Installation/setup

**Setup of facemask detector with fever/temperature feature:**

*The following instructions assumes you have a working Jetson Nano running Jetpack v4.5*

The facemask detector script can be run on any device (performance will vary), running the facemask detector with the thermal feature will only work with a properly configured Jetson Nano with a Lepton thermal module attached.

**Thermal grabber (C++) setup (Jetson Nano ONLY):**

Hardware:

* CENSIS IoT2Go Kit (with Jetson Nano and Logitech C920 webcam)
* FLIR Lepton® 3 (Thermal camera)
* FLIR Lepton® Breakout Board v2.0
* 7 FtF jumper wires

Install build requirements:

|  |
| --- |
| sudo apt install build-essential g++ libopencv-dev |

Download CMake 3.18:

|  |
| --- |
| version=3.18  build=1  mkdir ~/temp  cd ~/temp  wget https://cmake.org/files/v$version/cmake-$version.$build.tar.gz  tar -xzvf cmake-$version.$build.tar.gz  cd cmake-$version.$build/ |

Build and install CMake:

|  |
| --- |
| ./bootstrap  make -j$(nproc)  sudo make install |

*You may get an error concerning OpenSSL, if this occurs run the following command:*

|  |
| --- |
| sudo apt-get install libssl-dev |

***To build the thermal grabber program make sure you are within the* thermal\_grabber *directory when running the following commands***

|  |
| --- |
| mkdir build  cd build  cmake ..  make  cd .. |

We need to increase the SPI buffer size as the default is set to 4096 bytes which is too small for the Lepton 3 thermal module.

To increase the SPI buffer size run the following command:

|  |
| --- |
| sudo gedit /etc/modprobe.d/spidev.conf |

Then enter the following line, save, and restart the Jetson Nano:

|  |
| --- |
| options spidev bufsiz=20480 |

If the buffer size was set correctly the output from the following command should be *20480*.

|  |
| --- |
| cat /sys/module/spidev/parameters/bufsiz |

**Hardware setup**

Connect the breakout board to the Jetson Nano GPIO pins as shown.

(Diagrams available in larger format within documentation folder)

|  |  |
| --- | --- |
| *Jetson Nano board* | *Lepton breakout board v2.0* |

**Facemask detector (Python) setup (Jetson Nano):**

The following installation was tested on *Python 3.6.9*

Install TensorFlow (version 2.3.1 or later) on your Jetson Nano using the following [instructions](https://docs.nvidia.com/deeplearning/frameworks/install-tf-jetson-platform/index.html) from Nvidia.

Relevant commands from Nvidia instructions:

|  |
| --- |
| 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 |
| sudo apt-get install python3-pip |
| sudo pip3 install -U pip testresources setuptools==49.6.0 |
| sudo pip3 install -U numpy==1.19.4 future==0.18.2 mock==3.0.5 h5py==2.10.0 keras\_preprocessing==1.1.1 keras\_applications==1.0.8 gast==0.2.2 futures protobuf pybind11 |
| sudo pip3 install --pre --extra-index-url https://developer.download.nvidia.com/compute/redist/jp/v45 tensorflow |

We recommend increasing the available swap memory to at least 4GB (2GB default).

This can be done using [resizeSwapMemory](https://github.com/JetsonHacksNano/resizeSwapMemory) (make sure you are in a folder outside of the main project):

|  |
| --- |
| git clone https://github.com/JetsonHacksNano/resizeSwapMemory |
| cd resizeSwapMemory |
| ./setSwapMemorySize.sh -g 4 |

Run the following command to install the required packages via the provided requirements file:

|  |
| --- |
| pip3 install -r requirements-jetson.txt |

*Optional:* You may wish to recompile OpenCV from source to enable GPU acceleration as the default installation is CPU only. The following resources explain how to do this in detail: [Pyimagesearch](https://www.pyimagesearch.com/2020/03/25/how-to-configure-your-nvidia-jetson-nano-for-computer-vision-and-deep-learning/) and [Jetsonhacks.com](https://www.jetsonhacks.com/2019/11/22/opencv-4-cuda-on-jetson-nano/)

*If you run into issues installing specific packages via the requirements file we recommend installing them with super user privileges*

|  |
| --- |
| sudo pip3 install *package* |

**Development/model training on external device setup (Python) (Windows/Linux) *(Optional)*:**

The Jetson Nano is not designed to train models, to train a new model we recommend using a Windows/Linux device with a GPU.

Run the following command to install the required packages via the provided requirements file:

|  |
| --- |
| pip3 install -r requirements.txt |

**Setup of artificial facemask overlay scripts (Python) (Windows/Linux) *(Optional)*:**

The following assumes you have followed the above setup steps (requirements installation).

The following packages are required to use these scripts: *dlib* and *face\_recognition*

These packages were not included within the requirements file as they are not required for using the detector on the Jetson Nano.

Requires CMake.

[Linux guide](https://www.pyimagesearch.com/2018/01/22/install-dlib-easy-complete-guide/)

[Windows 10 guide](http://dlib.net/compile.html)

**Running the project:**

Individual instructions for running each part of the project are available within their README’s and documentation.

**Main facemask detector location:** /mask\_detection/detector.py

**Facemask calibrator location:** /mask\_detection/calibrator.py

**Model training algorithm location:** /mask\_detection/learning\_algo.py

**Artificial facemask overlay scripts:** /artificial\_dataset\_creation/

**Extras:**

**Troubleshooting for specific packages:**

[Keras](https://forums.developer.nvidia.com/t/can-i-install-keras-on-jetson-nano/75341)

[Scikit\_learn](https://stackoverflow.com/questions/60448903/cannot-install-scikit-learn-on-jetson-nano)

[Matplotlib](https://forums.developer.nvidia.com/t/jetson-nano-how-can-install-matplotlib/75132)

[Keras and Scipy](https://forums.developer.nvidia.com/t/keras-and-scipy-throwing-weird-errors-while-installing-on-jetson-nano-no-links-could-help-me/107220/3)

**Useful resources:**

[Getting Started with Jetson Nano Developer Kit](https://developer.nvidia.com/embedded/learn/get-started-jetson-nano-devkit)

[How to configure your NVIDIA Jetson Nano for Computer Vision and Deep Learning](https://www.pyimagesearch.com/2020/03/25/how-to-configure-your-nvidia-jetson-nano-for-computer-vision-and-deep-learning/)