Tutorial 3 – TensorFlow Project Environment Setup & Development Flow

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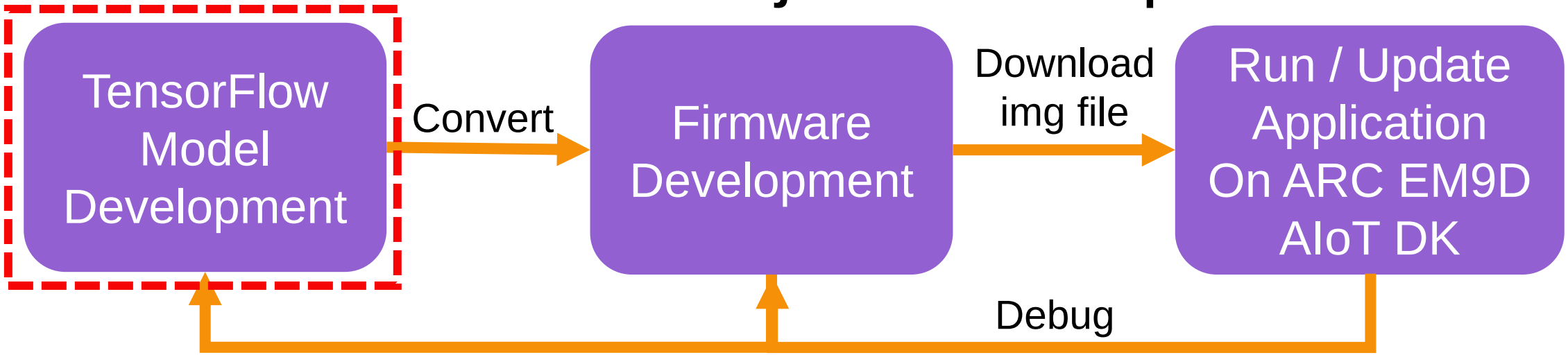
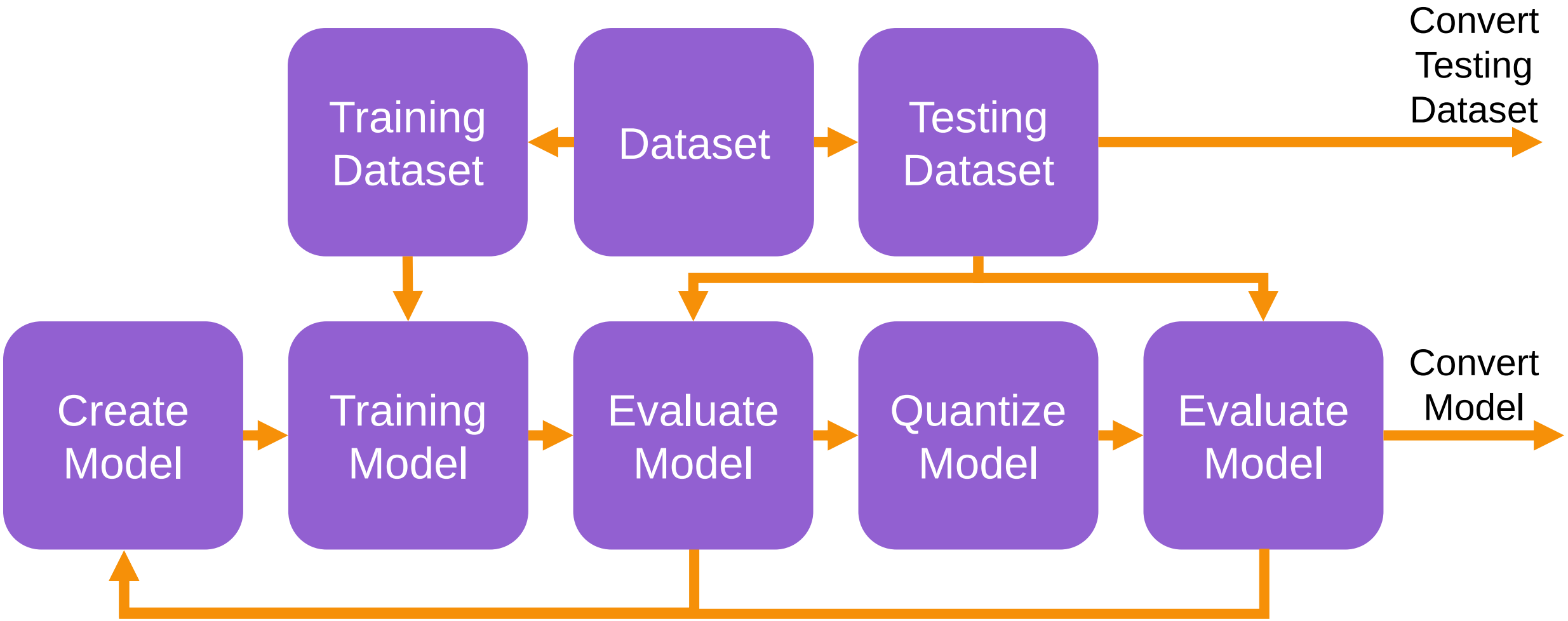
ARC EM9D AIoT DK Project Development Flow



Stage	TensorFlow Model Development	Firmware Development	Run / Update Application On ARC EM9D AIoT DK
Tool	Anaconda Cygwin	Cygwin Metaware or ARC GNU VirtualBox (Ubuntu 20.04)	JTAG Himax-FT4222-GUI USB Cable
Language	Python 3	C language C++ language	

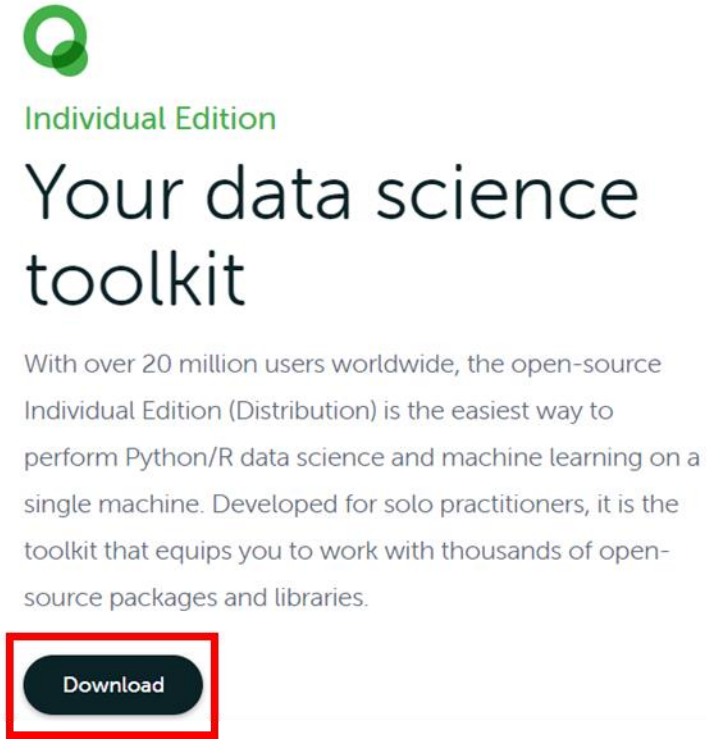
TensorFlow Model Development

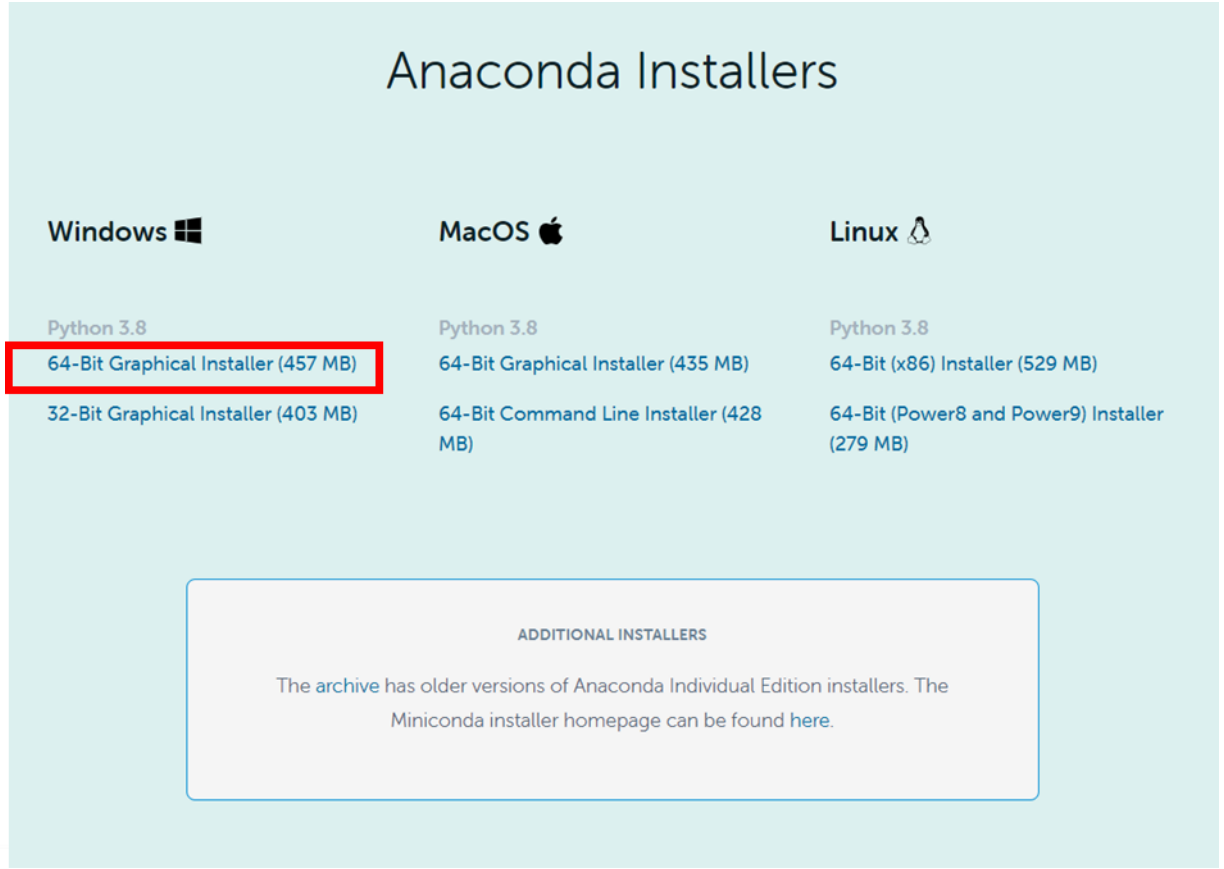


Anaconda3 Setup

Download

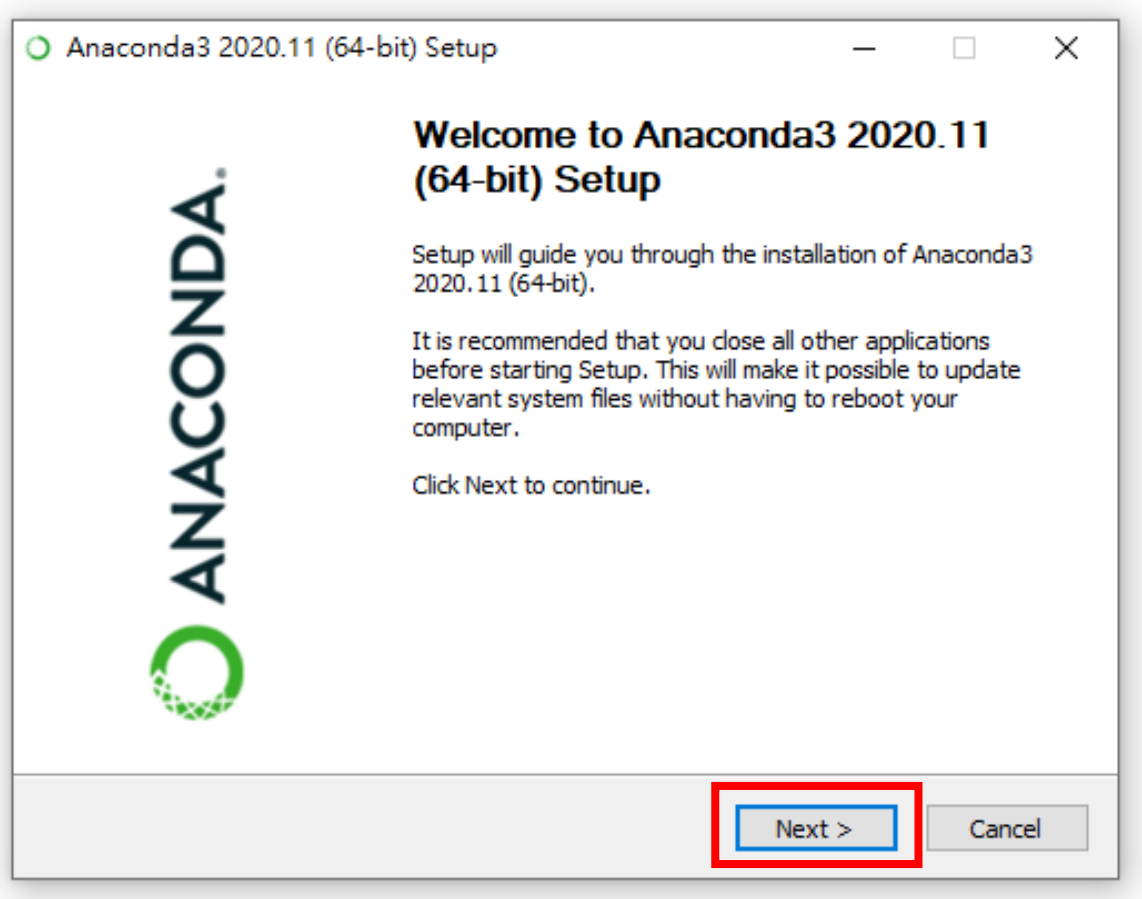
1. Download the installation file
   https://www.anaconda.com/products/individual

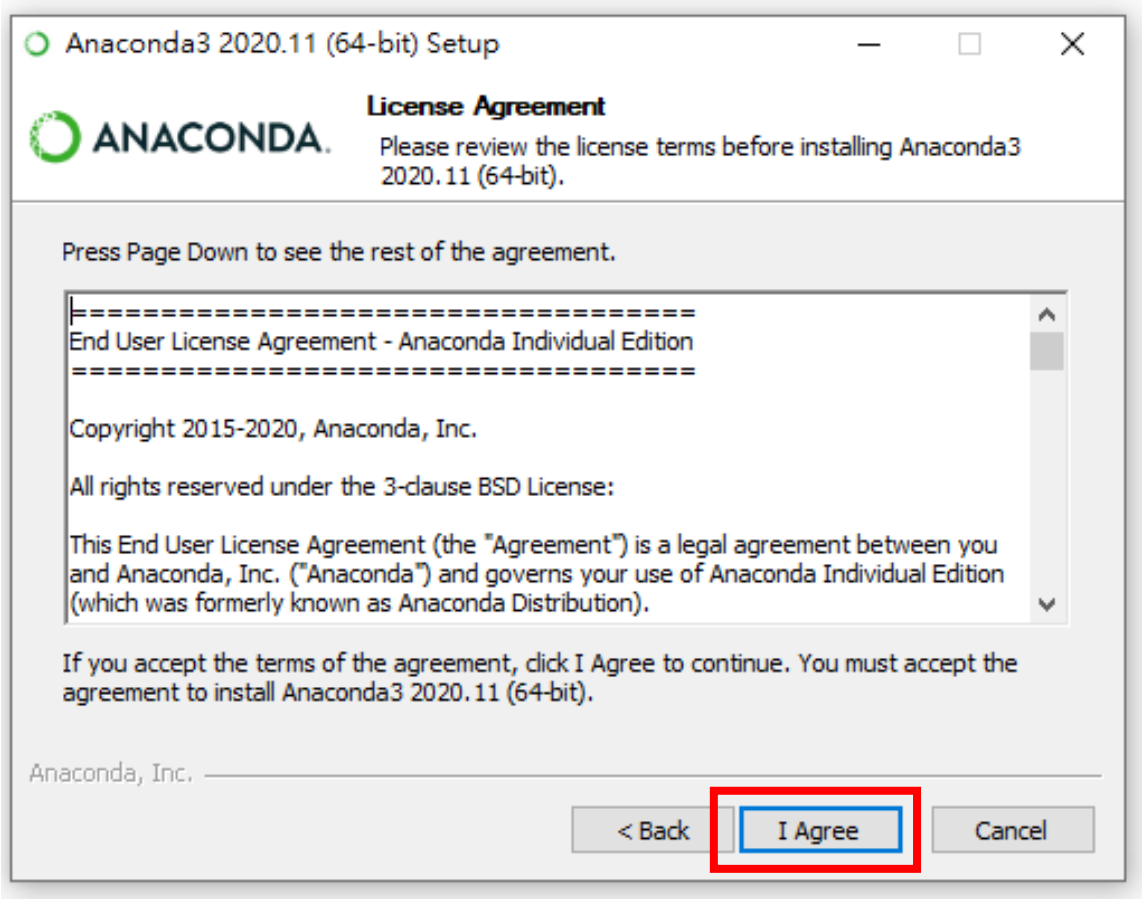




Anaconda3 Setup

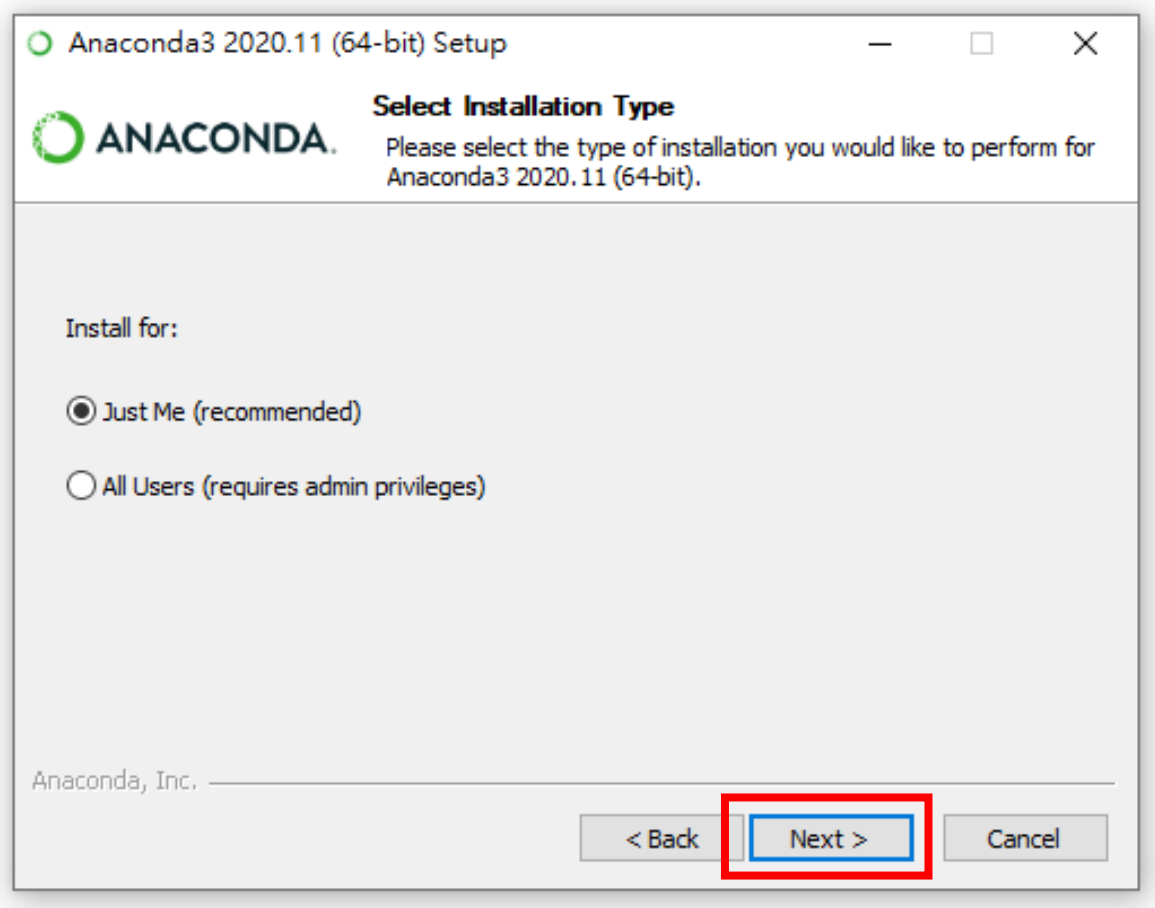
2. Click “Next” and “I Agree”

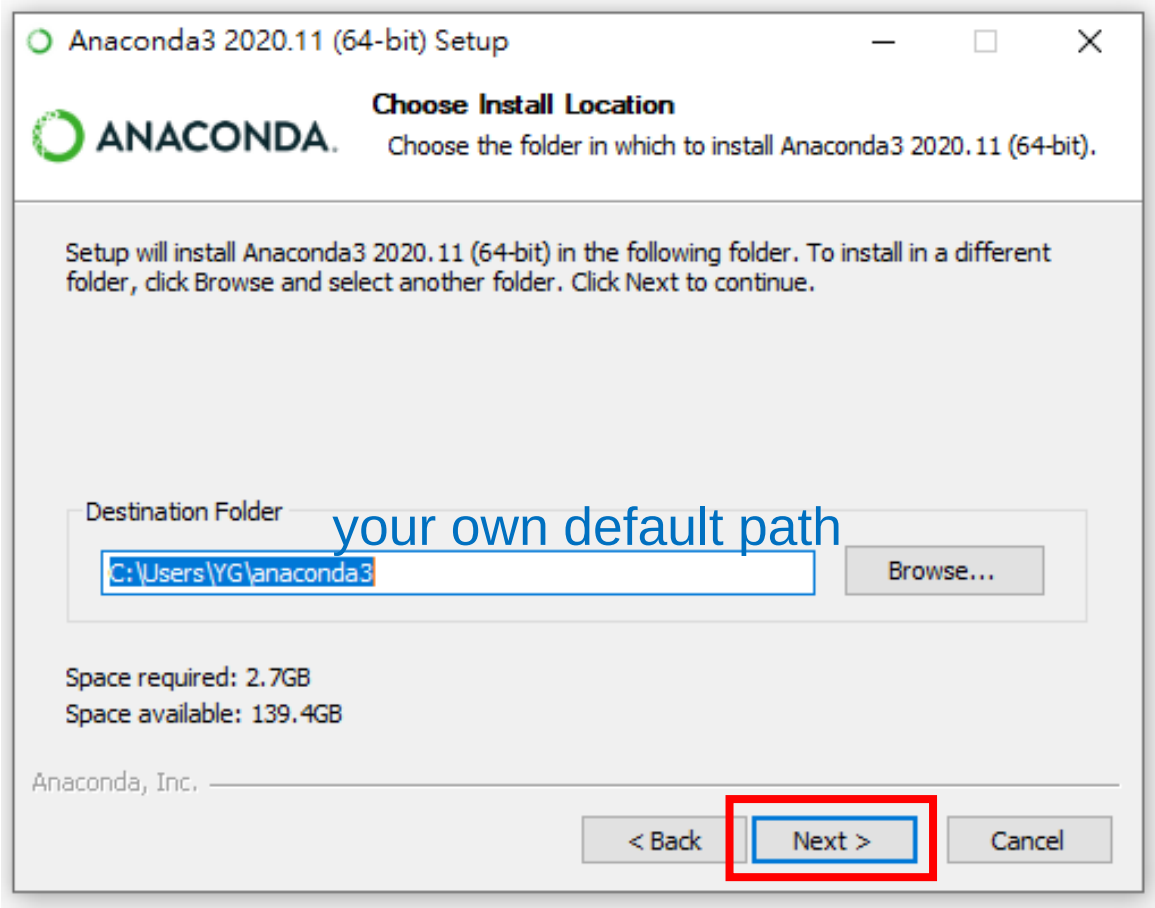




Anaconda3 Setup

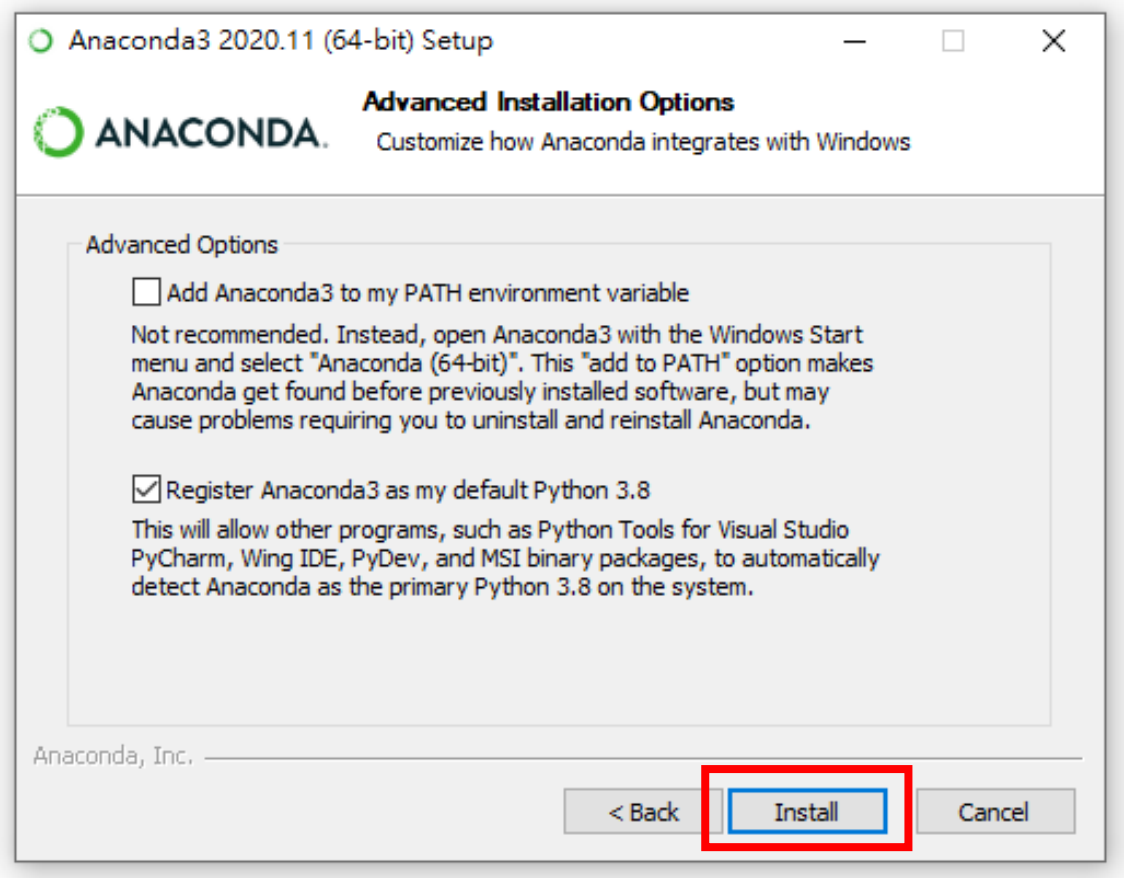
3. Click “Next”

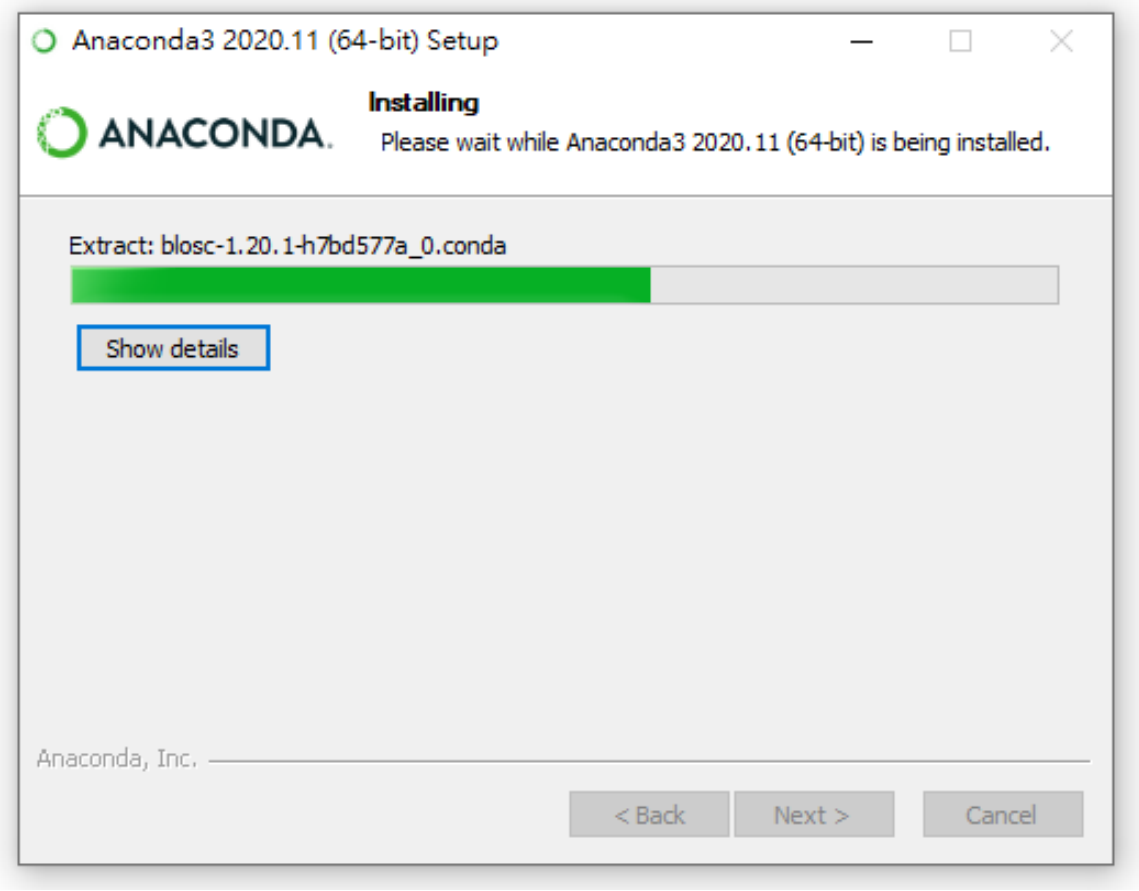




Anaconda3 Setup

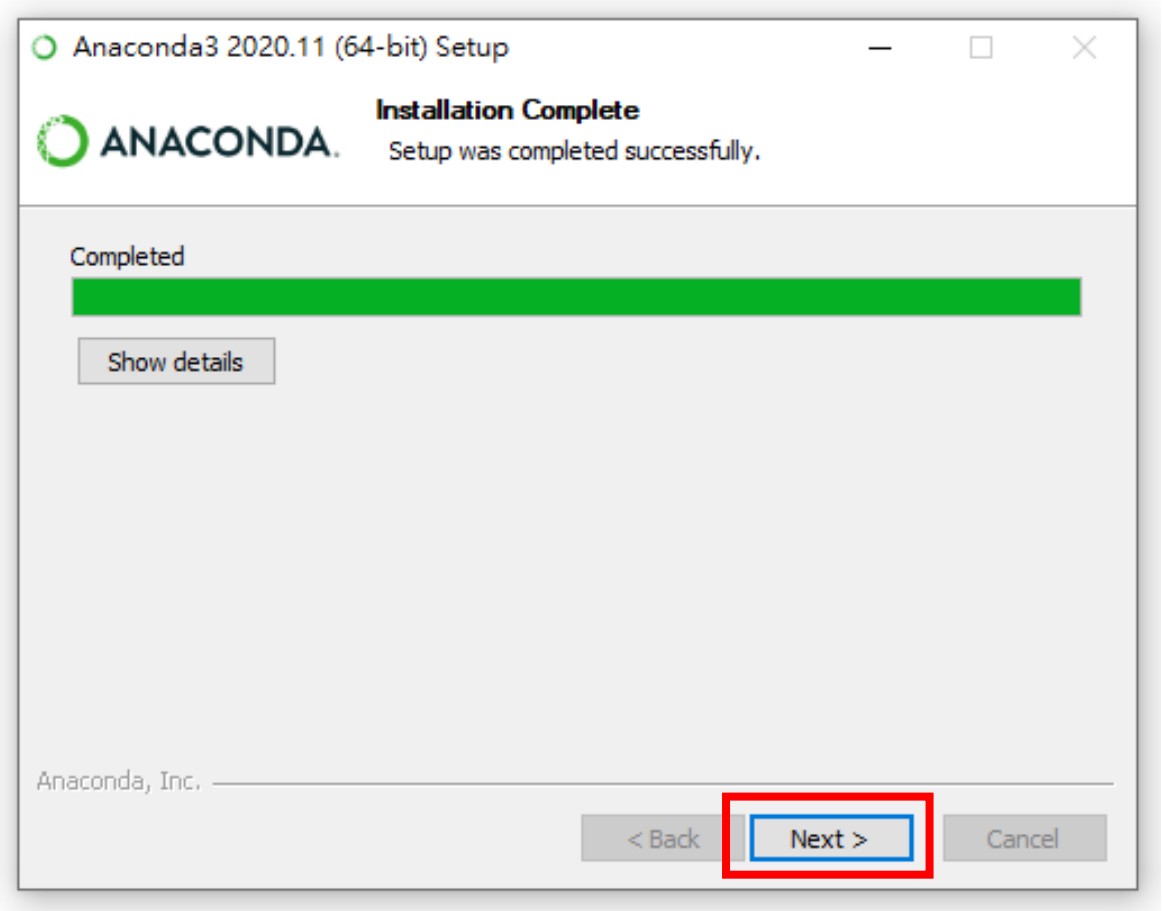
4. Click “Install”

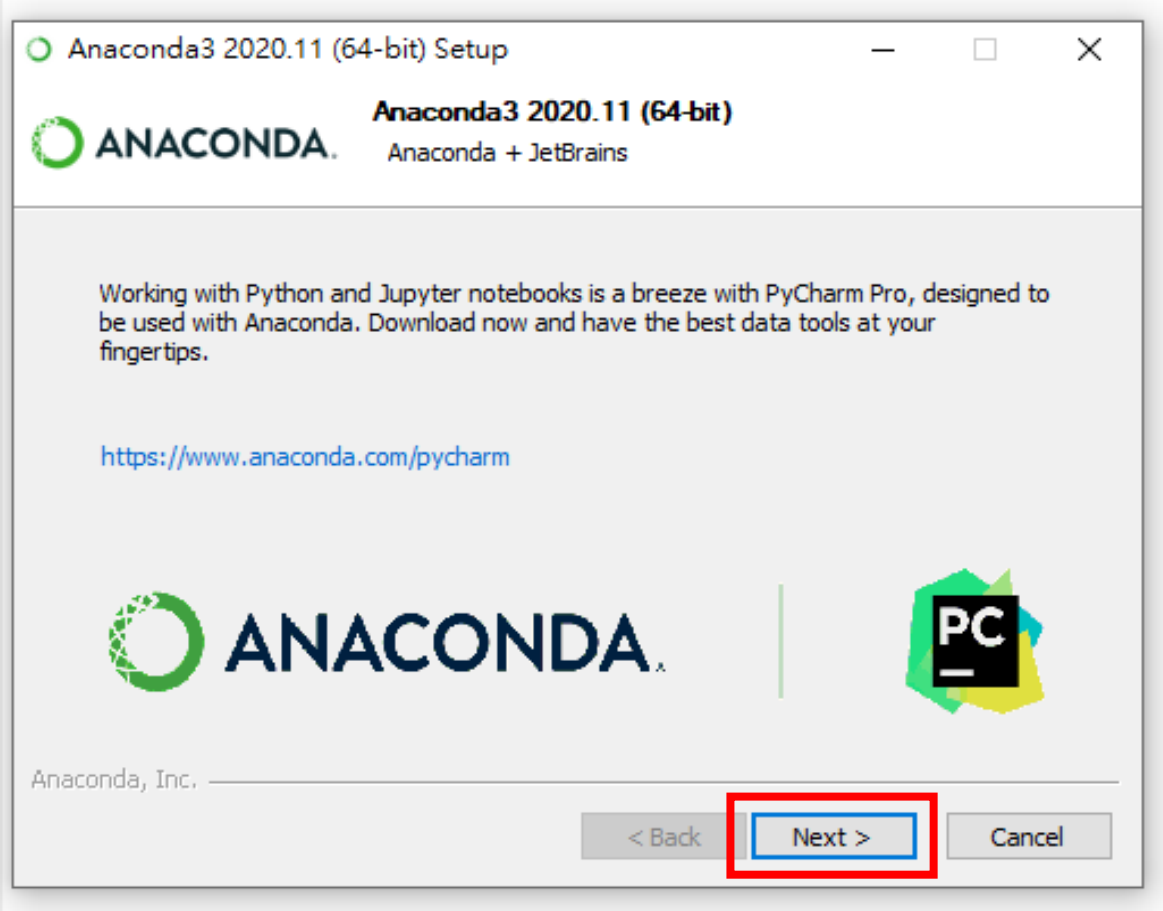




Anaconda3 Setup

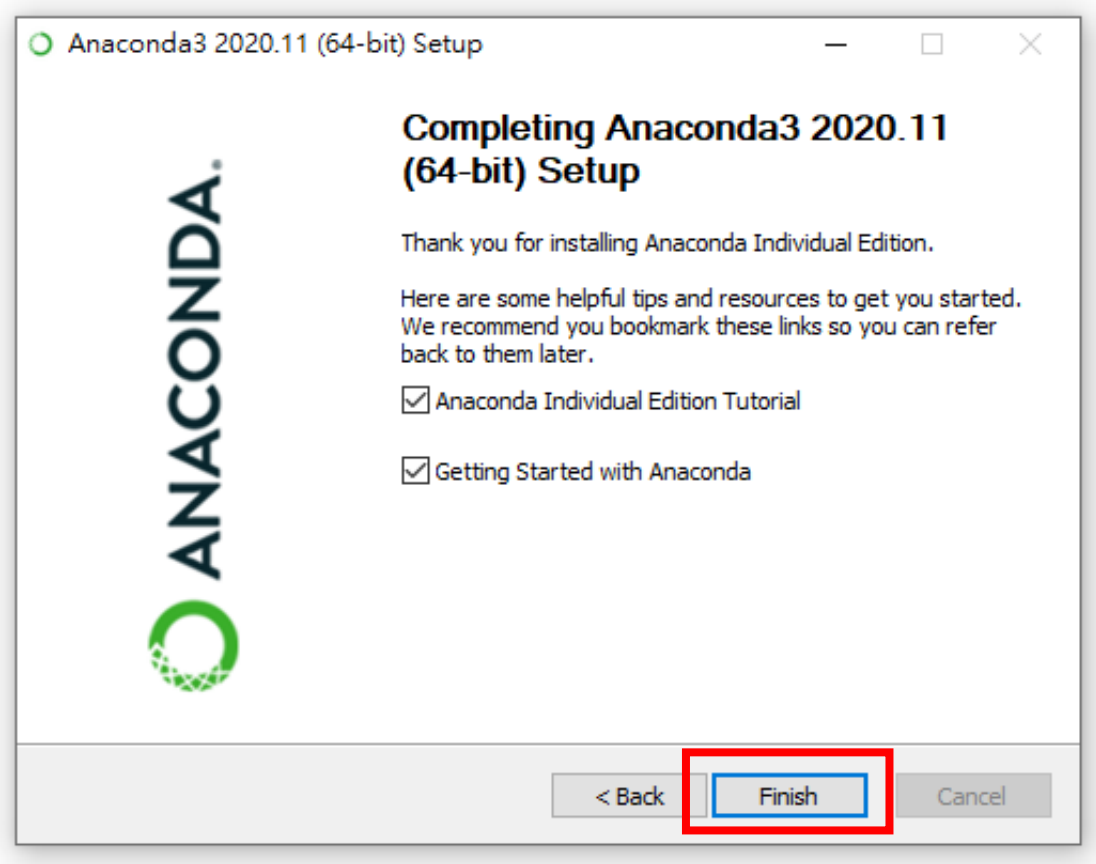
5. Click “Next”





Anaconda3 Setup

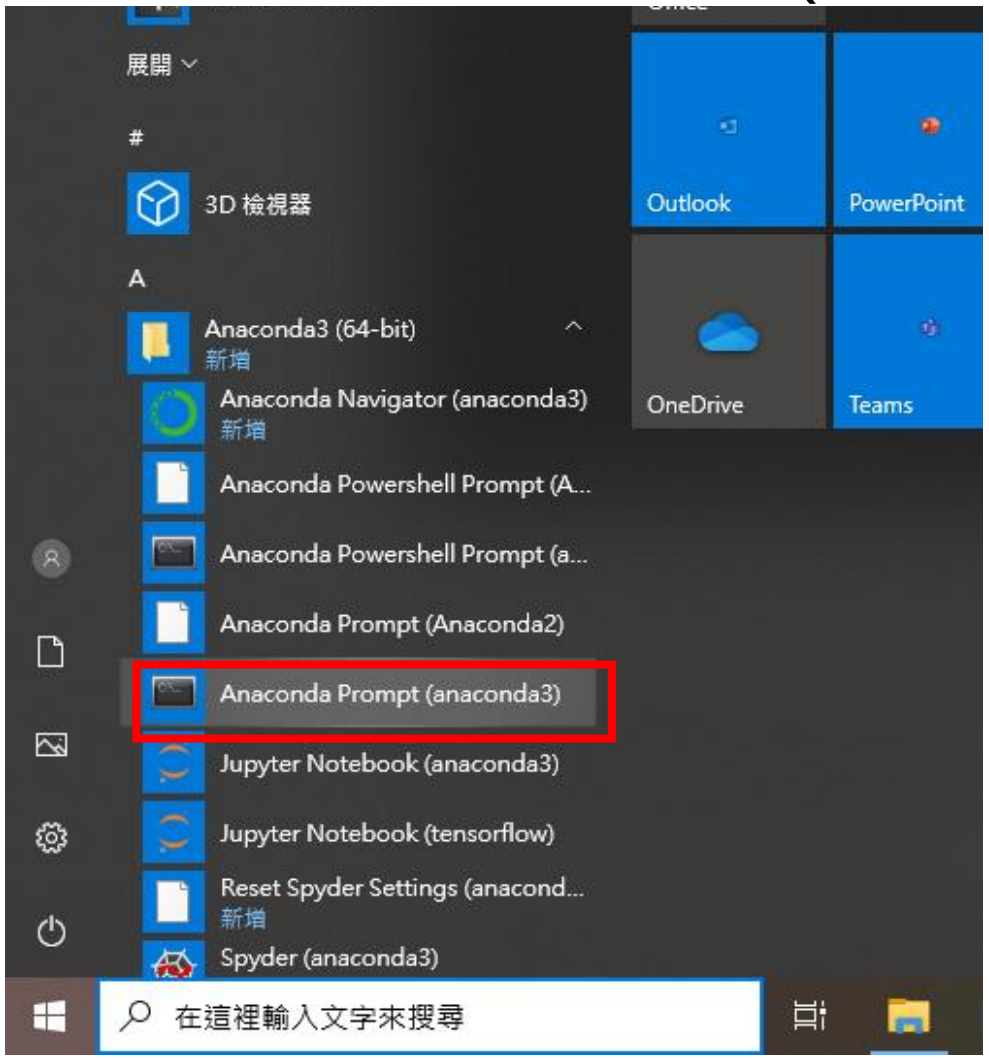
6. Click “Finish”

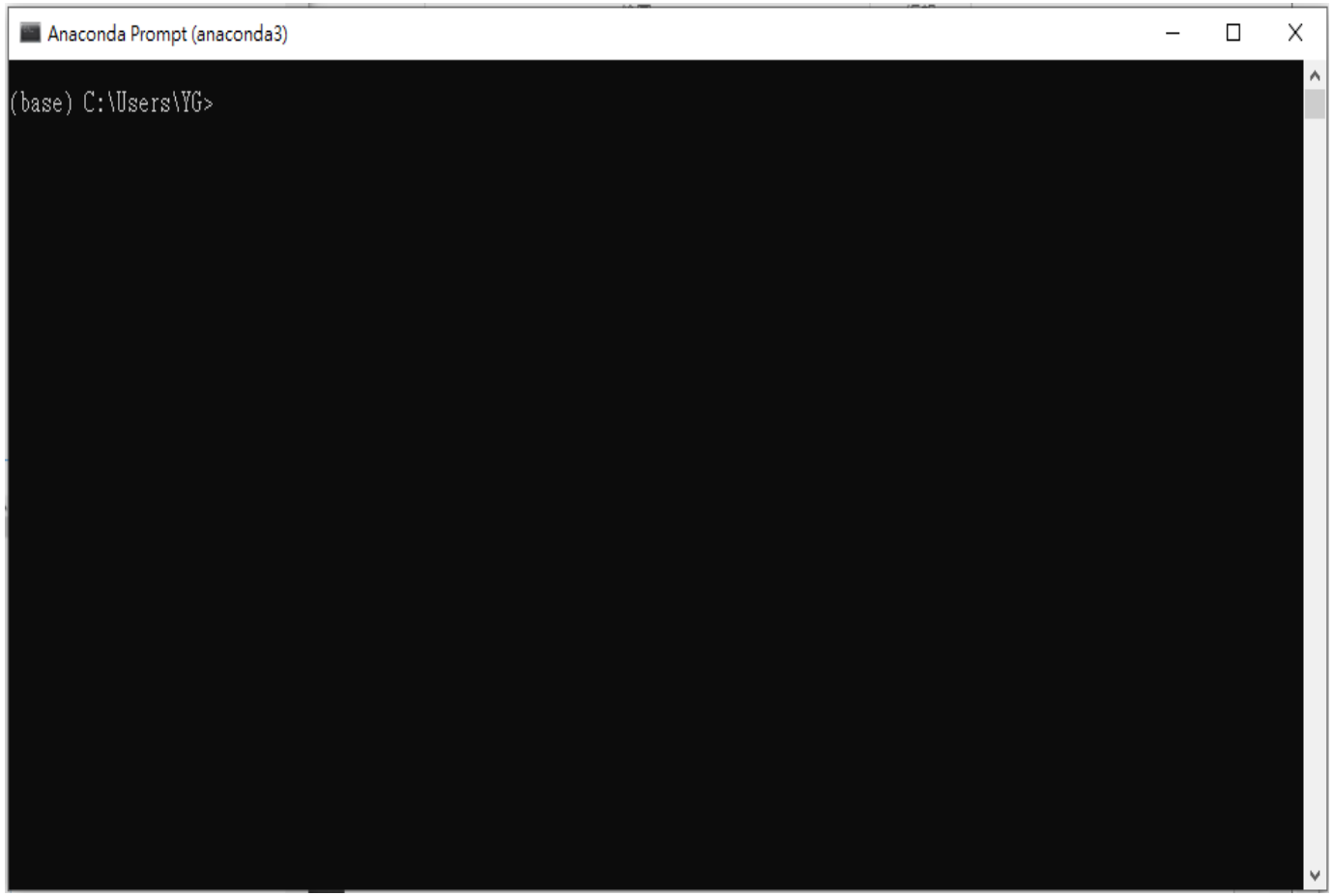


Tensorflow Environment Setup

Tensorflow Environment Setup

Windows > Anaconda3 (64-bit) > Anaconda Prompt (anaconda3)



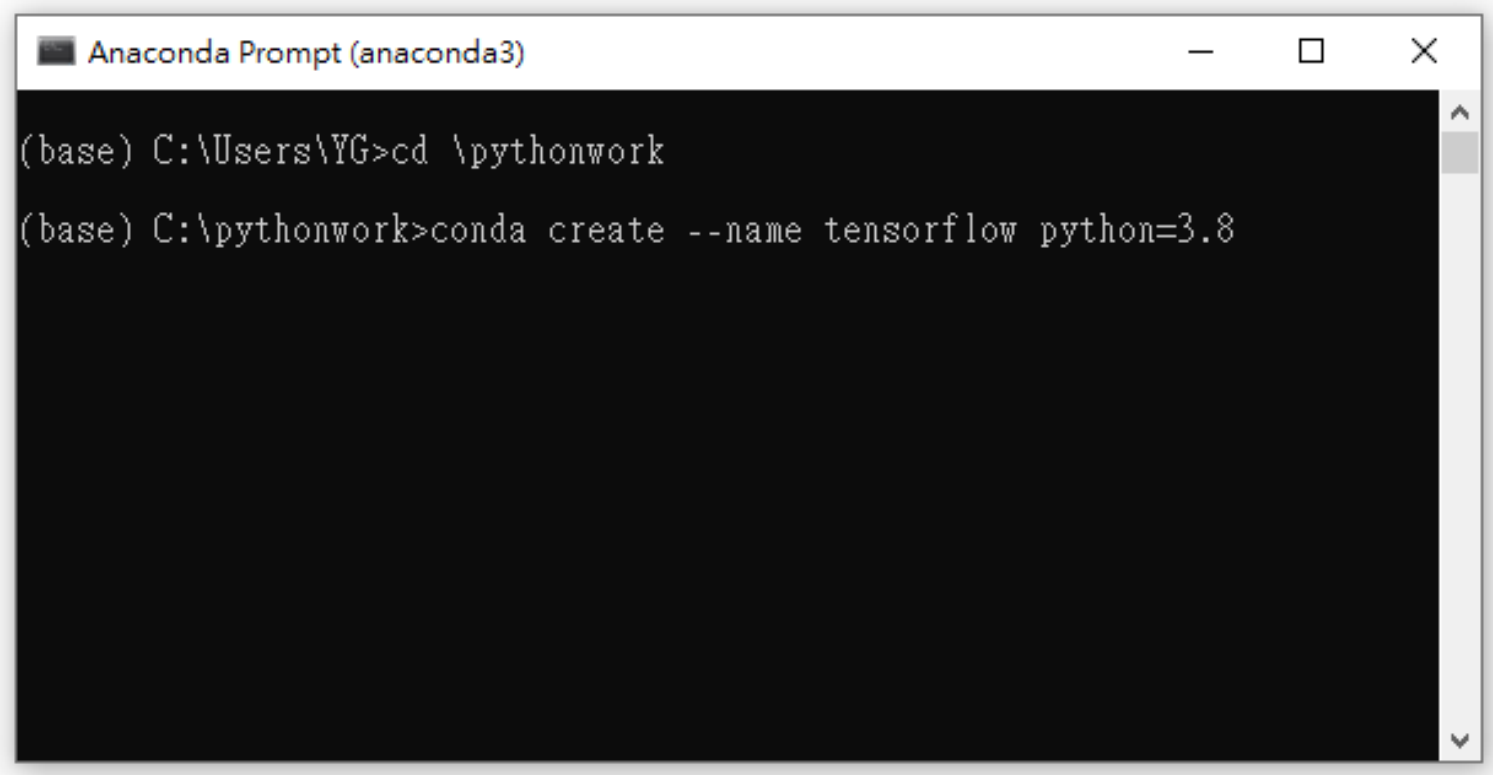


Tensorflow Environment Setup

Use conda command to build a virtual environment which is named “tensorflow”, and install Python 3.8

$ conda create --name tensorflow python=3.8

When it shows “Proceed([y]/n)?”
Click y to continue



TensorFlow Environment Setup

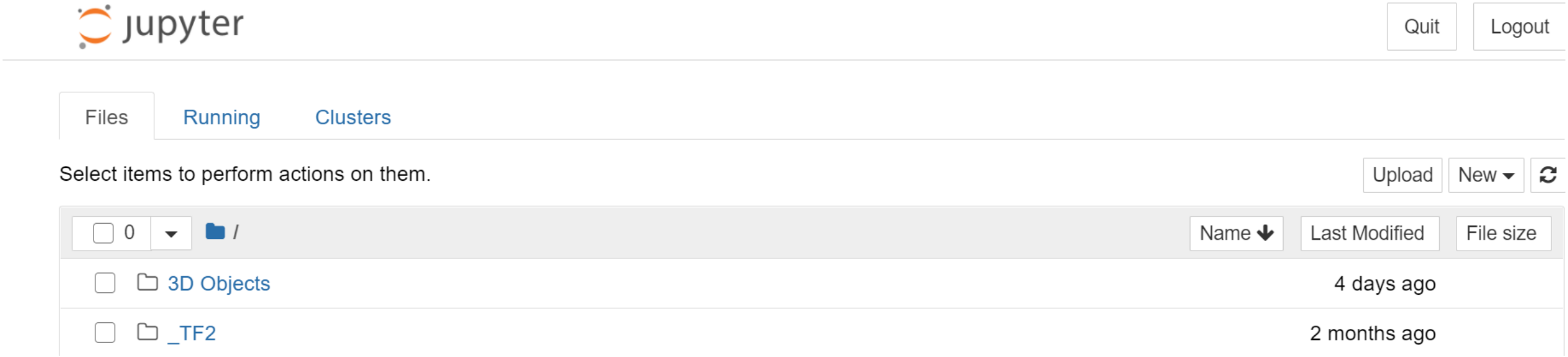
1. Enable your anaconda virtual environment
   $ conda activate tensorflow
2. Install Tensorflow
   $ conda install tensorflow==2.3.0
3. Install Keras
   $ conda install –c conda-forge keras
4. Install matplotlib
   $ conda install matplotlib
5. Install numpy
   $ conda install numpy
6. Install tensorflow_datasets
   $ pip install tensorflow_datasets==4.5.2
7. Install Jupyter notebook
   $ conda install jupyter notebook

- When you have any problem during installation, please search the install command.

TensorFlow Environment Test

TensorFlow Environment Test

1. Windows > Aanaconda3 (64-bit) > Jupyter Notebook (tensorflow)
2. Your root path: “C:\Users\{username}\”
   (Jupyter Notebook default root path)
3. Select “VM/Synopsys_SDK_Vxx/Example_Project/”

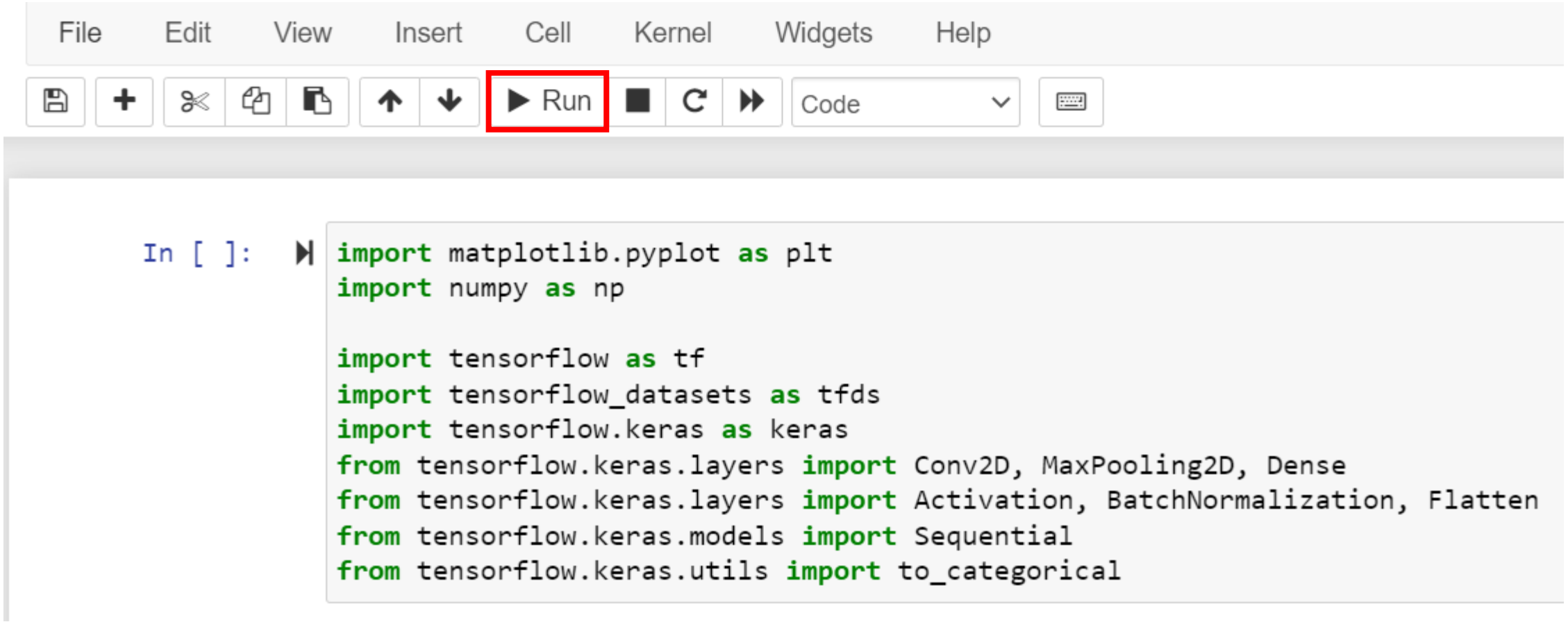


TensorFlow Environment Test

3. Open the folder “Lab5_tflm_emnist_training_letter”
4. Open “Lab5_tflm_emnist_training.ipynb”

TensorFlow Environment Test

5. Press “Run” step by step, and make sure the current block is done without error messages.



TensorFlow Environment Test

6. When first time using dataset in your PC, the process will download automatically. Please make sure no error happens here.

Load and preprocess training and testing dataset

```
In [ ]:  # Import training and testing dataset and save to the dataset_buffer

train_images_database, train_labels_database = tfds.as_numpy(tfds.load(
    'emnist/letters',
    split = 'train',
    shuffle_files = False,
    batch_size = -1,
    as_supervised = True,
```

```
Downloading and preparing dataset Unknown size (download: Unknown size, generated: Unknown size, total: Unknown size) to
C:\Users\williet\tensorflow_datasets\emnist\letters\3.0.0...

Dl Completed...: 0%  0/1 [00:05<?, ? url/s]

Dl Size...: 4%  23/535 [00:05<00:51, 10.02 MiB/s]
```

It will show the correct message.

```
Dataset emnist downloaded and prepared to C:\Users\williet\tensorflow_datasets\emnist\letters\3.0.0. Subsequent calls will r
euse this data.
```

TensorFlow Environment Test

7. It needs some time to execute evaluate_model, please wait.
   Or you can reduce 1.00 → 0.01 to speed up the evaluation.

Evaluate TensorFlow Lite INT-8 Model

Full test set contains 14800 samples. Evaluating int8 model on it might take more than 10 minutes. If you want to get estimation faster, please, limit number of samples to be evaluated by reducing **max_samples** value

In [30]:
```
max_samples = int(test_images_database.shape[0] * 0.20)
# max_samples = int(test_images_database.shape[0] * 1.00)

print(max_samples)
```

```
2960
```

TensorFlow Environment Test

8. After running the python project, it will create”generated/emnist_model_int8.tflite” & ”test_samples.cpp”
   That means your TensorFlow environment is ready.

```
Lab5_tflm_conversion_tutorial
|
---- model_conversion.ipynb
---- generated
     |
     ---- emnist_model_int8.tflite
     ---- test_samples.cpp
---- model_save (folder for model saving)
```

TensorFlow Environment Test

9. Open Cygwin and goto Lab5_tflm_conversion_tutorial/generated
   ```
   $ cd c:
   $ cd Users/{username}/
   $ cd VM/Synopsys_SDK_Vxx/Example_Project/
   $ cd Lab5_tflm_conversion_tutorial/generated/
   ```
10. Convert tflite to C model
    ```
    $ cd Lab5_tflm_conversion_tutorial/generated/
    $ xxd -i emnist_model_int8.tflite > model.h
    ```
11. You will see your TensorFlow model file model.h
12. Integrate model.h and test_samples.cpp to your firmware project (Later tutorial)