

系列文章

OpenVINO™ 工具套件



# 零基础安装并使用 OpenVINO™ integration with TensorFlow

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## 概述

本文重点介绍 OpenVINO™ 最新功能，无缝集成 TensorFlow 框架，对于熟悉 TensorFlow 开发的开发者来说，在原有代码的基础上只需要添加几行简单代码就可以实现模型精度不变的前提下推理加速，避免了显式地进行 OpenVINO™ 转换以及推理部分代码的重新编写，大大简化 OpenVINO™ 工具的使用，加速 AI 算法在生产环境中的应用部署。

该集成为提高 TensorFlow 兼容性提供以 OpenVINO™ 工具套件内联优化和所需运行时，并加速了各种英特尔芯片上多类 AI 模型的推理。通过将以下两行代码添加到 Python 代码中，就可以极大地加速你的 TensorFlow 模型的推理：

```
import openvino_tensorflow  
  
openvino_tensorflow.set_backend('<backend_name>')
```

下面我们来具体描述步骤。

# 1. 安装 Python 和 Anaconda

## 1.1 Python 和 Anaconda 简介

Python 是一种解释型高级通用编程语言，其在人工智能编码语言中发挥着至关重要的作用，人工智能领域的相关库或框架（如 scikit-learn、Tensorflow、Caffe 以及 PaddlePaddle 等）都是基于 Python 编程语言开发的。Python 虽然强大好用，但管理其数量庞大的第三方库，并解决其依赖关系是非常复杂的事情。

Anaconda 作为虚拟环境和 Python 库的管理工具，极大的方便了 Python 开发者管理 Python 所需要的虚拟环境和第三方库，而且解决了各种库之间的依赖关系。

## 1.2 下载并安装 Anaconda

首先下载并安装 Anaconda，具体步骤如下。

第一步，通过网址 <https://www.anaconda.com/products/individual> 进入 Anaconda 官网，点击 Download 进入下载界面，根据需求选择合适的下载文件，如图 1-1 所示。



图 1-1 下载 Anaconda

第二步，找到 Anaconda 下载文件，使用 bash Anaconda3-version-Linux-x86\_64.sh 进行安装。如图 1-2 所示。

```
yaru@yaru-XPS-8900:~/Downloads$ bash Anaconda3-2021.05-Linux-x86_64.sh
```

图 1-2 安装 Anaconda

第三步，进入注册信息页面，按回车键。

```
Welcome to Anaconda3 2021.05
In order to continue the installation process, please review the license
agreement.
Please, press ENTER to continue
>>
=====
End User License Agreement - Anaconda Individual Edition
=====

Copyright 2015-2021, Anaconda, Inc.

All rights reserved under the 3-clause BSD License:

This End User License Agreement ("Agreement") is a legal agreement between you and Anaconda, Inc. ("Anaconda") and governs your use of Anaconda Individual Edition (which was formerly known as Anaconda Distribution).

Subject to the terms of this Agreement, Anaconda hereby grants you a non-exclusive, non-transferable license to:
    * Install and use the Anaconda Individual Edition (which was formerly known as Anaconda Distribution)
    * Modify and create derivative works of sample source code delivered in Anaconda Individual Edition
```

图 1-3 安装 Anaconda 注册信息页面

第四步，阅读注册信息，然后输入 yes，查看文件即将安装的位置，按回车键，即可安装。

```
Please answer 'yes' or 'no':
>>> yes

Anaconda3 will now be installed into this location:
/home/yaru/anaconda3

- Press ENTER to confirm the location
- Press CTRL-C to abort the installation
- Or specify a different location below

[/home/yaru/anaconda3] >>>
PREFIX=/home/yaru/anaconda3
Unpacking payload ...
```

图 1-4 安装 Anaconda 安装路径

第五步，进入安装过程。

```
The following NEW packages will be INSTALLED:
_ipyw_jlab_nb_ext_conf-0.1.0-py38_0
_ipyw_jlab_nb_ext-0.1-main
_libgcc_mutex-0.1-main
alabaster-0.7.12-pyh3eb1b0_0
anaconda-2021.05-py38_0
anaconda-client-1.7.2-py38_0
anaconda-navigator-2.0.3-py38_0
anaconda-project-0.9.1-pyh3eb1b0_1
anyio-2.2.0-py38h06a4308_1
appdirs-1.4.4-py_0
argh-0.26.2-py38_0
argon2-cffi-20.1.0-py38h27cf23_1
asciimath-0.7.2-pyh3eb1b0_0
ascryptor-1.4.0-py_0
astroid-2.5-py38h06a4308_1
astropy-4.2.1-py38h27cf23_1
async_generator-1.10-pyh3eb1b0_0
atomicwrites-1.4.0-py_0
attrs-20.3.0-pyh3eb1b0_0
autopep8-1.5.6-pyh3eb1b0_0
babel-2.9.0-pyh3eb1b0_0
backcall-0.2.0-pyh3eb1b0_0
backports-0.1-pyh3eb1b0_2
backports.functools_lru_cache-1.6.4-pyh3eb1b0_0
backports.shutil_tempfile-1.0-pyh3eb1b0_1
backports.weakref-1.0.post1-py_1
beautifulsoup4-4.9.3-pyha847fdf_0
bitarray-2.1.0-py38h27cf23_1
bkcharts-0.2-py38_0
black-19.10b0-py_0
blas-1.0-mkl
bleach-3.3.0-pyh3eb1b0_0
blosc-1.21.0-h8c45485_0
bokeh-2.3.2-py38h06a4308_0
boto-2.49.0-py38_0
bottleneck-1.3.2-py38heb32a55_1
brotli-0.7.0-py38h27cf23_1003
```

图 1-5 安装 Anaconda 安装过程

第六步，安装完成后，收到加入环境变量的提示信息，输入 yes。

```
Preparing transaction: done
Executing transaction: done
Installation finished.
Do you wish the installer to initialize Anaconda3
by running conda init? [yes|no]
[no] >>> yes
no change  /home/yaru/anaconda3/condabin/conda
no change  /home/yaru/anaconda3/bin/conda
no change  /home/yaru/anaconda3/bin/conda-env
no change  /home/yaru/anaconda3/bin/activate
no change  /home/yaru/anaconda3/bin/deactivate
no change  /home/yaru/anaconda3/etc/profile.d/conda.sh
no change  /home/yaru/anaconda3/etc/fish/conf.d/conda.fish
no change  /home/yaru/anaconda3/shell/condabin/conda.ps1
no change  /home/yaru/anaconda3/lib/python3.8/site-packages/xontrib/conda.xsh
no change  /home/yaru/anaconda3/etc/profile.d/conda.csh
modified   /home/yaru/.bashrc
```

图 1-6 安装 Anaconda 设置环境变量

第八步，重启终端，即可使用 Anaconda3。

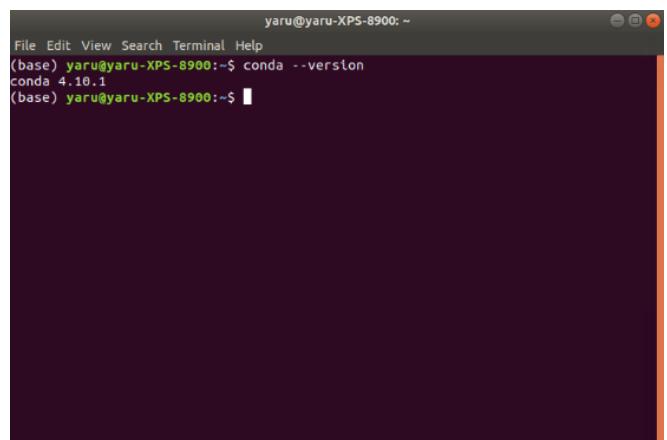


图 1-8 重启终端

第七步，看到图 1-7 这些信息说明已经安装完成。

```
==> For changes to take effect, close and re-open your current shell. <==
If you'd prefer that conda's base environment not be activated on startup,
set the auto_activate_base parameter to false:
conda config --set auto_activate_base false

Thank you for installing Anaconda3!
=====
Working with Python and Jupyter notebooks is a breeze with PyCharm Pro,
designed to be used with Anaconda. Download now and have the best data
tools at your fingertips.

PyCharm Pro for Anaconda is available at: https://www.anaconda.com/pycharm
```

图 1-7 安装 Anaconda 安装信息

## 2. 安装 openvino-tensorflow 插件

### 2.1 TensorFlow 简介

TensorFlow 是一个免费的软件库，专注于由 Google 创建的机器学习。TensorFlow 最初作为 Apache 2.0 开源许可证的一部分发布，最初由 Google 大脑团队的工程师和研究人员开发，主要供内部使用。TensorFlow 被认为是首次认真实施以深度学习为重点的框架。

TensorFlow 是一个端到端的平台，无论是专家还是初学者，都可以轻松的构建和部署深度学习模型。到目前为止，TensorFlow 是最流行的机器学习平台，社区参与人数最多、最活跃、演进也越快。如图 2-1 所示。

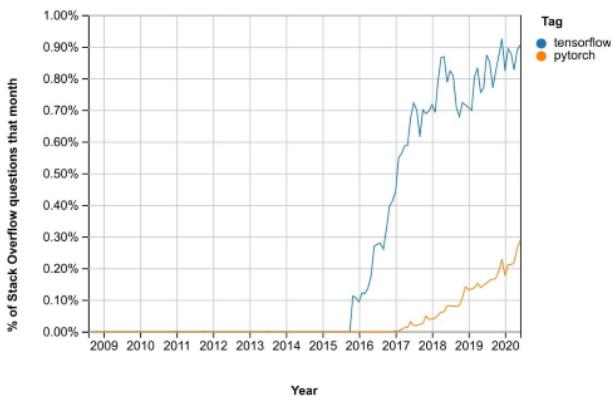


图 2-1 ARABIC1 TensorFlow 和 Pytorch 的增长速率

### 2.2 openvino-tensorflow 插件简介

该存储库包含 OpenVINO™ 与 TensorFlow 集成的源代码，该产品提供 OpenVINO™ 内联优化和运行时，以提高 TensorFlow 兼容性。它专为希望在推理应用程序中开始使用 OpenVINO™ 的开发人员而设计，以通过最少的代码修改来增强推理性能。OpenVINO™ 与 TensorFlow 的集成加速了各种英特尔® 芯片上许多 AI 模型的推理，例如：

- 英特尔® CPU
- 英特尔® 集成 GPU
- 英特尔® Movidius™ 视觉处理单元 - 称为 VPU
- 具有 8 个英特尔 Movidius™ MyriadX VPU 的英特尔® 视觉加速器设计 - 称为 VAD-M 或 HDDL

### 2.3 安装

#### 2.3.1 使用 Anaconda 创建环境

TensorFlow Object Detection API 的下载安装步骤如下：使用命令 conda create -n tensorflow\_addon python=3.6 创建 python 解释器版本为 3.6，名字为 tensorflow\_addon 的虚拟环境。

```
yaru@yaru-XPS-8900:~$ conda create -n tensorflow_addon python=3.6
Collecting package metadata (current_repodata.json): done
Solving environment: done

==> WARNING: A newer version of conda exists. <= current version: 4.7.10 latest version: 4.10.3
Please update conda by running
    $ conda update -n base -c defaults conda

## Package Plan ##

environment location: /home/yaru/anaconda3/envs/tensorflow_addon

added / updated specs:
- python=3.6

The following NEW packages will be INSTALLED:

libgcc_mutex          pkgs/main/linux-64::libgcc_mutex-0.1-main
ca-certificates         pkgs/main/linux-64::ca-certificates-2021.7.5-h06a4308_0
certifi                 pkgs/main/linux-64::certifi-2021.5.30-py36h06a4308_0
id_impl_linux-64       pkgs/main/linux-64::id_impl_linux-64-2.35.1-h7274673_9
libffi                 pkgs/main/linux-64::libffi-3.3-he6710b0_2
libgcc-ng               pkgs/main/linux-64::libgcc-ng-9.1.0-hdf63c60_0
libstdcxx-ng            pkgs/main/linux-64::libstdcxx-ng-9.1.0-hdf63c60_0
ncurses                pkgs/main/linux-64::ncurses-6.2-he6710b0_1
openssl                pkgs/main/linux-64::openssl-1.1.1k-h27cfcd23_0
ptp                   pkgs/main/linux-64::ptp-21.0.1-py36h06a4308_0
python                 pkgs/main/linux-64::python-3.6.13-h12dedb9_1
readline                pkgs/main/linux-64::readline-8.1-h27cfcd23_0
setup-tools             pkgs/main/linux-64::setuptools-52.0.0-py36h06a4308_0
sqlite                 pkgs/main/linux-64::sqlite-3.36.0-hc218d9a_0
tk                      pkgs/main/linux-64::tk-8.6.10-hbc83047_0
wheel                  pkgs/main/noarch::wheel-0.37.0-pyhd3eb1b0_0
xz                      pkgs/main/linux-64::xz-5.2.5-h7b6447c_0
zlib                   pkgs/main/linux-64::zlib-1.2.11-h7b6447c_3

Proceed ([y]/n)? y
```

图 2-2 Anaconda 创建环境

#### 2.3.2 安装插件

激活 Python 虚拟环境 tensorflow\_addon，依次输入以下三条命令，完成 openvino-tensorflow 插件的安装。

- pip install -U pip==21.0.1
- pip install -U tensorflow==2.4.1
- pip install openvino-tensorflow

```
yaru@yaru-XPS-8900:~$ conda activate tensorflow_addon
(tensorflow_addon) yaru@yaru-XPS-8900:~$ pip install -U pip==21.0.1
Requirement already satisfied: pip==21.0.1 in ./anaconda3/envs/tensorflow_addon/lib/python3.6/site-packages (from -U pip==21.0.1)
(tensorflow_addon) yaru@yaru-XPS-8900:~$ pip install -U tensorflow==2.4.1
Collecting tensorflow==2.4.1
  Using cached tensorflow-2.4.1-cp36-cp36-manylinux2010_x86_64.whl (394.3 MB)
Collecting h5py==2.10.0
  Using cached h5py-2.10.0-cp36-cp36-manylinux1_x86_64.whl (2.9 MB)
Collecting termcolor==1.1.0
  Using cached termcolor-1.1.0-py3-none-any.whl
Collecting gast==0.3.3
  Using cached gast-0.3.3-py2.py3-none-any.whl (9.7 kB)
Collecting tensorflow-estimator<2.5.0,>=2.4.0
  Using cached tensorflow_estimator-2.4.0-py2.py3-none-any.whl (462 kB)
Collecting protobuf<3.17.0,>=3.16.0
  Using cached protobuf-3.17.0-cp36-cp36-manylinux2_2_5_x86_64.manylinux1_x86_64.whl (1.0 MB)
Collecting absl-py==0.10
  Using cached absl-py-0.10-cp36-cp36-manylinux1_x86_64.whl (132 kB)
```

图 2-3 激活环境安装 tensorflow

```
[tensorflow_addon] yaru@yaru-XPS-8900:~$ pip install openvino-tensorflow
Collecting openvino-tensorflow
  Using cached openvino_tensorflow-0.5.0-cp36-cp36m-manylinux2014_x86_64.whl (25.0 MB)
Installing collected packages: openvino-tensorflow
Successfully installed openvino-tensorflow-0.5.0
```

图 2-4 安装 openvino-tensorflow

```
(tensorflow_addon) yaru@yaru-XPS-8900:~$ python -c "import tensorflow as tf; print('TensorFlow version: ',tf.__version__);"
import openvino_tensorflow; print(openvino_tensorflow.__version__)
2021-08-31 16:11:17.669983: W tensorflow/stream_executor/platform/default/dso_loader.cc:60] Could not load dynamic library 'libcudart.so.11.0'
; dlerror: libcudart.so.11.0: cannot open shared object file: No such file or directory
2021-08-31 16:11:17.669924: I tensorflow/stream_executor/cuda/cudart_stub.cc:29] Ignore above cudart dlerror if you do not have a GPU set up o
I tensorflow/stream_executor/cuda/cuda_dnn.cc:36] Could not load dynamic library 'libcudnn.so.8'
TensorFlow version: 2.4.1
OpenVINO integration with TensorFlow version: b'0.5.0'
nGraph version used for this build: b'0.0.6b33800a'
TensorFlow version used for this build: v2.4.1-49-gd5cd02a817f
CMX11_ABI Flag used for this build: 0
OpenVINO integration with TensorFlow built with Grappler: False
```

图 2-5 验证安装

### 2.3.3 验证安装

激活 tensorflow\_addon 环境，输入 `python -c "import tensorflow as tf; print('TensorFlow version: ',tf.__version__); import openvino_tensorflow; print(openvino_tensorflow.__version__)"` 打印 Tensorflow 版本，openvino-tensorflow 版本。输入如图 3-4。

### 3. 运行 demo，观察使用插件和不使用插件的结果对比

#### 3.1 克隆 openvino\_tensorflow.git 仓库到本地

- \$ git clone https://github.com/openvinotoolkit/openvino\_tensorflow.git
- \$ cd openvino\_tensorflow
- \$ git submodule init
- \$ git submodule update --recursive

如图 3-1：

```
yaru@yaru-XPS-8900:~$ git clone https://github.com/openvinotoolkit/openvino_tensorflow.git
cloning into 'openvino_tensorflow'...
remote: Enumerating objects: 100% (2602/2602), done.
remote: Compressing objects: 100% (1091/1091), done.
remote: Total 15825 (delta 1773), reused 2178 (delta 1477), pack-reused 13223
Receiving objects: 100% (15825/15825) | 20.96 MB/s, done.
Resolving deltas: 100% (12005/12005), done.
yaru@yaru-XPS-8900:~$ cd openvino_tensorflow
yaru@yaru-XPS-8900:~/openvino_tensorflow$ git submodule init
Submodule 'ocm' (https://github.com/intel/ocm) registered for path 'ocm'
yaru@yaru-XPS-8900:~/openvino_tensorflow$ git submodule update --recursive
Cloning into '/home/yaru/openvino_tensorflow/ocm'...
Submodule path 'ocm': checked out '7375fdb18c40904c58e826abbf22a2470b739fa'
```

图 3-1 克隆仓库

#### 3.2 下载模型文件

终端运行命令

```
curl -L "https://storage.googleapis.com/download.tensorflow.org/models/inception_v3_2016_08_28_frozen.pb.tar.gz" |tar -C ./examples/data -xz
```

```
yaru@yaru-XPS-8900:~/openvino_tensorflow$ curl -L "https://storage.googleapis.com/download.tensorflow.org/models/inception_v3_2016_08_28_frozen.pb.tar.gz" | tar -C ./examples/data -xz
% Total % Received % Xferd Average Speed Time Time Current
          0     0      0   0:00:00 0:00:00 0:00:00
  0 84.5M  100 84.5M  0      0 0:00:09 0:00:09 0:00:00

```

图 3-2 下载模型

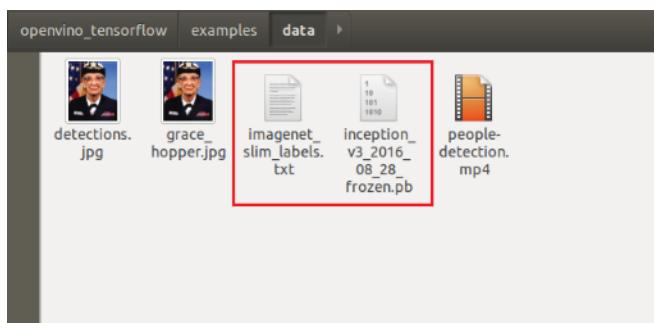


图 3-3 下载的 inception 模型

#### 3.3 运行 demo，对比 enable openvino\_tensorflow 和 disable openvino\_tensorflow

激活 tensorflow\_addon 环境，运行 python examples/classification\_sample.py，默认是 enable openvino\_tensorflow，通过在命令行增加参数 - disable\_ovtf 达到 disable openvino\_tensorflow 的效果，可以观察到，enable openvino\_tensorflow 插件相较于 disable openvino\_tensorflow 插件，推理时间有明显缩短。

```
[tensorflow_addon] yaru@yaru-XPS-8900:~/openvino_tensorflow$ python examples/classification_sample.py -- disable_ovtf
2021-09-01 14:15:22.147975 I tensorflow/stream_executor/platform/default/dso_loader.cc:110] dlopen: lib/libcudart.so.11.0
2021-09-01 14:15:22.147990 I tensorflow/stream_executor/platform/default/dso_loader.cc:110] ignore above cudart derror if you do not have a GPU set up on your machine.
2021-09-01 14:15:23.443357 I tensorflow/stream_executor/platform/default/dso_loader.cc:110] Tensorflow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) To use the following CPU instructions in performance-critical operations: AVX2 FMA
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
2021-09-01 14:15:23.443361 I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:156] kernel driver does not appear to be running on this host (yaru-XPS-8900). This typically means that the corresponding CUDA driver is not installed. Check if the CUDA driver is installed and running or contact your system administrator.
2021-09-01 14:15:23.443367 I tensorflow/stream_executor/cuda/cuda_driver.cc:328] Failed call to cuInit: UNKNOWN ERROR (303)
2021-09-01 14:15:23.443375 I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:156] kernel driver does not appear to be running on this host (yaru-XPS-8900). This typically means that the corresponding CUDA driver is not installed. Check if the CUDA driver is installed and running or contact your system administrator.
2021-09-01 14:15:23.443377 I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:156] None of the MLIR optimization passes are enabled (registered 0 passes)
2021-09-01 14:15:23.443384 I tensorflow/stream_executor/platform/profile_utils/cpu_utils.cc:111] CPU Frequency: 3399905000 Hz
2021-09-01 14:15:24.355031 I /opt/intel/openvino_tensorflow/openvino_tensorflow/rewrite_pass.cc:87] MGraph is available but disabled.
2021-09-01 14:16:10.519390 I tensorflow/core/platform/default/dso_loader.cc:110] DSO shared object file: lib/libcudart.so.11.0
2021-09-01 14:16:10.519396 I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:156] kernel driver does not appear to be running on this host (yaru-XPS-8900). This typically means that the corresponding CUDA driver is not installed. Check if the CUDA driver is installed and running or contact your system administrator.
2021-09-01 14:16:10.519398 I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:156] None of the MLIR optimization passes are enabled (registered 0 passes)
2021-09-01 14:16:10.519400 I tensorflow/core/platform/default/dso_loader.cc:110] DSO shared object file: lib/libcudart.so.11.0
2021-09-01 14:16:10.519404 I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:156] kernel driver does not appear to be running on this host (yaru-XPS-8900). This typically means that the corresponding CUDA driver is not installed. Check if the CUDA driver is installed and running or contact your system administrator.
2021-09-01 14:16:10.519406 I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:156] None of the MLIR optimization passes are enabled (registered 0 passes)
2021-09-01 14:16:10.519408 I tensorflow/core/platform/profile_utils/cpu_utils.cc:111] CPU Frequency: 3399905000 Hz
Inference time in ms: 31.76
Military uniform 0.7839194
Mortarboard 0.027078714
Pickelhaube 0.014100761
Bearskin 0.010530634
Bulletproof vest 0.009587347
```

图 3-4 enable openvino\_tensorflow vs disable openvino\_tensorflow

#### enable openvino\_tensorflow:

- Inference time in ms: 31.76
- Military uniform 0.7839194
- Mortarboard 0.027078714
- Pickelhaube 0.014100761
- Bearskin 0.010530634
- Bulletproof vest 0.009587347

#### disable openvino\_tensorflow:

- Inference time in ms: 46.25
- Military uniform 0.7839196
- Mortarboard 0.027078161
- Pickelhaube 0.014100781
- Bearskin 0.010530489
- Bulletproof vest 0.009587237

## 4. 过程中遇到的问题及解决办法

### 4.1 设备本地装了 OpenVINO 工具可能遇到的报错情况

如果设备本地装了 OpenVINO 工具很有可能遇到 import cv2; ImportError:/opt/intel/openvino\_2021/opencv/lib/libopencv\_dnn.so.4.5:undefined symbol 报错，如图 4-1。

```
[root@pranvino ~]# source /opt/intel/prnrvino_2021/bin/setupvars.sh
[root@pranvino ~]# python examples/classification/simple.py > classify.out
2021-09-01 14:41:33.415886: W tensorflow/stream_executor/placement/defaultrt_loader.cc(20) Could not load dynamic library 'libcuda.so.11.0'; dlerror: libcuda.so.11.0: cannot open shared object file: No such file or directory; 3 tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415892: W tensorflow/stream_executor/gpu/gpu_device_guru.cc(14) This Rosetta file binary is optimized with -O3, so it will not work well on Intel(R) Deep Neural Network Library (DNNL) to use the following CPU instructions:
To avoid this in other operations, rebuild TensorFlow with the appropriate compiler flags.
2021-09-01 14:41:33.415894: W tensorflow/stream_executor/lib/dnn/dnn.h(121) Could not load dynamic library 'libcudnn.so.11.0'; dlerror: libcudnn.so.11.0: cannot open shared object file: No such file or directory; 10 tensorflow/stream_processing/internal/thread_pool/thread_pool.h(35) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415896: W tensorflow/stream_executor/lib/rocc/rocc.h(12) The kernel driver does not appear to be running on this host [00:0C:00:00:00:00]: /proc/driver/rocc/version does not exist.
2021-09-01 14:41:33.415898: W tensorflow/stream_executor/gpu/gpu_driver.h(189) No CUDA drivers are available for this device.
Inference time: 0.01 ms
Inference count: 1
[...]
[root@pranvino ~]# python examples/classification/simple.py
ImportError: /opt/intel/openvino_2021/opencv/lib/libopencv_dnn.so.4.5: undefined symbol: __ZNKengraphModelDescription16setOnnxFormatEv
```

图 4-1 import cv2; ImportError 报错

简单的解决办法是注释掉 home 目录下 .bashrc 文件里的 source /opt/intel/prnrvino\_2021/bin/setupvars.sh。

```
# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc.

if ! shopt -o posix; then
  if [ -f /usr/share/bash-completion/bash_completion ]; then
    . /usr/share/bash-completion/bash_completion
  elif [ -f /etc/bash_completion ]; then
    . /etc/bash_completion
  fi
fi
# source /opt/intel/prnrvino_2021/bin/setupvars.sh
```

在重启终端，运行 demo，就可以正常运行了。

### 4.2 因没有安装 opencv-python 可能遇到的报错情况

```
[root@pranvino ~]# source /opt/intel/prnrvino_2021/bin/setupvars.sh
[root@pranvino ~]# python examples/classification/simple.py > classify.out
2021-09-01 14:41:33.415886: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415892: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415894: W tensorflow/stream_executor/lib/rocc/rocc.h(12) The kernel driver does not appear to be running on this host [00:0C:00:00:00:00]: /proc/driver/rocc/version does not exist.
2021-09-01 14:41:33.415896: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415898: W tensorflow/stream_executor/gpu/gpu_driver.h(189) No CUDA drivers are available for this device.
2021-09-01 14:41:33.415900: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415902: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415904: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415906: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415908: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415910: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415912: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415914: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415916: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415918: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415920: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415922: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415924: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415926: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
2021-09-01 14:41:33.415928: W tensorflow/stream_executor/lib/cuda/cuda_runtime.h(107) Unknown above error divisor if you do not have a GPU set up on your machine.
```

图 4-2 没有安装 cv2 报错

解决方法是在终端输入命令 pip install opencv-python，问题解决。

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