



# Installing TensorFlow For Jetson Platform

## Installation Guide

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# Chapter 1. Overview

## TensorFlow on Jetson Platform

[TensorFlow™](#) is an open-source software library for numerical computation using data flow graphs. Nodes in the graph represent mathematical operations, while the graph edges represent the multidimensional data arrays (tensors) that flow between them. This flexible architecture lets you deploy computation to one or more CPUs or GPUs in a desktop, server, or mobile device without rewriting code.

## Jetson AGX Orin

Bring your next-gen products to life with the world's most powerful AI computer for energy-efficient autonomous machines. With up to 275 TOPS for running the NVIDIA AI software stack, this developer kit lets you create advanced robotics and edge AI applications for manufacturing, logistics, retail, service, agriculture, smart city, healthcare, and life sciences.

## Jetson Orin NX

The NVIDIA Jetson Orin NX brings supercomputer performance to the edge in a small form factor system-on-module. Up to 21 TOPS of accelerated computing delivers the horsepower to run modern neural networks in parallel and process data from multiple high-resolution sensors — a requirement for full AI systems.

## Jetson AGX Xavier

The NVIDIA Jetson AGX Xavier developer kit for Jetson platform is the world's first AI computer for autonomous machines. The Jetson AGX Xavier delivers the performance of a GPU workstation in an embedded module under 30W.

## 1.1. Benefits of TensorFlow on Jetson Platform

Installing TensorFlow for Jetson Platform provides you with the access to the latest version of the framework on a lightweight, mobile platform without being restricted to TensorFlow Lite.

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## Chapter 2. Prerequisites and Dependencies

Before you install TensorFlow for Jetson, ensure you:

1. Install [JetPack](#) on your Jetson device.
2. Install system packages required by TensorFlow:

```
$ sudo apt-get update
$ sudo apt-get install libhdf5-serial-dev hdf5-tools libhdf5-dev zlib1g-dev zip libjpeg8-dev liblapack-dev libblas-dev gfortran
```

3. Install and upgrade `pip3`.

```
$ sudo apt-get install python3-pip
$ sudo python3 -m pip install --upgrade pip
$ sudo pip3 install -U testresources setuptools==65.5.0
```

4. Install the Python package dependencies.

```
$ sudo pip3 install -U numpy==1.22 future==0.18.2 mock==3.0.5 keras_preprocessing==1.1.2
keras_applications==1.0.8 gast==0.4.0 protobuf pybind11 cython pkgconfig packaging
h5py==3.7.0
```

---

# Chapter 3. Installing TensorFlow



**Note:** As of the 20.02 TensorFlow release, the package name has changed from `tensorflow-gpu` to `tensorflow`. See the section on [Upgrading TensorFlow](#) for more information.

Install TensorFlow using `pip3`. This command will install the latest version of TensorFlow compatible with JetPack 5.1.2.

```
$ sudo pip3 install --extra-index-url https://developer.download.nvidia.com/compute/redist/jp/v512 tensorflow==2.12.0+nv23.06
```

If you want to install an older version of TensorFlow, issue the following command:

```
$ sudo pip3 install --extra-index-url https://developer.download.nvidia.com/compute/redist/jp/v$JP_VERSION tensorflow==$TF_VERSION+nv$NV_VERSION
```

Where:

## **JP\_VERSION**

The major and minor version of JetPack you are using, such as 42 for JetPack 4.2.2 or 33 for JetPack 3.3.1.



## **Note:**

For JetPack versions 5.0.2 and 4.6.1, `JP_VERSION` includes the patch version, and would therefore be 502 and 461, instead of 50 and 46, respectively.

## **TF\_VERSION**

The released version of TensorFlow, for example, 2.11.0 or 1.15.5.

## **NV\_VERSION**

The monthly NVIDIA container version of TensorFlow, for example, 23.01.



**Note:** The version of TensorFlow you are trying to install must be supported by the version of JetPack you are using. Also, the package name may be different for older releases. See the [TensorFlow For Jetson Platform Release Notes](#) for a list of some recent TensorFlow releases with their corresponding package names, as well as NVIDIA container and JetPack compatibility.

For example, to install TensorFlow 2.9.1 as of the 22.09 release, use the following command:

```
$ sudo pip3 install --extra-index-url https://developer.download.nvidia.com/compute/redist/jp/v502 tensorflow-gpu==2.9.1+nv22.09
```

## 3.1. Installing Multiple TensorFlow Versions

If you want to have multiple versions of TensorFlow available at the same time, this can be accomplished using virtual environments. See below.

### Set up the Virtual Environment

First, install the `virtualenv` package and create a new Python 3 virtual environment:

```
$ sudo apt-get install virtualenv
$ python3 -m virtualenv -p python3 <chosen_venv_name>
```

### Activate the Virtual Environment

Next, activate the virtual environment:

```
$ source <chosen_venv_name>/bin/activate
```

Install the desired version of TensorFlow and its dependencies:

```
$ pip3 install -U numpy grpcio absl-py py-cpuinfo psutil portpicker six mock requests gast
h5py astor termcolor protobuf keras-applications keras-preprocessing wrapt google-pasta
setuptools testresources
$ pip3 install --extra-index-url https://developer.download.nvidia.com/compute/redist/jp/v51
tensorflow==$TF_VERSION+nv$NV_VERSION
```

### Deactivate the Virtual Environment

Finally, deactivate the virtual environment:

```
$ deactivate
```

### Run a Specific Version of TensorFlow

After the virtual environment has been set up, simply activate it to have access to the specific version of TensorFlow. Make sure to deactivate the environment after use:

```
$ source <chosen_venv_name>/bin/activate
$ <Run the desired TensorFlow scripts>
$ deactivate
```

## 3.2. Upgrading TensorFlow

To upgrade to a more recent release of TensorFlow, if one is available, run the install command with the 'upgrade' flag:

```
$ sudo pip3 install --upgrade --extra-index-url https://
developer.download.nvidia.com/compute/redist/jp/v51 tensorflow==2.11.0+nv23.01
```

---

# Chapter 4. Verifying The Installation

## About this task

To verify that TensorFlow has been successfully installed on your device, you'll need to launch a Python prompt and import TensorFlow.

## Procedure

1. From the terminal, run:

```
$ python3
```

2. Import TensorFlow:

```
>>> import tensorflow
```

If TensorFlow was installed correctly, this command should execute without error.



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# Chapter 5. Best Practices

## Performance model

It is recommended to choose the right performance mode to get the best possible performance given energy usage limitations. There is a command line tool (`nvpmodel`) that can be used to change the performance mode. In order to check the current performance mode, issue:

```
$ sudo nvpmodel -q --verbose
```

To change the mode to MAX-N, issue:

```
$ sudo nvpmodel -m 0
```

For more information, see:

- ▶ [How do you switch between max-q and max-p?](#)
- ▶ [Jetson/Performance](#)
- ▶ [Two cores disabled](#)

## Swap space on Jetson Xavier

On Jetson Xavier, certain applications could run out of memory (16GB shared between CPU and GPU). This problem can be resolved by creating a swap partition on the external memory. Typically 4GB of swap space is enough.

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## Chapter 6. Uninstalling

TensorFlow can easily be uninstalled using the `pip3 uninstall` command, as below:

```
$ sudo pip3 uninstall -y tensorflow
```



**Note:** If you are If you are using a version of TensorFlow older than the 20.02 release, the package name is `tensorflow-gpu`, and you will need to run the following command to uninstall TensorFlow instead. See the [TensorFlow For Jetson Platform Release Notes](#) for more information.

```
$ sudo pip3 uninstall -y tensorflow-gpu
```

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# Chapter 7. Troubleshooting

Join the [NVIDIA Jetson and Embedded Systems community](#) to discuss Jetson Platform-specific issues.

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# Chapter 8. Support

## TensorFlow

For more information about TensorFlow, see:

- ▶ [TensorFlow tutorials](#)
- ▶ [TensorFlow API](#)
- ▶ [Install TensorFlow on Ubuntu](#)
- ▶ [NVIDIA TensorFlow documentation](#)

## Jetson Platform

For more information about Jetson Platforms, see:

- ▶ [NVIDIA Jetson AGX Orin Developer Kit](#)
- ▶ [NVIDIA Jetson AGX Xavier Developer Kit](#)
- ▶ [NVIDIA Jetson Xavier NX Developer Kit](#)
- ▶ [Jetson software documentation](#)

## NVIDIA SDK Manager

- ▶ See [NVIDIA SDK Manager](#) for more information.

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