

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.$build.tar.gz
tar -xvzf cmake-$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

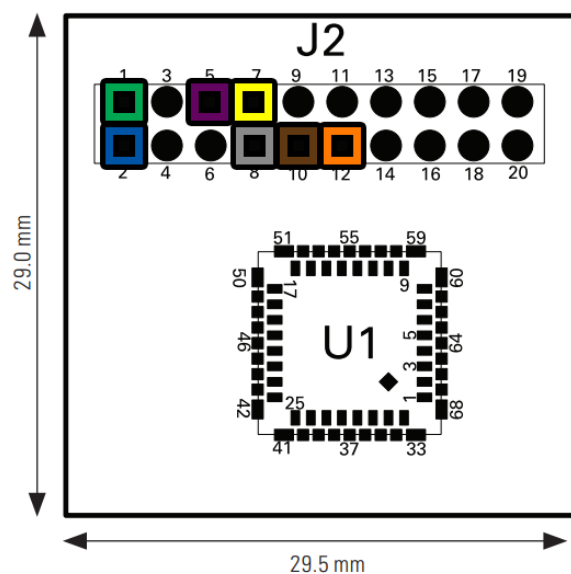
Connect the breakout board to the Jetson Nano GPIO pins as shown.

(Diagrams available in larger format within documentation folder)

Jetson Nano board

Jetson Nano J41 Header					
Sysfs GPIO	Name	Pin	Pin	Name	Sysfs GPIO
	3.3 VDC Power	1	2	5.0 VDC Power	
	I2C_2_SDA I2C Bus 1	3	4	5.0 VDC Power	
	I2C_2_SCL I2C Bus 1	5	6	GND	
gpio216	AUDIO_MCLK	7	8	UART_2_TX /dev/ttyTHS1	
	GND	9	10	UART_2_RX /dev/ttyTHS1	
gpio50	UART_2_RTS	11	12	I2S_4_SCLK	gpio79
gpio14	SPI_2_SCK	13	14	GND	
gpio194	LCD_TE	15	16	SPI_2_CS1	gpio232
	3.3 VDC Power	17	18	SPI_2_CS0	gpio15
gpio16	SPI_1_MOSI	19	20	GND	
gpio17	SPI_1_MISO	21	22	SPI_2_MISO	gpio13
gpio18	SPI_1_SCK	23	24	SPI_1_CS0	gpio19
	GND	25	26	SPI_1_CS1	gpio20
	I2C_1_SDA I2C Bus 0	27	28	I2C_1_SCL I2C Bus 0	
gpio149	CAM_AF_EN	29	30	GND	
gpio200	GPIO_PZ0	31	32	LCD_BL_PWM	gpio168
gpio38	GPIO_PE6	33	34	GND	
gpio76	I2S_4_LRCK	35	36	UART_2_CTS	gpio51
gpio12	SPI_2_MOSI	37	38	I2S_4_SDIN	gpio77
	GND	39	40	I2S_4_SDOUT	gpio78

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](#) 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](#) (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](#) and [Jetsonhacks.com](#)

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](#)

[Windows 10 guide](#)

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](#)

[Scikit_learn](#)

[Matplotlib](#)

[Keras and Scipy](#)

Useful resources:

[Getting Started with Jetson Nano Developer Kit](#)

[How to configure your NVIDIA Jetson Nano for Computer Vision and Deep Learning](#)