PyTorch and YOLOv5 Installation Instructions for Nvidia Jetson Xavier

Bryant Springle
Kevin T. Crofton Department of Aerospace and Ocean Engineering
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24073
Email: bryantsp@vt.edu

The purpose of this document is to provide instructions for installing the object detection software, YOLOv5 on an Nvidia Jetson device. Please note, this process was run successfully for a Jetson Xavier using Python 3.6. For all other Jetson devices, the instructions may or may not differ.

To begin, open a terminal on your Jetson device (ctrl + alt + t). There is no need to do this in a specific directory. The home folder will suffice. Copy and paste line by line.

1. Update the system

```
sudo apt-get update
```

2. Install basic dependencies needed for YOLOv5

```
sudo apt-get install python3-pip python3-dev
sudo apt-get install python3-matplotlib
sudo apt-get install libopenblas-base libopenmpi-dev
pip3 install Cython
pip3 install scipy numpy scikit-build tqdm
pip3 install pillow seaborn pyyaml ffmpeg-python
pip3 install git
```

   (Note: Installation of scipy and numpy may take some time - be patient)
   (Note: Error may occur when collecting git - just ignore that)

3. Use any editor to add a few lines to your /.bashrc file. We can use 'nano' to do this.

```
sudo nano ~/.bashrc
```

   Scroll to the bottom and copy and paste the following:

```
export PKG_CONFIG_PATH='/usr/lib/aarch64-linux-gnu/pkgconfig'
export PATH=/usr/local/cuda-10.2/bin:PATH
export OPENBLAS_CORETYPE=ARMV8
export OMP_NUM_THREADS=1
```

To save and exit the bash file, Press (ctrl + x) to save. Then Press "y". Then Press "Enter".

4. Install OpenCV dependencies

```
sudo apt-get install build-essential cmake unzip pkg-config
sudo apt-get install libjpeg-dev libpng-dev libtiff-dev
sudo apt-get install libavcodec-dev libavformat-dev
sudo apt-get install libswscale-dev libv4l-dev
sudo apt-get install libxvidcore-dev libx264-dev
sudo apt-get install libgtk-3-dev
sudo apt-get install libatlas-base-dev gfortran
```

5. Install OpenCV

```
pip3 install --upgrade setuptools
pip3 install --upgrade pip
pip3 install opencv-python opencv-contrib-python
```

(Note: Error may occur with python setup.py - just ignore that)

6. Install PyTorch (Starting with Torch)

Nvidia has provided the appropriate pip wheel files that are build for the Jetson's ARM aarch64 architecture. These files are located here: `https://forums.developer.nvidia.com/t/pytorch-for-jetson-version-1-10-now-available/72048`

Visit the above link and click on the desired PyTorch pip wheel version. (Note: We have had success with 'PyTorch v1.8.0'). There will be a downloadable file in the dropdown. You need not download this file. Instead, right click on the file and click "Copy link".The link will look like "`https://nvidia.box.com/shared/static/p57jwntv436lfrd78inwl7iml6p13fzh.whl`" for torch v1.8.0. Back in the command window, run:

```
wget [Pasted link] -O torch-1.8.0-cp36-cp36m-linux_aarch64.whl
pip3 install torch-1.8.0-cp36-cp36m-linux_aarch64.whl
```

(Note: These instruction use torch v1.8.0 as an example. If installing a different link, the torch file name will be different. For example, for torch v1.9.0, the file name would be `torch-1.9.0-cp36-cp36m-linux_aarch64.whl`.)

7. Install PyTorch (Torchvision)

It is important to note that the version of Torchvision that is downloaded and installed needs to be compatible with Torch. To check compatibility, you can visit `https://pypi.org/project/torchvision/`. For Torch v1.8.0, Torchvision v0.9.0 is compatible. To install, run the following:

```
git clone --branch v0.9.0 https://github.com/pytorch/vision torchvision
cd torchvision
```

```
export BUILD_VERSION=0.9.0
python3 setup.py install --user
cd ../
```

8. Install YOLOv5 From github

```
sudo apt-get update
git clone https://github.com/ultralytics/yolov5.git
cd yolov5
pip3 install -r requirements.txt
```

This should install any dependency that was missed that is required for yolov5. From here„ manually go into the yolov5 file and find the file named "detect.py".

For the Jetson Xavier, to ensure the CUDA cores are being utilized: (ctrl + F) Search for " device=" " and change to " device=0 ". You can also search for " half=False" and change this to "half=true". Save.

From here you should be able to run yolov5 from any terminal (using a webcam).

```
cd yolov5/
python3 detect.py --source 0
```

That's all folks.