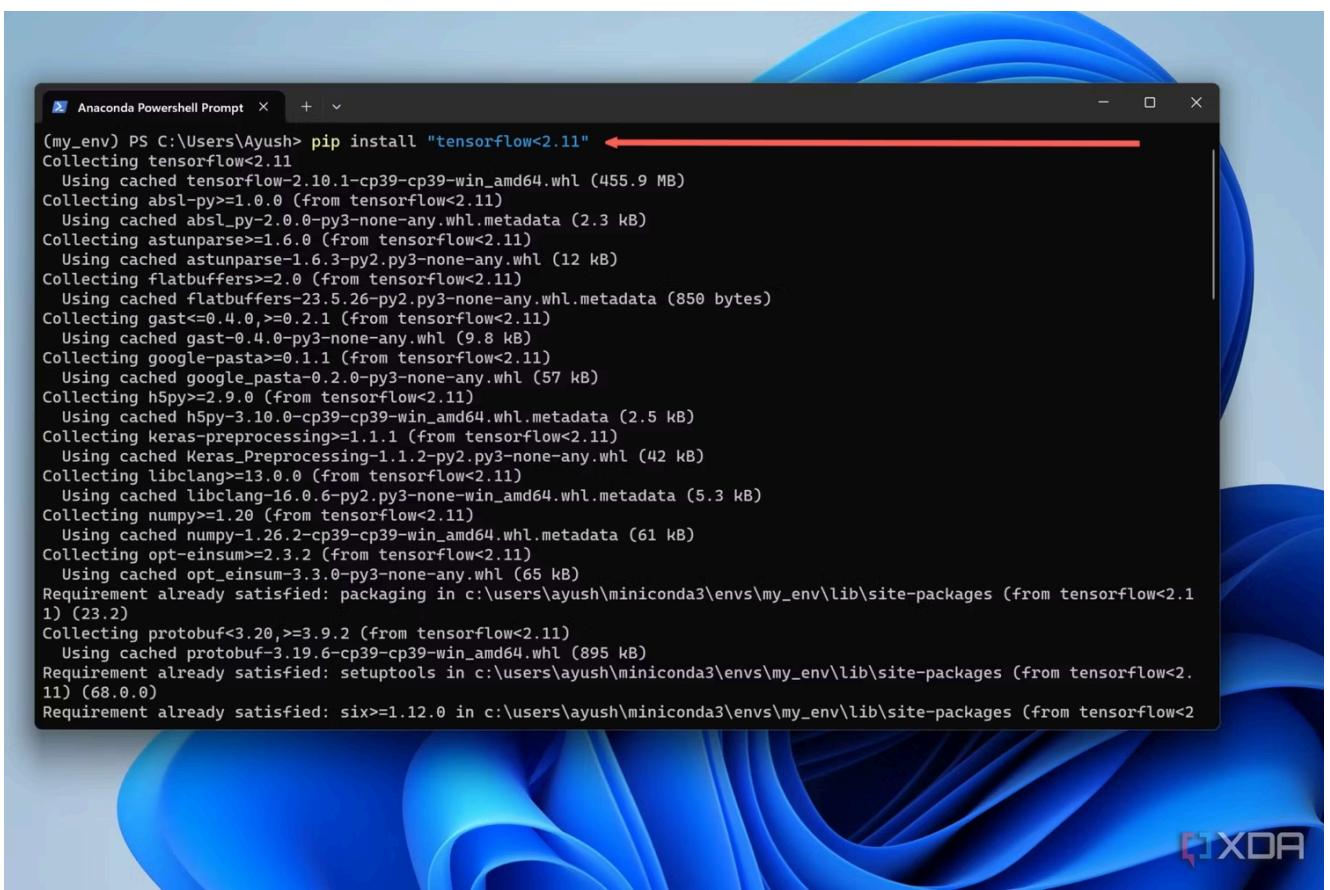
The following packages will be downloaded:

  package          |      build
ca-certificates-2023.11.17 | h56e8100_0      151 KB  conda-forge
cudatoolkit-11.2.2        | h7d7167e_12     634.4 MB  conda-forge
```



## 5. Install the TensorFlow library by running the following command:

```
pip install "tensorflow<2.11"
```



```
Anaconda Powershell Prompt + - □ ×

(my_env) PS C:\Users\Ayush> pip install "tensorflow<2.11"
Collecting tensorflow<2.11
  Using cached tensorflow-2.10.1-cp39-cp39-win_amd64.whl (455.9 MB)
Collecting absl-py>=1.0.0 (from tensorflow<2.11)
  Using cached absl_py-2.0.0-py3-none-any.whl.metadata (2.3 kB)
Collecting astunparse>=1.6.0 (from tensorflow<2.11)
  Using cached astunparse-1.6.3-py2.py3-none-any.whl (12 kB)
Collecting flatbuffers>=2.0 (from tensorflow<2.11)
  Using cached flatbuffers-23.5.26-py2.py3-none-any.whl.metadata (850 bytes)
Collecting gast<=0.4.0,>=0.2.1 (from tensorflow<2.11)
  Using cached gast-0.4.0-py3-none-any.whl (9.8 kB)
Collecting google-pasta>=0.1.1 (from tensorflow<2.11)
  Using cached google_pasta-0.2.0-py3-none-any.whl (57 kB)
Collecting h5py>=2.9.0 (from tensorflow<2.11)
  Using cached h5py-3.10.0-cp39-cp39-win_amd64.whl.metadata (2.5 kB)
Collecting keras-preprocessing>=1.1.1 (from tensorflow<2.11)
  Using cached Keras_Preprocessing-1.1.2-py2.py3-none-any.whl (42 kB)
Collecting libclang>=13.0.0 (from tensorflow<2.11)
  Using cached libclang-16.0.6-py2.py3-none-win_amd64.whl.metadata (5.3 kB)
Collecting numpy>=1.20 (from tensorflow<2.11)
  Using cached numpy-1.26.2-cp39-cp39-win_amd64.whl.metadata (61 kB)
Collecting opt-einsum>=2.3.2 (from tensorflow<2.11)
  Using cached opt_einsum-3.3.0-py3-none-any.whl (65 kB)
Requirement already satisfied: packaging in c:\users\ayush\miniconda3\envs\my_env\lib\site-packages (from tensorflow<2.11) (23.2)
Collecting protobuf<3.20,>=3.9.2 (from tensorflow<2.11)
  Using cached protobuf-3.19.6-cp39-cp39-win_amd64.whl (895 kB)
Requirement already satisfied: setuptools in c:\users\ayush\miniconda3\envs\my_env\lib\site-packages (from tensorflow<2.11) (68.0.0)
Requirement already satisfied: six>=1.12.0 in c:\users\ayush\miniconda3\envs\my_env\lib\site-packages (from tensorflow<
```



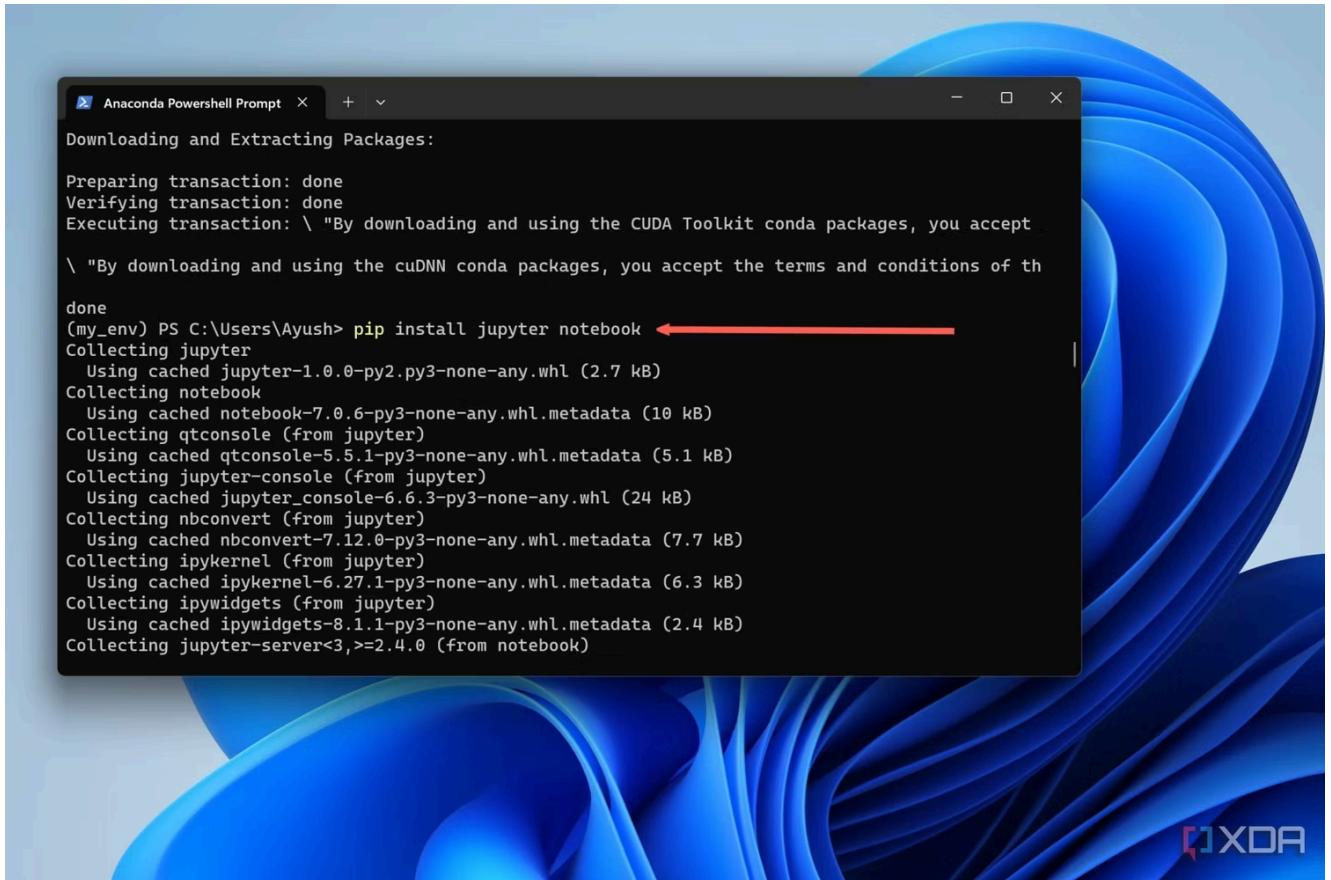
# Jupyter Notebook

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Finally, you can set up a local Jupyter Notebook server containing all your project files.

1. Run this code inside the **Anaconda Powershell Prompt**:

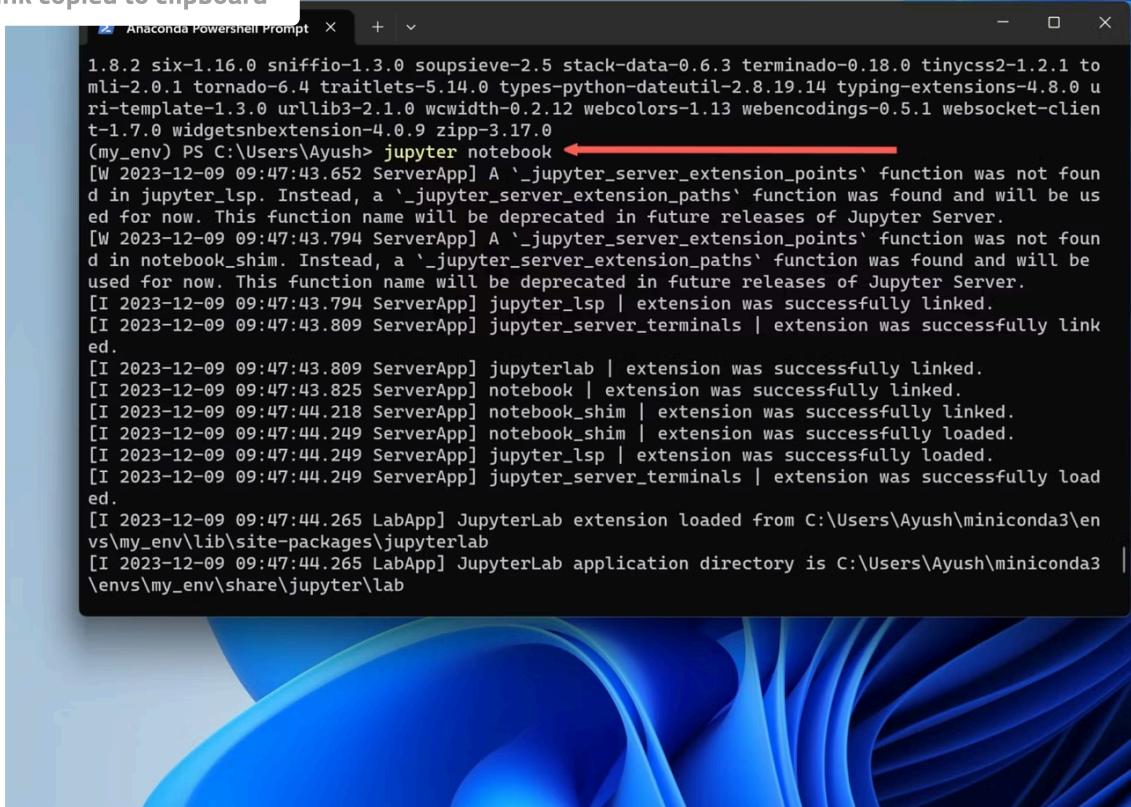
```
pip install jupyter notebook -y
```



2. Open the Jupyter Notebook server by typing:

```
jupyter notebook
```

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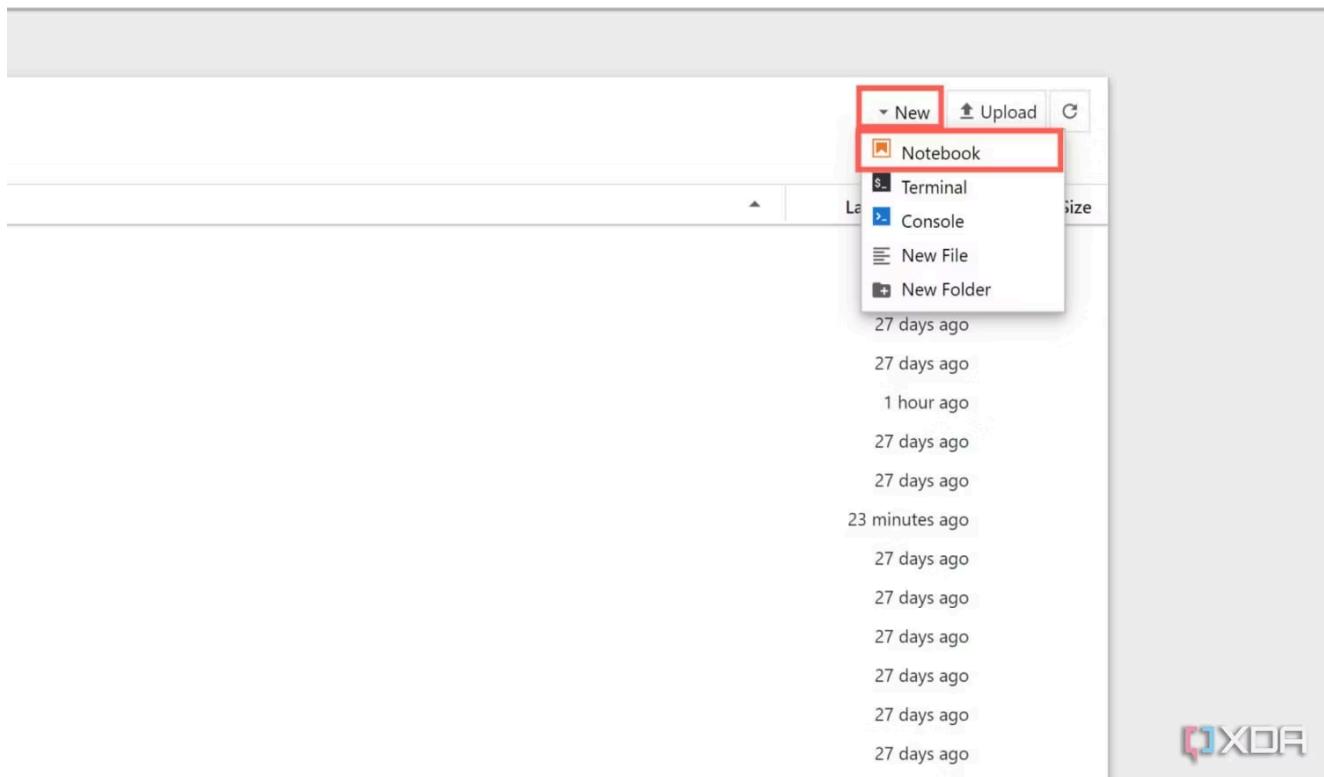
```
1.8.2 six-1.16.0 sniffio-1.3.0 soupsieve-2.5 stack-data-0.6.3 terminado-0.18.0 tiny.css2-1.2.1 to  
mli-2.0.1 tornado-6.4 traitlets-5.14.0 types-python-dateutil-2.8.19.14 typing-extensions-4.8.0 u  
ri-template-1.3.0 urllib3-2.1.0 wcwidth-0.2.12 webcolors-1.13 webencodings-0.5.1 websocket-clien  
t-1.7.0 widgetsnbextension-4.0.9 zipp-3.17.0  
(my_env) PS C:\Users\Ayush> jupyter notebook ←  
[W 2023-12-09 09:47:43.652 ServerApp] A `jupyter_server_extension_points` function was not foun  
d in jupyter_lsp. Instead, a `_jupyter_server_extension_paths` function was found and will be us  
ed for now. This function name will be deprecated in future releases of Jupyter Server.  
[W 2023-12-09 09:47:43.794 ServerApp] A `_jupyter_server_extension_points` function was not foun  
d in notebook_shim. Instead, a `_jupyter_server_extension_paths` function was found and will be  
used for now. This function name will be deprecated in future releases of Jupyter Server.  
[I 2023-12-09 09:47:43.794 ServerApp] jupyter_lsp | extension was successfully linked.  
[I 2023-12-09 09:47:43.809 ServerApp] jupyter_server_terminals | extension was successfully link  
ed.  
[I 2023-12-09 09:47:43.809 ServerApp] jupyterlab | extension was successfully linked.  
[I 2023-12-09 09:47:43.825 ServerApp] notebook | extension was successfully linked.  
[I 2023-12-09 09:47:44.218 ServerApp] notebook_shim | extension was successfully linked.  
[I 2023-12-09 09:47:44.249 ServerApp] notebook_shim | extension was successfully loaded.  
[I 2023-12-09 09:47:44.249 ServerApp] jupyter_lsp | extension was successfully loaded.  
[I 2023-12-09 09:47:44.249 ServerApp] jupyter_server_terminals | extension was successfully load  
ed.  
[I 2023-12-09 09:47:44.265 LabApp] JupyterLab extension loaded from C:\Users\Ayush\miniconda3\en  
vs\my_env\lib\site-packages\jupyterlab  
[I 2023-12-09 09:47:44.265 LabApp] JupyterLab application directory is C:\Users\Ayush\miniconda3  
\envs\my_env\share\jupyter\lab
```



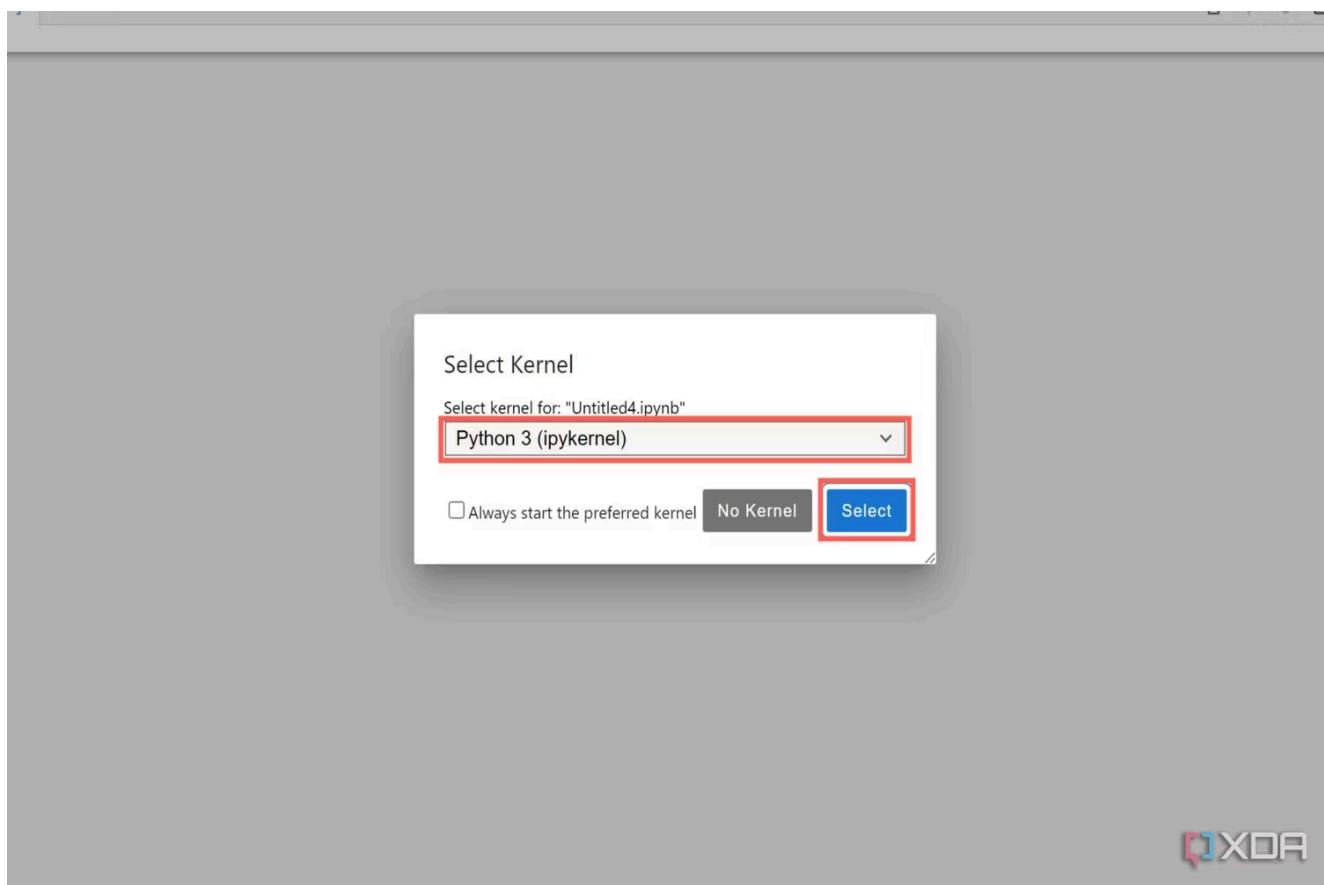
You can check if the Miniconda coding environment works with the GPU. To do so,

1. Click on the **New** button and choose **Notebook**.

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2. Select **Python 3 (ipykernel)** as the kernel.



3. Copy these lines of code inside the newly created Notebook:

Link copied to clipboard low as tf

- o    gpus = tf.config.list\_physical\_devices("GPU")
- o    if gpus:
- o       for gpu in gpus:
- o          print("Found a GPU with the name:", gpu)
- o    else:
- o       print("Failed to detect a GPU.")

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Last Checkpoint: 1 minute ago

Edit View Run Kernel Settings Help

+ X □ ▶ Code ▾

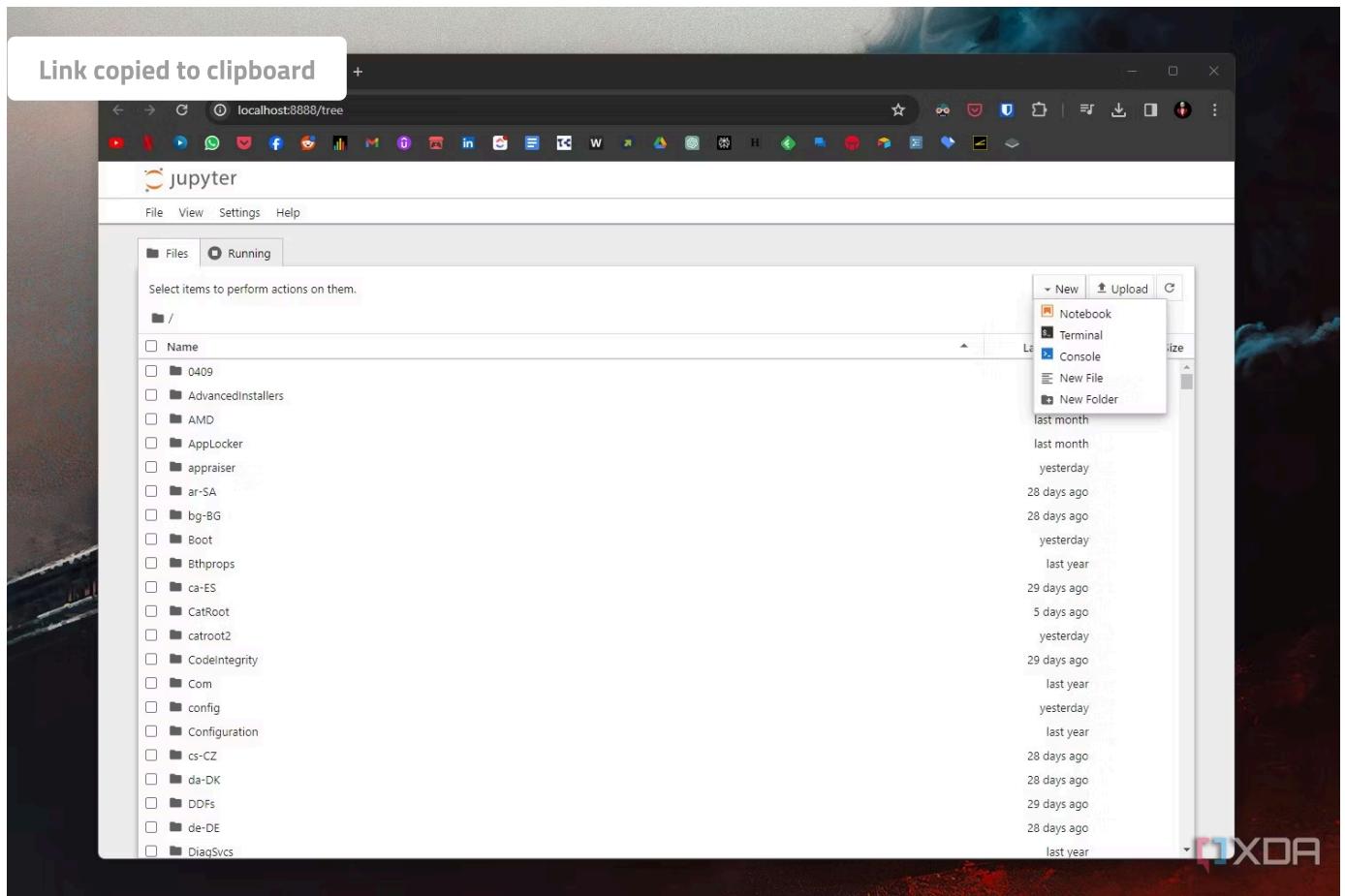
```
[2]: import tensorflow as tf
gpus = tf.config.list_physical_devices("GPU")
if gpus:
    for gpu in gpus:
        print("Found a GPU with the ID:", gpu)
else:
    print("Failed to detect a GPU.")
```

Found a GPU with the ID: PhysicalDevice(name='/physical\_device:GPU:0', device\_type='GPU')

4. Press the **Run** button.

If Jupyter Notebook displays a graphics card as the output, it means the process was successful!

## Running Jupyter Notebook on a GPU



Once you've verified that the graphics card works with Jupyter Notebook, you can use the *import tensorflow* code snippet to leverage your GPU in all your machine-learning projects. In case Jupyter Notebook is unable to detect your graphics card, you can retry the same procedure in another Conda environment. Be sure to install the same versions of the CUDA drivers and the cuDNN and TensorFlow libraries as I've used in this tutorial to avoid running into compatibility issues.

If your projects take eons to compile, your graphics card could be lacking in horsepower. Upgrading to a better GPU is an easy fix that will give your PC the much-needed boost to run complex AI and deep learning algorithms.

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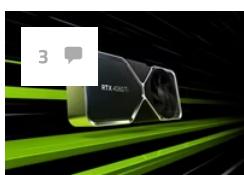
Ayush Pande is a PC hardware and gaming journalist. When he's not writing articles, you can find him tinkering with computers, playing long RPGs, or strumming a guitar.

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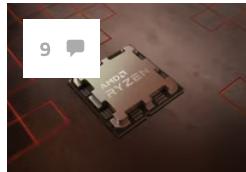
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