

OpenCV OAK-D Camera Experience
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2021.11.20 - present

Having frustrating time w/ RealSense SDK. On recent USAi Labs virtual Meetup Dianne suggested OpenCV OAK camera from Luxonix:
<https://shop.luxonix.com/products/1098obcenclosure>
It's on indefinite backorder everywhere but Luxonix which promises to ship in December so ordered it.

Tested the Ubuntu install next am without error from:
<https://docs.luxonix.com/projects/api/en/latest/install/#raspberrypi-os>
Full testing will require the camera and additional python installs.

Google "OpenCV OAK ROS2":
Used to "follow me"
<https://www.youtube.com/watch?v=06jcqfZ4Er8>

<https://discuss.luxonix.com/d/50-ros2-support>

2021.12.13
It's arrived!



2021.12.21

<https://docs.luxonis.com/projects/api/en/latest/install/#raspberrypi-os>

```
ubuntu@AUDACITY:~$ sudo apt update
ubuntu@AUDACITY:~$ sudo apt upgrade
ubuntu@AUDACITY:~$ ls /dev/video*
/dev/video10  /dev/video11  /dev/video12  /dev/video13
/dev/video14  /dev/video15  /dev/video16
ubuntu@AUDACITY:~$ rs-enumerate-devices
No device detected. Is it plugged in?
ubuntu@AUDACITY:~$ v4l2-ctl --list-devices
bcm2835-codec-decode (platform:bcm2835-codec):
    /dev/video10
    /dev/video11
    /dev/video12
    /dev/media0
bcm2835-isp (platform:bcm2835-isp):
    /dev/video13
    /dev/video14
    /dev/video15
    /dev/video16
    /dev/media1
ubuntu@AUDACITY:~$ cheese
nothing
```

Test installation

<https://github.com/luxonis/depthai-python/tree/develop/examples>

We have a set of examples that should help you verify if your setup was correct.

First, clone the depthai-python repository and change directory into this repo:

```
ubuntu@AUDACITY:~$ git clone
https://github.com/luxonis/depthai-python.git
ubuntu@AUDACITY:~$ cd depthai-python
```

Using a virtual environment (or system-wide, if you prefer), run the following to install the requirements for this example repository:

```
ubuntu@AUDACITY:~/depthai-python$ cd examples
ubuntu@AUDACITY:~/depthai-python/examples$ python3
install_requirements.py
```

Traceback (most recent call last):

```
  File "<string>", line 1, in <module>
ModuleNotFoundError: No module named 'cv2'
but no crash
extensive install
```

Now, run the `rgb_preview.py` script from within examples directory to make sure everything is working:

From DESKTOP terminal:

```
ubuntu@AUDACITY:~/depthai-python/examples$ python3 rgb_preview.py
python3: can't open file 'rgb_preview.py': [Errno 2] No such file
or directory
ubuntu@AUDACITY:~/depthai-python/examples$ cd ColorCamera/
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3
rgb_preview.py
Traceback (most recent call last):
  File "rgb_preview.py", line 24, in <module>
    with dai.Device(pipeline) as device:
RuntimeError: Failed to find device (ma2480), error message:
X_LINK_DEVICE_NOT_FOUND
```

```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ sudo find
/ -name opencv2
/usr/include/opencv4/opencv2
```

```
ubuntu@AUDACITY:/usr/include/opencv4$ ls
opencv2
```

Google “install opencv2 ubuntu”:

<https://linuxize.com/post/how-to-install-opencv-on-ubuntu-20-04/>

```
ubuntu@AUDACITY:~$ sudo apt install libopencv-dev python3-opencv
```

installs w/o error

```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3
```

`rgb_preview.py`

Still fails

```
ubuntu@AUDACITY:~$ sudo reboot
```

maybe it will find the camera now?

Doesn't seem to recognize camera. Is it working?

Check power supply...

2021.12.22

OAK-D power supply = 5.24V

W/ camera plugged into powered USB-3 hub:

```
ubuntu@AUDACITY:~$ lsusb
Bus 002 Device 003: ID 2109:0817 VIA Labs, Inc.
Bus 002 Device 002: ID 2109:0817 VIA Labs, Inc. USB3.0 Hub
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 013: ID 03e7:2485 Intel Movidius MyriadX
Bus 001 Device 007: ID 2109:2817 VIA Labs, Inc.
Bus 001 Device 006: ID 413c:2105 Dell Computer Corp. Model L100
Keyboard
Bus 001 Device 005: ID 413c:3012 Dell Computer Corp. Optical
Wheel Mouse
Bus 001 Device 004: ID 2109:2817 VIA Labs, Inc.
Bus 001 Device 002: ID 2109:3431 VIA Labs, Inc. Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

Plugged into R. Pi. USB3 port:

```
ubuntu@AUDACITY:~$ lsusb
Bus 002 Device 003: ID 2109:0817 VIA Labs, Inc.
Bus 002 Device 002: ID 2109:0817 VIA Labs, Inc. USB3.0 Hub
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 007: ID 2109:2817 VIA Labs, Inc.
Bus 001 Device 006: ID 413c:2105 Dell Computer Corp. Model L100
Keyboard
Bus 001 Device 005: ID 413c:3012 Dell Computer Corp. Optical
Wheel Mouse
Bus 001 Device 004: ID 2109:2817 VIA Labs, Inc.
Bus 001 Device 014: ID 03e7:2485 Intel Movidius MyriadX
Bus 001 Device 002: ID 2109:3431 VIA Labs, Inc. Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ 
usb-devices
```

```
...
T: Bus=01 Lev=02 Prnt=02 Port=00 Cnt=01 Dev#= 14 Spd=480 MxCh= 0
D: Ver= 2.00 Cls=00(>ifc ) Sub=00 Prot=00 MxPS=64 #Cfgs= 1
P: Vendor=03e7 ProdID=2485 Rev=00.01
S: Manufacturer=Movidius Ltd.
S: Product=Movidius MyriadX
S: SerialNumber=03e72485
C: #Ifs= 1 Cfg#= 1 Atr=80 MxPwr=500mA
I: If#=0x0 Alt= 0 #EPs= 2 Cls=ff(vend.) Sub=11 Prot=ff
Driver=(none)
```

```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ cheese  
nothing
```

```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3  
rgb_preview.py  
Traceback (most recent call last):  
  File "rgb_preview.py", line 24, in <module>  
    with dai.Device(pipeline) as device:  
RuntimeError: Failed to find device (ma2480), error message:  
X_LINK_DEVICE_NOT_FOUND
```

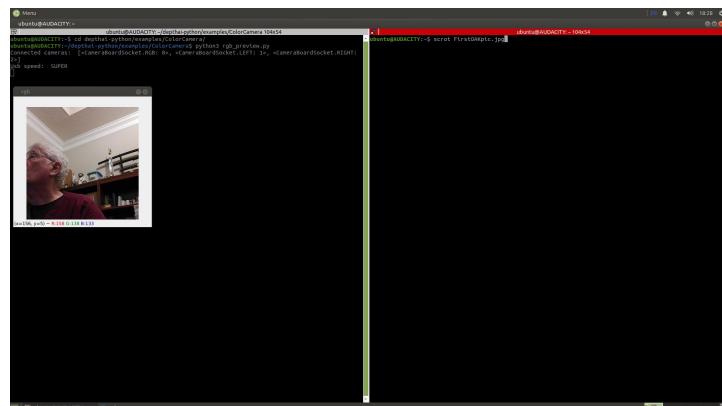
Google “`RuntimeError: Failed to find device (ma2480), error message: X_LINK_DEVICE_NOT_FOUND`”:

<https://discuss.luxonis.com/d/161-unable-to-run-deptai-python-library-for-oak-d>

refers to problem in VM, doesn't apply, but does mention installing dependencies I'm not sure were mentioned above -

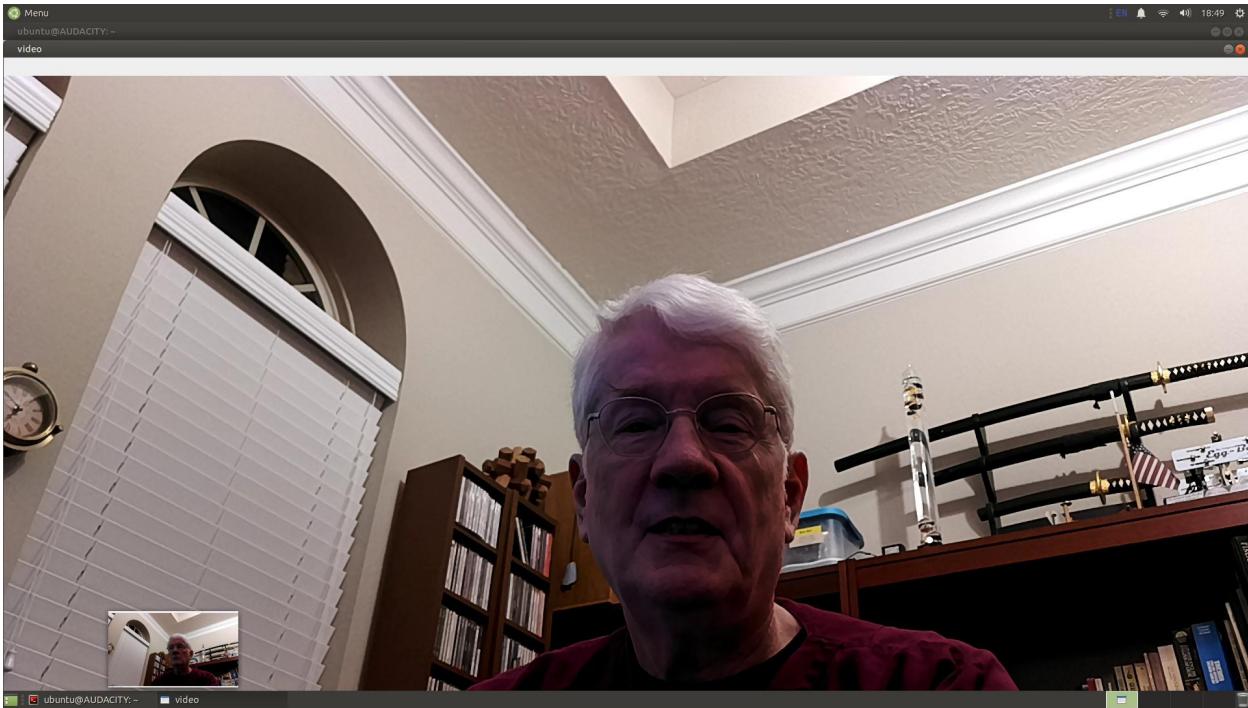
```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ sudo wget  
-qO- http://docs.luxonis.com/_static/install_dependencies.sh |  
bash  
mod long install, then -  
Defaulting to user installation because normal site-packages is  
not writeable  
Requirement already satisfied: pip in  
/home/ubuntu/.local/lib/python3.8/site-packages (21.3.1)  
SUBSYSTEM=="usb", ATTRS{idVendor}=="03e7", MODE=="0666"
```

```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3  
rgb_preview.py  
Connected cameras: [ <CameraBoardSocket.RGB: 0>,  
<CameraBoardSocket.LEFT: 1>, <CameraBoardSocket.RIGHT: 2>]  
Usb speed: SUPER  
camera image displays!!!
```



```
ubuntu@AUDACITY:~  
/depthai-python  
/examples  
/ColorCamera$ ls  
autoexposure_roi.py  
rgb_camera_control.py  
rgb_preview.py  
rgb_scene.py  
rgb_video.py
```

```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3  
rgb_video.py
```



```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3  
rgb_scene.py
```

```
ubuntu@AUDACITY:~  
ubuntu@AUDACITY:~ cd depthai-python/examples/ColorCamera/  
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3 rgb_preview.py  
Connected cameras: [<CameraBoardSocket.RGB: 0, <CameraBoardSocket.LEFT: 1>, <CameraBoardSocket.RIGHT: 2>]  
usb speed: SUPER  
^C[traceback (most recent call last):  
  File "rgb_preview.py", line 34, in <module>  
    _nRGB = qRGB.get() # blocking call, will wait until a new data has arrived  
KeyboardInterrupt  
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ ls  
autoexposure_rot.py  rgb_camera_control.py  rgb_preview.py  rgb_scene.py  rgb_video.py  
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3 rgb_video.py  
^C[traceback (most recent call last):  
  File "rgb_video.py", line 36, in <module>  
    cv2.imshow('video', videoin.getcvFrame())  
KeyboardInterrupt  
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ ls  
autoexposure_rot.py  rgb_camera_control.py  rgb_preview.py  rgb_scene.py  rgb_video.py  
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3 rgb_scene.py  
[]
```

```
ubuntu@AUDACITY:~ scrot First0AKpic.jpg  
ubuntu@AUDACITY:~ ls  
Default  Downloads  Pictures  Templates  ds_000  echo  ros2_ws  
Desktop  First0AKpic.jpg  Public  Videos  ds_001  librealsense_build  
Documents  Rviz.txt  ds_002  depthai-python  libuvc_installation.sh  
ubuntu@AUDACITY:~ cheese  
^C  
ubuntu@AUDACITY:~ scrot -d 5 First0AKvid.jpg  
ubuntu@AUDACITY:~ ls  
Default  Downloads  Music  Pviz.txt  ds_000  depthai-python  libuvc_installation.sh  
Desktop  First0AKpic.jpg  Pictures  Templates  ds_000  echo  ros2_ws  
Documents  First0AKvid.jpg  Public  Videos  ds_001  librealsense_build  
ubuntu@AUDACITY:~ Frist0AKvid.jpg  
First0AKvid.jpg: command not found  
ubuntu@AUDACITY:~ scrot -d 1 First0Akscene.jpg
```

Effect: OFF
Scene: OFF

34, y=36) - R:182 G:167 B:159

```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3
rgb_camera_control.py
```

The screenshot shows a terminal window on the right and a camera preview window on the left. The terminal window displays command-line output related to DepthAI and ROS. The camera preview window shows a close-up of a person's face with a crop box highlighting a portion of it.

```
ubuntu@AUDACITY:~$ cd depthai-python/examples/ColorCamera/
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ ls
ColorCamera/  depthai-camera-control.py  depthai-camera-control.py  depthai-camera-control.py
ColorCamera$ python3 rgb_preview.py
Default Downlaods Pictures Templates d5_000 echo ros2_ws
Desktop FirstoAKpic.jpg Public Videos d5_001 librealsense_build
Documents Music Rvz.txt d5 depthai-python libuvic_installation.sh
ubuntu@AUDACITY:~$ ls
Default Downlaods Pictures Rvz.txt d5 depthai-python libuvic_installation.sh
Desktop FirstoAKpic.jpg Public Videos d5_001 librealsense_build
Documents FirstoAKvid.jpg Public Videos d5_001 librealsense_build
ubuntu@AUDACITY:~$ cheese
`C
ubuntu@AUDACITY:~$ scrot FirstoAKpic.jpg
ubuntu@AUDACITY:~$ ls
Default Downlaods Pictures Rvz.txt d5 depthai-python libuvic_installation.sh
Desktop FirstoAKpic.jpg Public Videos d5_001 librealsense_build
Documents FirstoAKvid.jpg Public Videos d5_001 librealsense_build
ubuntu@AUDACITY:~$ FirstoAKvid.jpg
FirstoAKvid.jpg: command not found
ubuntu@AUDACITY:~$ scrot -d 1 FirstoAKscene.jpg
ubuntu@AUDACITY:~$ scrot -d 5 FirstoAKcontrol.jpg
ubuntu@AUDACITY:~$
```

```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3
autoexposure_roi.py
```

The screenshot shows a terminal window on the right and a camera preview window on the left. The terminal window displays command-line output related to DepthAI and ROS. The camera preview window shows a scene with a person and a TV monitor, with a blue crop box highlighting the TV monitor area.

```
ubuntu@AUDACITY:~$ cd depthai-python/examples/ColorCamera/
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ ls
ColorCamera/  depthai-camera-control.py  depthai-camera-control.py  depthai-camera-control.py
ColorCamera$ python3 rgb_preview.py
Default Downlaods Pictures Templates d5_000 echo ros2_ws
Desktop FirstoAKpic.jpg Public Videos d5_001 librealsense_build
Documents FirstoAKvid.jpg Public Videos d5_001 librealsense_build
ubuntu@AUDACITY:~$ cheese
`C
ubuntu@AUDACITY:~$ scrot -d 5 FirstoAKvid.jpg
ubuntu@AUDACITY:~$ ls
Default Downlaods Pictures Rvz.txt d5 depthai-python libuvic_installation.sh
Desktop FirstoAKpic.jpg Public Videos d5_001 librealsense_build
Documents FirstoAKvid.jpg Public Videos d5_001 librealsense_build
ubuntu@AUDACITY:~$ FirstoAKvid.jpg
FirstoAKvid.jpg: command not found
ubuntu@AUDACITY:~$ scrot -d 1 FirstoAKscene.jpg
ubuntu@AUDACITY:~$ scrot -d 5 FirstoAKcontrol.jpg
ubuntu@AUDACITY:~$ ls
Default FirstoAKcontrol.jpg Pictures Videos depthai-python ros2_ws
Desktop FirstoAKpic.jpg Pictures Videos depthai-python ros2_ws
Documents FirstoAKscene.jpg Public d5 echo
Downloads FirstoAKvid.jpg Rvz.txt d5_000 librealsense_build
ubuntu@AUDACITY:~$ scrot -d 5 FirstoAkautoexp.jpg
ubuntu@AUDACITY:~$
```

Clearly it's wrong about the TV monitor...!

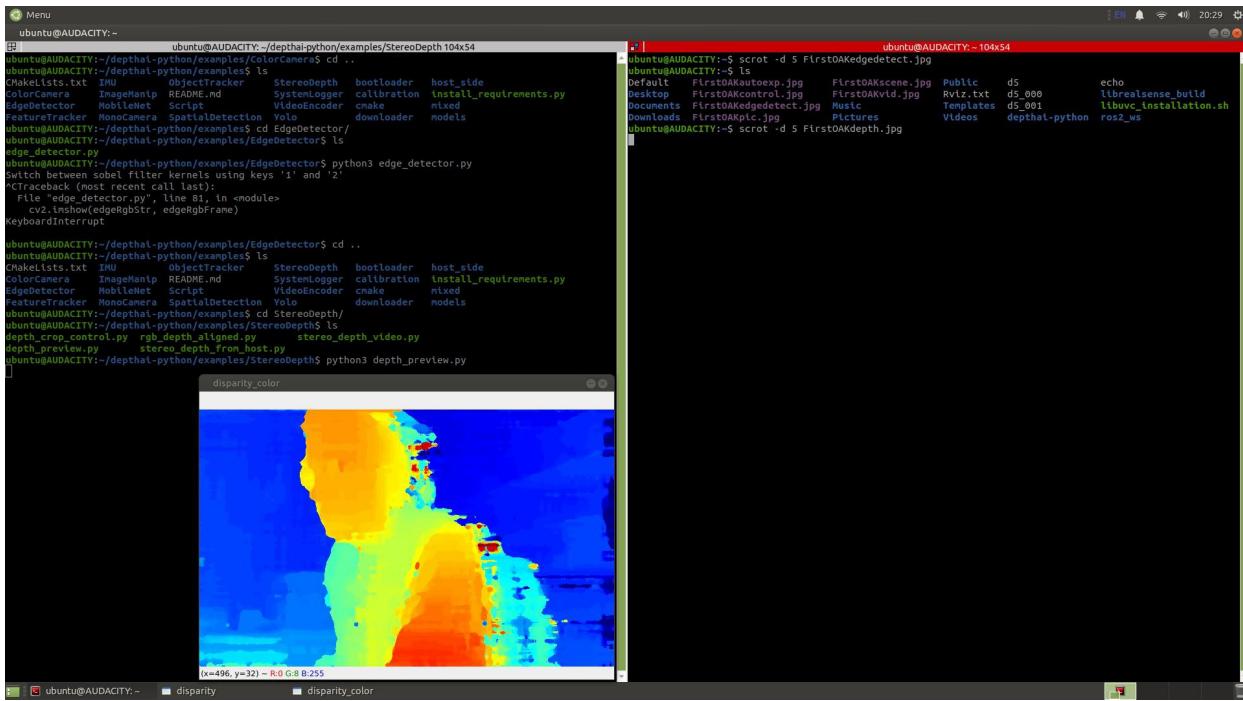
https://docs.luxonis.com/projects/api/en/latest/tutorials/code_samples/

```
ubuntu@AUDACITY:~/depthai-python/examples$ ls
FeatureTracker      MobileNet          StereoDepth
Yolo                 ColorCamera        IMU
MonoCamera           Script            SystemLogger
bootloader           downloader        mixed
EdgeDetector         ImageManip        ObjectTracker
SpatialDetection    VideoEncoder     calibration
host_side            models
```

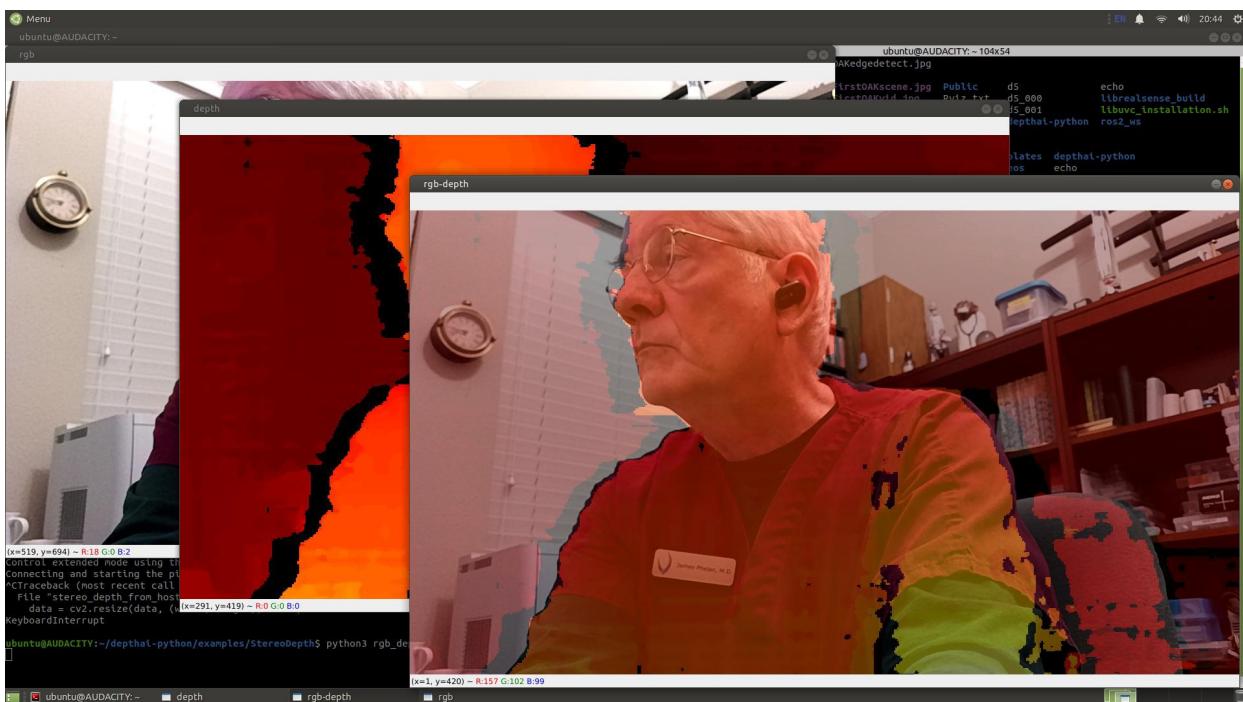
```
ubuntu@AUDACITY:~/depthai-python/examples/EdgeDetector$ python3
edge_detector.py
```



```
ubuntu@AUDACITY:~/depthai-python/examples/StereoDepth$ python3
depth_preview.py
```



```
ubuntu@AUDACITY:~/depthai-python/examples/StereoDepth$ python3
rgb_depth_aligned.py
```



2021.12.24

Google “**OAK D ROS2**”:

<https://discuss.luxonis.com/d/50-ros2-support>

which links to

<https://github.com/luxonis/depthai-ros>

depthai-ros(Gen2)

main branch supports ROS Melodic, ROS Noetic, ROS2 Foxy. Might also work on kinetic too.

Getting Started

Install Dependencies

The following script will install depthai-core and update usb rules and install depthai devices

```
ubuntu@AUDACITY:~$ sudo wget -qO-
https://raw.githubusercontent.com/luxonis/depthai-ros/main/install\_dependencies.sh | sudo bash
long install
if you don't have opencv installed then try sudo apt install libopencv-dev
ubuntu@AUDACITY:~$ sudo apt install libopencv-dev
...libopencv-dev is already the newest version (4.2.0+dfsg-5)...
if you don't have rosdep installed and not initialized please
execute the following steps:
ubuntu@AUDACITY:~$ sudo apt install python3-rosdep
python3-rosdep is already the newest version (0.21.0-1).
ubuntu@AUDACITY:~$ sudo rosdep init
ERROR: default sources list file already exists:
      /etc/ros/rosdep/sources.list.d/20-default.list
Please delete if you wish to re-initialize
ubuntu@AUDACITY:~$ rosdep update
updated
install the following vcstool sudo apt install python3-vcstool
ubuntu@AUDACITY:~$ sudo apt install python3-vcstool
```

Setting up procedure

The following setup procedure assumes you have cmake version >= 3.10.2 and OpenCV version >= 4.0.0

ubuntu@AUDACITY:~\$ **python3**

Python 3.8.10 (default, Nov 26 2021, 20:14:08)

[GCC 9.3.0] on linux

Type "help", "copyright", "credits" or "license" for more information.

>>> **import cv2**

>>> **cv2.__version__**

'4.5.4' ^D ^D

1. **mkdir -p <directory_for_workspaces>/src**

<directory_for_workspaces> = **depthai-ros_ws**

->

mkdir -p depthai-ros_ws/src

ubuntu@AUDACITY:~\$ **mkdir -p depthai-ros_ws/src**

2. **cd <directory_for_workspaces>**

->

cd depthai-ros_ws

ubuntu@AUDACITY:~\$ **cd depthai-ros_ws**

3. **ubuntu@AUDACITY:~/depthai-ros_ws\$ wget**

https://raw.githubusercontent.com/luxonis/depthai-ros/main/underlay.repos

4. **ubuntu@AUDACITY:~/depthai-ros_ws\$ vcs import src < underlay.repos**

5. **ubuntu@AUDACITY:~/depthai-ros_ws\$ rosdep install --from-paths src --ignore-src -r -y**

6. **ubuntu@AUDACITY:~/depthai-ros_ws\$ source**

/opt/ros/<ros-distro>/setup.bash

-bash: ros-distro: No such file or directory

ubuntu@AUDACITY:~/depthai-ros_ws\$ **source /opt/ros/foxy/setup.bash**

Skip down to p14

7. `ubuntu@AUDACITY:~/depthai-ros_ws$ catkin_make`
Command 'catkin_make' not found, but can be installed with:
`sudo apt install catkin`
`ubuntu@AUDACITY:~/depthai-ros_ws$ sudo apt install catkin`

Reading package lists... Done
Building dependency tree
Reading state information... Done
Some packages could not be installed. This may mean that you have
requested an impossible situation or if you are using the
unstable
distribution that some required packages have not yet been
created
or been moved out of Incoming.
The following information may help to resolve the situation:

The following packages have unmet dependencies:

`catkin : Depends: python3-catkin-pkg (>= 0.4.14-2) but it is not`
`going to be installed`
`E: Unable to correct problems, you have held broken packages.`

<https://answers.ros.org/question/258444/sudo-apt-install-catkin-not-working/>

Unintuitive though, this error can also happen when your terminal
can't find the command in directories in ROS_PACKAGE_PATH. So
make sure ROS_PACKAGE_PATH is set appropriately (e.g. by source
`/opt/ros/indigo/setup.bash` etc.)

`ubuntu@AUDACITY:~/depthai-ros_ws$ source /opt/ros/foxy/setup.bash`
didn't solve problem

`ubuntu@AUDACITY:~/depthai-ros_ws$ sudo apt-get install`
`ros-foxy-catkin`

`E: Unable to locate package ros-foxy-catkin`
try

`ubuntu@AUDACITY:~/depthai-ros_ws$ sudo apt-get install`
`ros2-foxy-catkin`

Reading package lists... Done
Building dependency tree
Reading state information... Done
`E: Unable to locate package ros2-foxy-catkin`

try here:

<https://answers.ros.org/question/384666/how-to-fix-catkin-dependencies-error-ros2-galactic/>

"You cannot use Catkin with ROS 2."

Ah, should be "colcon build"

```
ubuntu@AUDACITY:~/depthai-ros_ws$ colcon build
seems to hang at:
[Processing: depthai_bridge][depthai_bridge:build 66% - 16min
0.4s]
^C
```

try again w/ colcon instead of cmake:

```
7. ubuntu@AUDACITY:~/depthai-ros_ws$ colcon build
gets stuck again at lower%.
```

```
ubuntu@AUDACITY:~/depthai-ros_ws/build$ ls
COLCON_IGNORE  depthai_bridge  depthai_examples  depthai_ros_msgs
ubuntu@AUDACITY:~/depthai-ros_ws/build$ cd ..
ubuntu@AUDACITY:~/depthai-ros_ws$ colcon build --packages-select
depthai_bridge
Starting >>> depthai_bridge
Finished <<< depthai_bridge [1.88s]
Summary: 1 package finished [2.49s]
ubuntu@AUDACITY:~/depthai-ros_ws$ colcon build --packages-select
depthai_ros_msgs
Starting >>> depthai_ros_msgs
Finished <<< depthai_ros_msgs [4.56s]
Summary: 1 package finished [5.15s]
ubuntu@AUDACITY:~/depthai-ros_ws$ colcon build --packages-select
depthai_examples
Starting >>> depthai_examples
[Processing: depthai_examples]
[Processing: depthai_examples]pthai_examples:build 71% - 1min
2.5s]
[1min 32.3s] [0/1 complete] [depthai_examples:build 71% - 1min
31.7s]
seems to want to get stuck here
Posted issue to
https://github.com/luxonis/depthai-ros/issues/55#issuecomment-1002368033
and got response
It has run out of memory to compile.
MAKEFLAGS="-j 1" colcon build --packages-select depthai_ros_msgs
depthai_bridge
do this to avoid parallelization which will be able to build on
pi without issues.
```

Below statements should be -j, not -J

```
ubuntu@AUDACITY:~/depthai-ros_ws$ MAKEFLAGS="-J 1" colcon build
--packages-select depthai_examples
still got stuck at 71%, ^C to abort
Try using all 4 processors instead
ubuntu@AUDACITY:~/depthai-ros_ws$ MAKEFLAGS="-J 4" colcon build
--packages-select depthai_examples
still got stuck at 71%, ^C to abort
try making swapfile
drawing from -
C:\Users\Me\Documents\My Downloads\Robotics\USAi Labs\Mars
Rover\AUDACITY\Intel RealSense camera\Intel RealSense Camera
Experience.wpd
using ^F "swapfile" found -
No swapon - setting up 1Gb swap file
+ sudo fallocate -l 2G /swapfile
+ sudo chmod 600 /swapfile
+ sudo mkswap /swapfile
Setting up swapspace version 1, size = 2 GiB (2147479552 bytes)
no label, UUID=3e93f675-cc1f-45b7-944d-39dd5d7dada6
+ sudo swapon /swapfile
+ sudo swapon --show
NAME      TYPE SIZE USED PRIO
/swapfile file 2G   0B   -2
so-
ubuntu@AUDACITY:~/depthai-ros_ws$ cd
ubuntu@AUDACITY:~$ sudo fallocate -l 2G /swapfile
ubuntu@AUDACITY:~$ sudo chmod 600 /swapfile
ubuntu@AUDACITY:~$ sudo mkswap /swapfile
mkswap: /swapfile: warning: wiping old swap signature.
Setting up swapspace version 1, size = 2 GiB (2147479552 bytes)
no label, UUID=60409385-1fa8-4d1b-9ccd-6c157a349682

ubuntu@AUDACITY:~$ cd depthai-ros_ws/
ubuntu@AUDACITY:~$ MAKEFLAGS="-J 1" colcon build
--packages-select depthai_examples
still gets stuck, don't think swap worked:
ubuntu@AUDACITY:~$ free -m
              total        used        free      shared
buff/cache    available
Mem:          3793           846         2485           63
461           2831
Swap:          0             0            0            0
```

```

ubuntu@AUDACITY:~$ df
Filesystem      1K-blocks      Used Available Use%
...
/dev/mmcblk0p2  122655944  15834968  101795020  14% /
...
Google "ubuntu 20.04 create swap file":
https://www.digitalocean.com/community/tutorials/how-to-add-swap-space-on-ubuntu-20-04
ubuntu@AUDACITY:~$ sudo swapon --show
blank
ubuntu@AUDACITY:~$ free -h
      total        used        free      shared
Mem:   3.7Gi     858Mi     2.3Gi    122Mi
Swap:      0B       0B       0B
ubuntu@AUDACITY:~$ sudo fallocate -l 8G /swapfile
ubuntu@AUDACITY:~$ ls -lh /swapfile
-rw----- 1 root root 8.0G Dec 28 21:36 /swapfile
ubuntu@AUDACITY:~$ sudo chmod 600 /swapfile
ubuntu@AUDACITY:~$ ls -lh /swapfile
-rw----- 1 root root 8.0G Dec 28 21:36 /swapfile
ubuntu@AUDACITY:~$ sudo mkswap /swapfile
mkswap: /swapfile: warning: wiping old swap signature.
Setting up swapspace version 1, size = 8 GiB (8589930496 bytes)
no label, UUID=be58132b-f1d3-4c35-af12-f404cec5b6f7
ubuntu@AUDACITY:~$ sudo swapon /swapfile
ubuntu@AUDACITY:~$ sudo swapon --show
NAME      TYPE SIZE USED PRI0
/swapfile file  8G  0B   -2
ubuntu@AUDACITY:~$ free -h
      total        used        free      shared
Mem:   3.7Gi     861Mi     2.2Gi    121Mi
Swap:   8.0Gi       0B     8.0Gi
ubuntu@AUDACITY:~$ cat /proc/sys/vm/swappiness
60

```

save for later:

Step 5 – Making the Swap File Permanent

Our recent changes have enabled the swap file for the current session. However, if we reboot, the server will not retain the swap settings automatically. We can change this by adding the swap file to our /etc/fstab file.

Back up the /etc/fstab file in case anything goes wrong:

```
sudo cp /etc/fstab /etc/fstab.bak
```

Add the swap file information to the end of your /etc/fstab file by typing:

```
echo '/swapfile none swap sw 0 0' | sudo tee -a /etc/fstab
```

try running from desktop terminal:

```
ubuntu@AUDACITY:~$ MAKEFLAGS="-J 1" colcon build  
--packages-select depthai_examples  
Starting >>> depthai_examples  
[Processing: depthai_examples]  
[Processing: depthai_examples]pthai_examples:build 71% - 3min 0.7s]  
[Processing: depthai_examples]epthai_examples:build 71% - 3min 30.7s]  
[Processing: depthai_examples]  
[Processing: depthai_examples]  
Finished <<< depthai_examples [4min 47s]
```

Summary: 1 package finished [4min 47s]

success!!

8. `ubuntu@AUDACITY:~/depthai-ros_ws$ source devel/setup.bash`
`-bash: devel/setup.bash: No such file or directory`
catkin creates a devel but colcon doesn't.
It creates the /install directory
`ubuntu@AUDACITY:~/depthai-ros_ws/install$ source local_setup.bash`

2021.12.29

This is the wrong branch:

<https://github.com/luxonis/depthai-ros/tree/main>

You want this branch:

<https://github.com/luxonis/depthai-ros/tree/foxy-devel>

7. colcon build

already done

8. source install/setup.bash

note setup.bash, not local_setup.bash tried above

ubuntu@AUDACITY:~/depthai-ros_ws\$ **source install/setup.bash**

Executing an example

1. cd <directory_for_workspaces>

already there

2. source install/setup.bash

already done

3. ros2 run depthai_examples stereo_node - example node

FROM DESKTOP TERMINAL --

ubuntu@AUDACITY:~/depthai-ros_ws\$ **ros2 run depthai_examples stereo_node**

Package 'depthai_examples' not found

ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/share/d

epthai_examples\$ **source local_setup.bash**

ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/share/d

epthai_examples\$ **ros2 run depthai_examples stereo_node**

just sits there

from another terminator window:

ubuntu@AUDACITY:~\$ **ros2 topic list**

/left/camera_info

/left/image

/parameter_events

/right/camera_info

/right/image

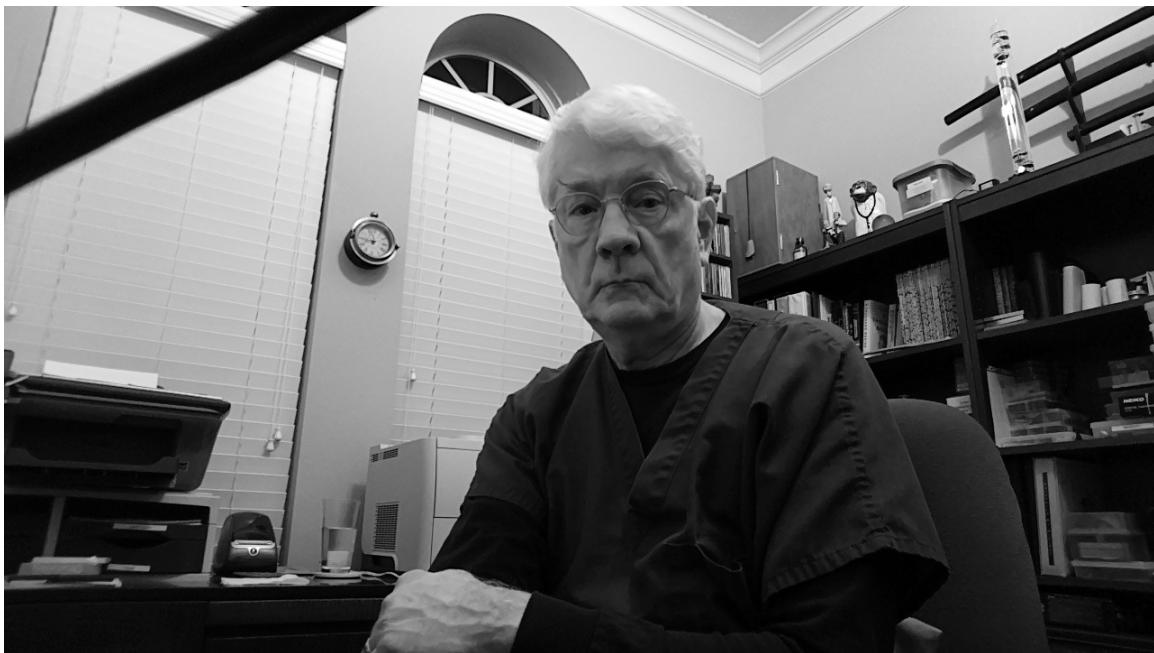
/rosout

/stereo/camera_info

/stereo/depth

```
ubuntu@AUDACITY:~$ ros2 topic echo /left/camera_info
header:
  stamp:
    sec: 1640831379
    nanosec: 317303322
  frame_id: oak_left_camera_optical_frame
height: 720
width: 1280
distortion_model: rational_polynomial
d:
- -11.076838493347168
- 103.74700164794922
- 0.001187969115562737
- -0.0011164243333041668
- -84.99313354492188
- -11.119194030761719
- 103.3470687866211
- -83.93621826171875
k:
- 802.8373413085938
- 0.0
- 629.55224609375
- 0.0
- 803.3001098632812
- 352.3416442871094
- 0.0
- 0.0
- 1.0
r:
- 0.9999950528144836
- -0.0029878909699618816
- -0.0009690020233392715
- 0.002992092864587903
- 0.9999859929084778
- 0.0043641915544867516
- 0.0009559487225487828
- -0.004367069341242313
- 0.9999899864196777
p:
- 804.1485595703125
- 0.0
- 655.7861328125
- 60.63922383740137
- 0.0
- 804.587890625
- 355.006103515625
- 0.0
- 0.0
- 0.0
- 1.0
- 0.0
binning_x: 0
binning_y: 0
roi:
  x_offset: 0
  y_offset: 0
  height: 0
  width: 0
  do_rectify: false
---
```

```
ubuntu@AUDACITY:~$ rivz2 rviz2  
can't get anything to display  
Fixed Frame only allows map  
$ cheese  
displays nothing  
$ rqt
```



/left/image



/right/image

2022.01.05

Adapting --
echo "source ~/ros2_ws/install/local_setup.bash" >> ~/.bashrc
source install/setup.bash
to
ubuntu@AUDACITY:~/depthai-ros_ws/install\$ echo "source
~/depthai-ros_ws/install/local_setup.bash" >> ~/.bashrc

Trying from here:

<https://docs.luxonis.com/en/latest/>

which says to start here:

https://docs.luxonis.com/en/latest/pages/tutorials/first_steps/#first-steps-with-depthai

First steps with DepthAI

Connect the DepthAI device

On Ubuntu, you can check if a new USB device was detected by running:

ubuntu@AUDACITY:~\$ **lsusb | grep MyriadX**

this fails but this works:

ubuntu@AUDACITY:~\$ **lsusb | grep Myriad**

Bus 002 Device 005: ID 03e7:f63b Intel Myriad VPU [Movidius Neural Compute Stick]

Setup

Download demo script

ubuntu@AUDACITY:~\$ **git clone**

<https://github.com/luxonis/depthai.git>

Cloning into 'depthai'...

remote: Enumerating objects: 7056, done.

remote: Counting objects: 100% (440/440), done.

remote: Compressing objects: 100% (273/273), done.

remote: Total 7056 (delta 261), reused 284 (delta 143), pack-reused 6616

Receiving objects: 100% (7056/7056), 3.52 MiB | 1.22 MiB/s, done.

Resolving deltas: 100% (4403/4403), done.

After the repository is downloaded, make sure to enter the downloaded repository by running

ubuntu@AUDACITY:~\$ **cd depthai**

Create python virtualenv (optional)

skip

Install requirements

ubuntu@AUDACITY:~/depthai\$ **python3 install_requirements.py**

Extensive install

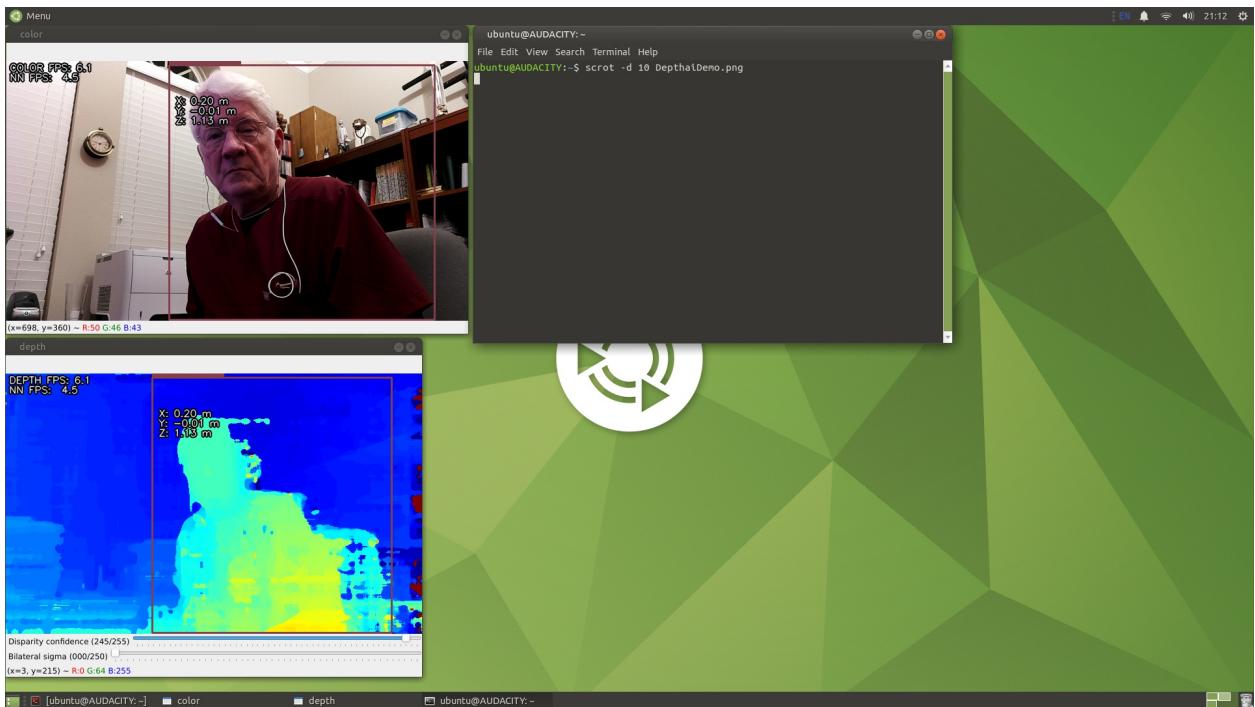
Warning - If you are using a Linux system, in most cases you have to add a new udev rule for our script to be able to access the device correctly. You can add and apply new rules by running:

```
ubuntu@AUDACITY:~/depthai$ echo 'SUBSYSTEM=="usb",  
ATTRS{idVendor}=="03e7", MODE="0666"' | sudo tee  
/etc/udev/rules.d/80-movidius.rules  
ubuntu@AUDACITY:~/depthai$ sudo udevadm control --reload-rules &&  
sudo udevadm trigger
```

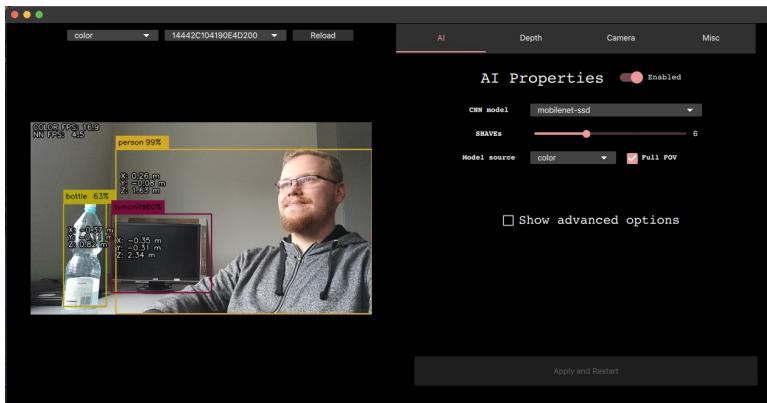
Run demo script

NEEDS TO RUN FROM DESKTOP TERMINAL

```
ubuntu@AUDACITY:~/depthai$ python3 depthai_demo.py
```



The demo program does NOT look like the one in the docs:

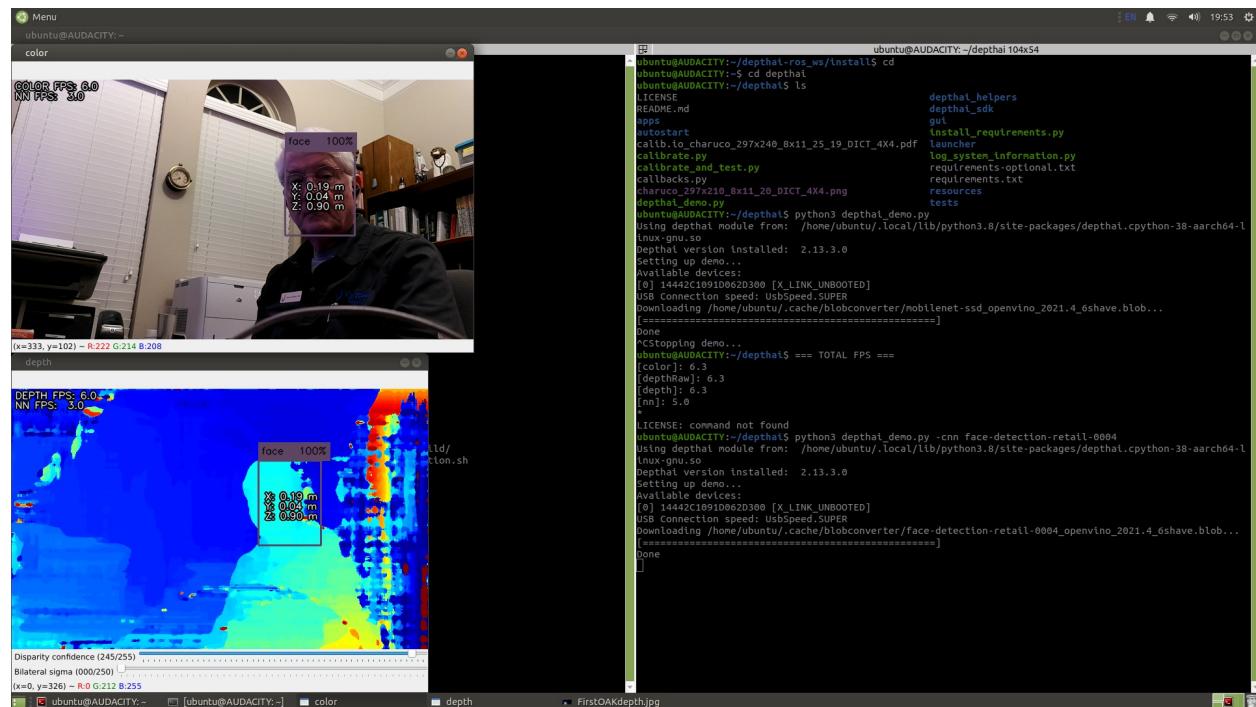


Will have to try the command line approach e.g.:

```
$ python3 depthai_demo.py -cnn face-detection-retail-0004  
...another day.
```

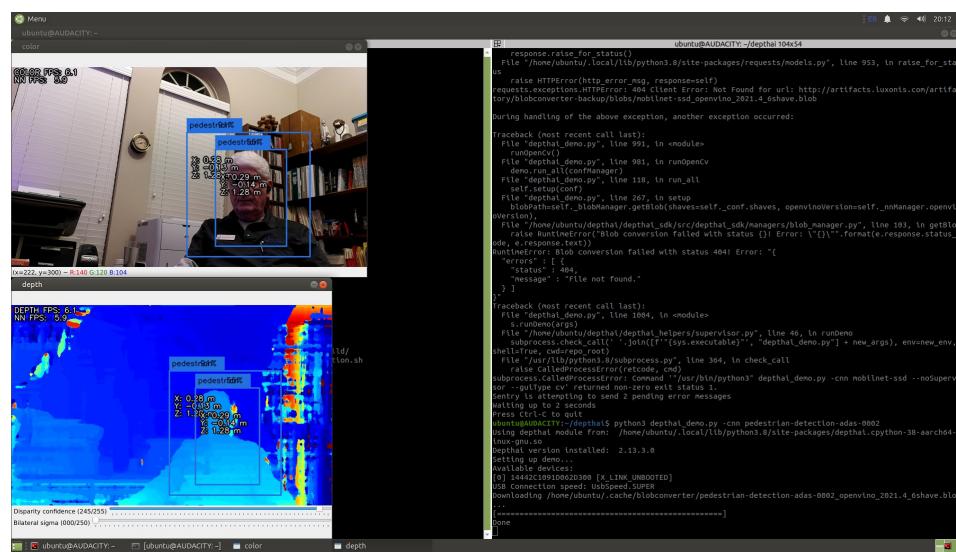
2022.01.07

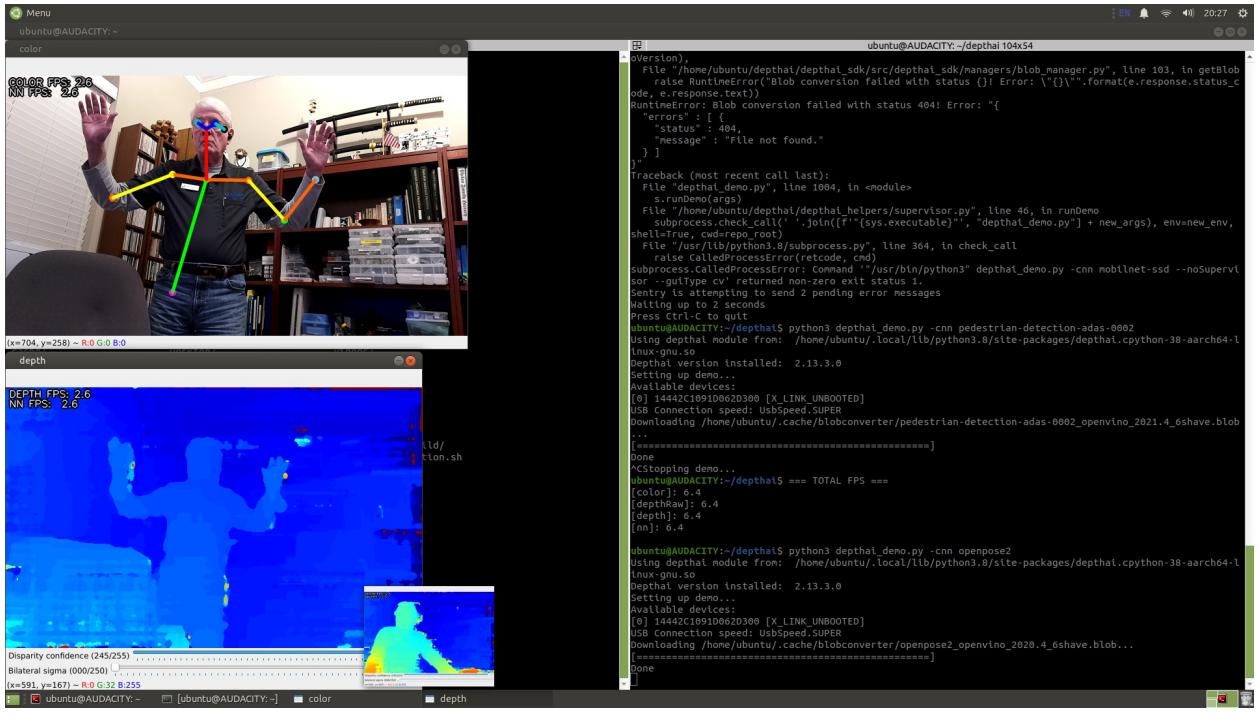
```
ubuntu@AUDACITY:~/depthai$ python3 depthai_demo.py -cnn  
face-detection-retail-0004
```



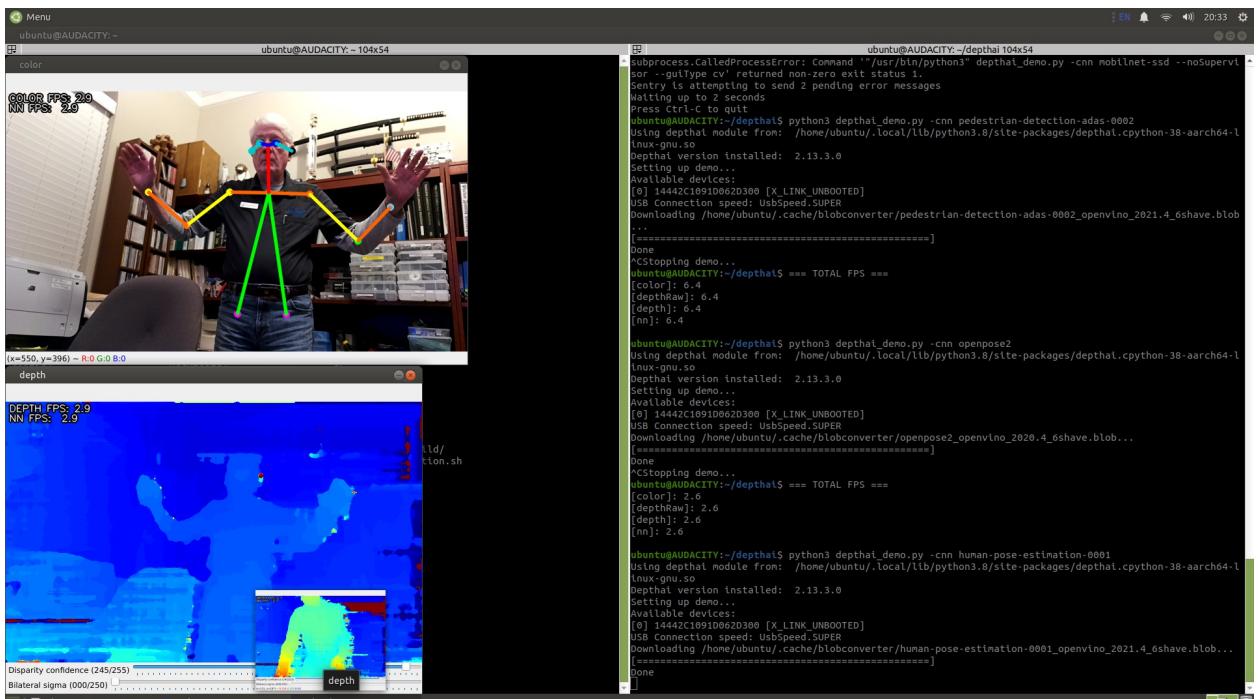
deeplabv3p_person
face-detection-adas-0001
mobilenet-ssd
pedestrian-detection-adas-0002

meh
failed
failed
below





openpose2

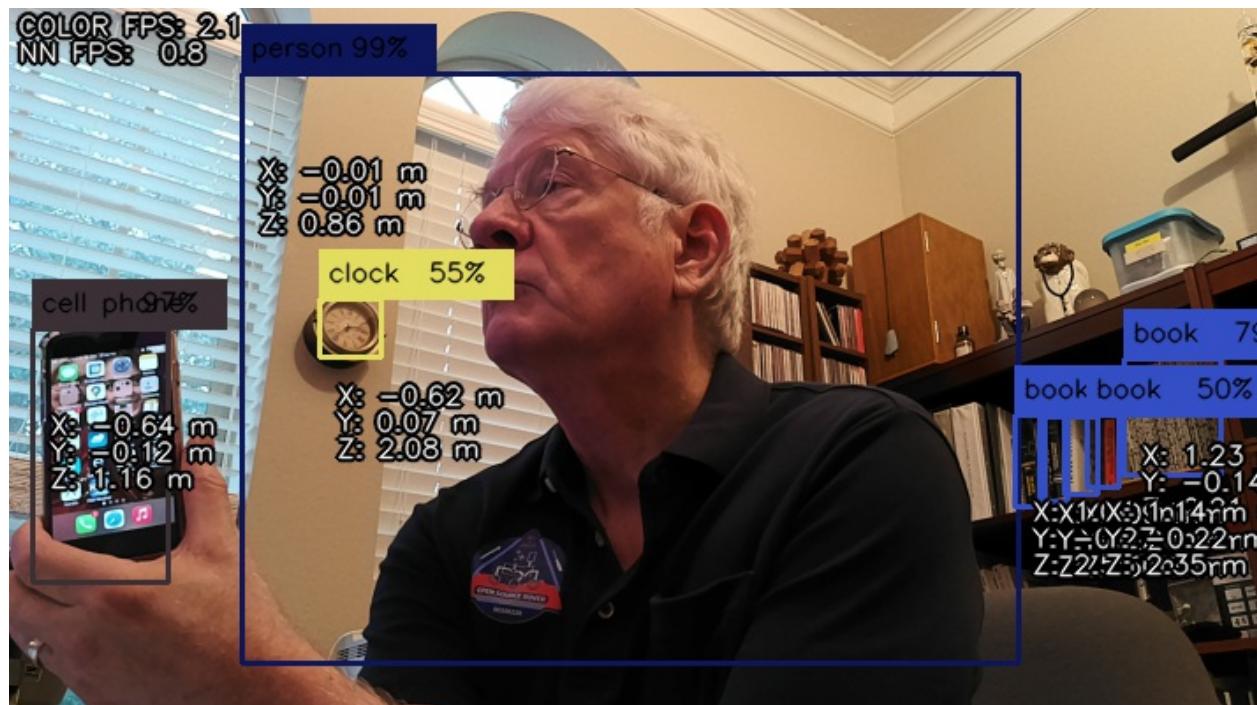


human-pose-estimation-0001

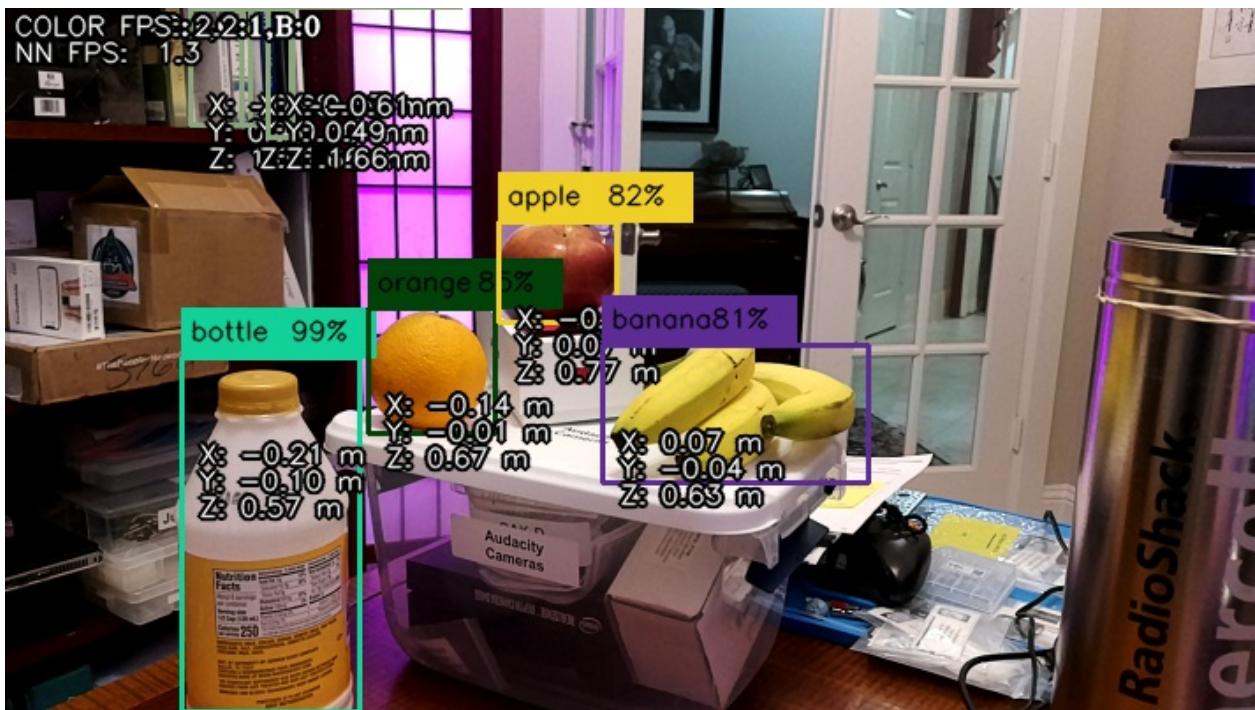


person-vehicle-bike-detection-crossroad-1016

Fails to detect vehicles across the street through screen and rain.



yolo-v3 person cellphone clock books

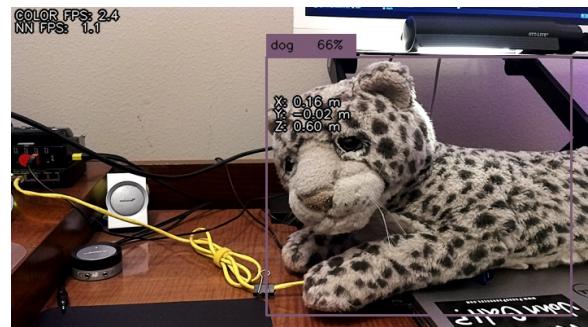


Apple Banana Bottle Orange

Evaluating a stuffed leopard is a little more difficult:



Teddy Bear 88%



Dog 66%



Bed 66%



...and finally Cat 61%

2022.01.09

Working from

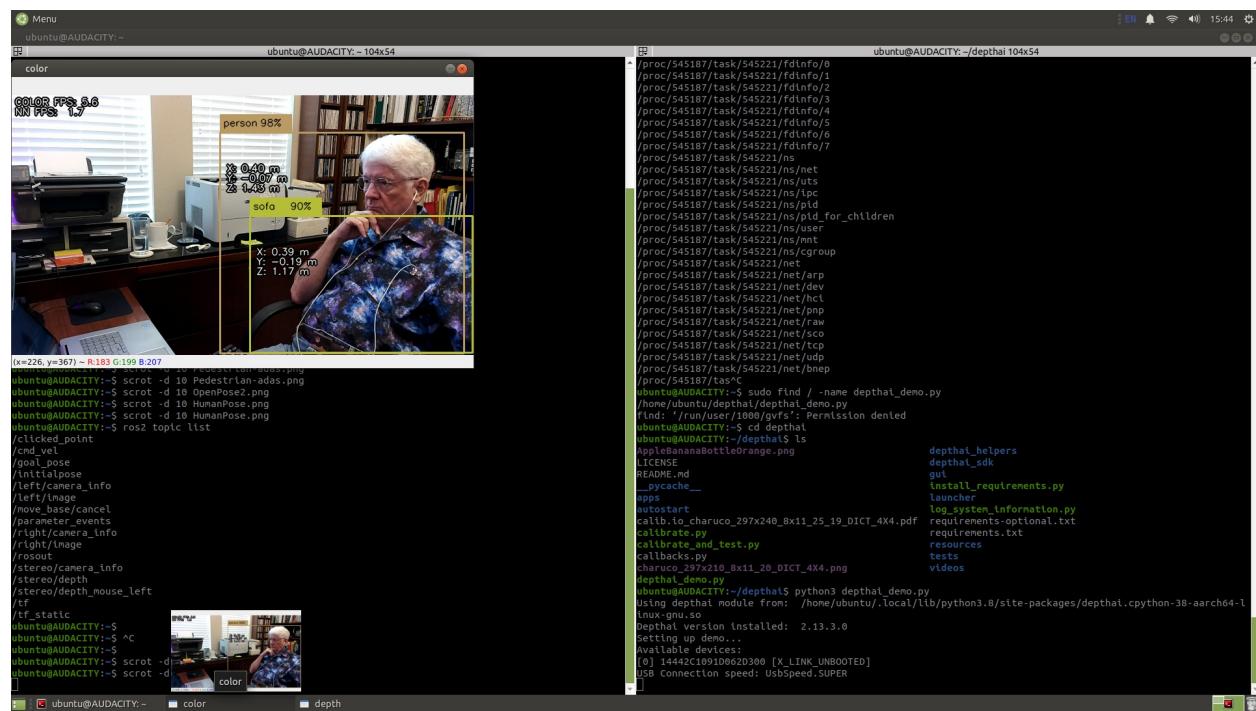
<https://github.com/luxonis/depthai-ros/tree/foxy-devel>

can't get examples to work

Starting over from:

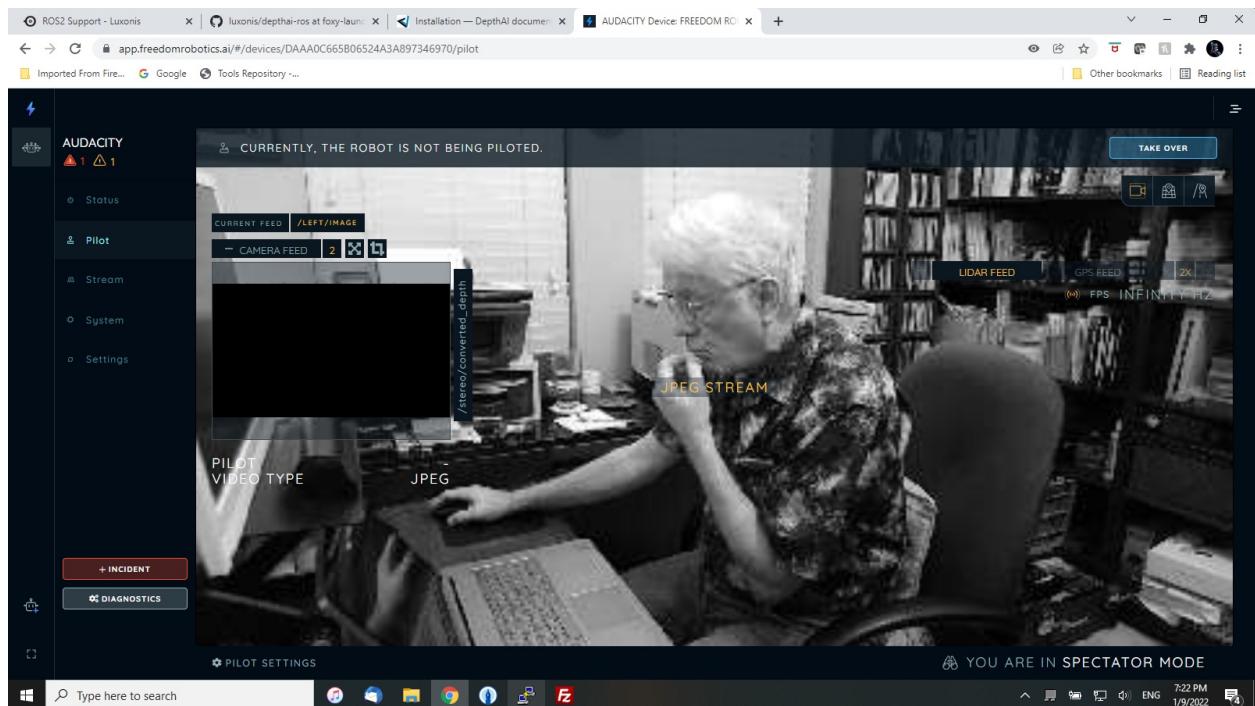
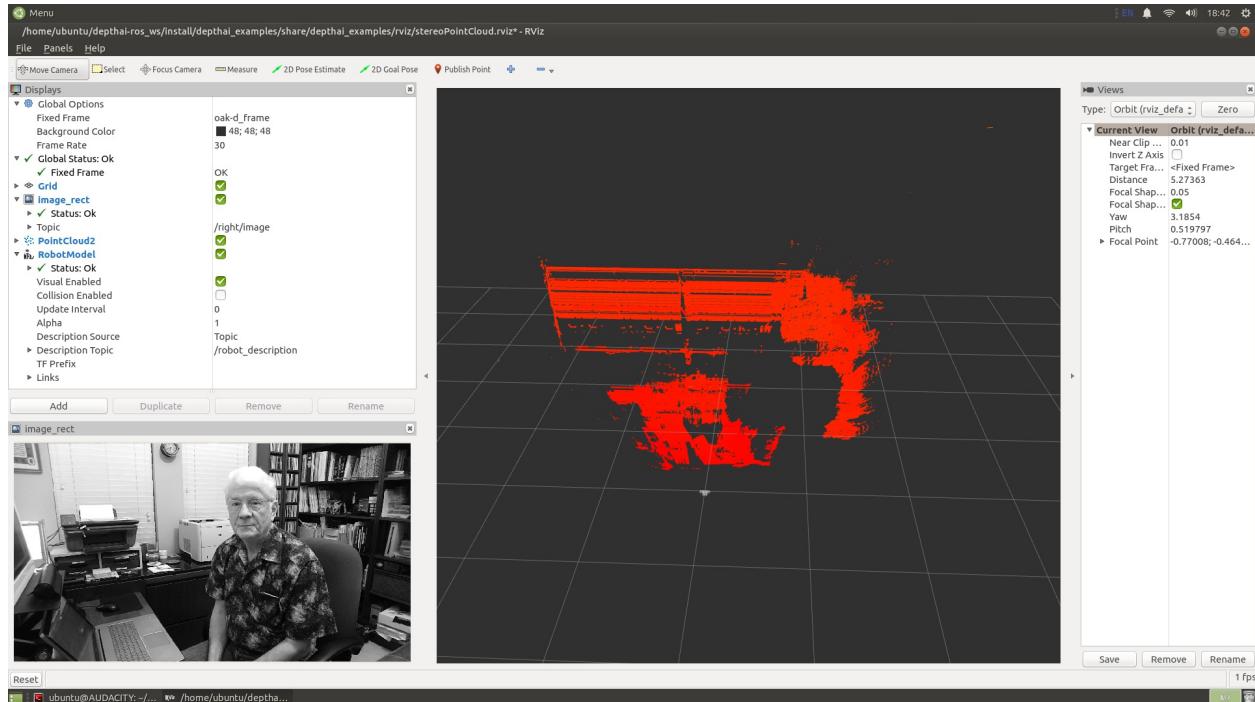
<https://github.com/luxonis/depthai>

ubuntu@AUDACITY:~/depthai\$ python3 depthai_demo.py



OK, I gained a little weight over the holidays, but "sofa"?!

```
ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/share/depthai_examples/launch$ ros2 launch stereo.launch.py Rviz pops up.
```



Freedom Robotics dashboard display keeps flipping between Right, Left, and Stereo views at few seconds each. See no way to select just one. But at least it shows! Joystick doesn't function.

2022.01.11

Update Freedomrobotics agent. Add -3 to python!

```
curl -sSf  
"https://api.freedomrobotics.ai/accounts/A6124B5AB85968B6435933C2  
1/devices/DAAA0C665B06524A3A897346970/installscript?mc_token=T73A  
701617E51E9A2D0A2F811&mc_secret=Sc93f666badc41fd587030d89&install  
_elements=webrtc&auto_install_deps=true&ppa_is_allowed=true" |  
python3
```

Blank lines deleted:

```
#####
Installing FREEDOM ROBOTICS Micro Service
Copyright Freedom Robotics Inc 2021. All rights reserved. Confidential.
#####
Please enter the sudo password to enable install to set up the
Freedom SYSTEM SERVICE, Remote SSH, etc... for the Freedom Agent.
(This will time out after 60 seconds and continue without installing
the services.)
[sudo] password for ubuntu:
#####
Step 1/6: VERIFYING PREREQUISITES
    COMPLETE
Step 2/6: INSTALLING CREDENTIALS
    COMPLETE
Step 3/6: REMOTE CONNECTION
    COMPLETE
Step 4/6: INSTALLING PACKAGE (python3.8)
Installing freedomrobotics agent and its direct dependencies for python 3.8.
This might take a few minutes.
    COMPLETE
Step 5/6: RTC DEPENDENCIES
Installing webrtc dependencies. First installation might take a few minutes.
    COMPLETE
Step 6/6: INSTALLING MICRO SERVICE
    COMPLETE
#####
INSTALL COMPLETE
MICRO AGENT      : INSTALLED AND ACTIVE
ROS SHADOW       : INSTALLED
REMOTE SSH        : INSTALLED
PYTHON3.8 PACKAGE : INSTALLED
RTC DEPENDENCIES : INSTALLED
ACCOUNT          : A6124B5AB85968B6435933C21
DEVICE           : DAAA0C665B06524A3A897346970
#####
```

From desktop Terminator window:
ubuntu@AUDACITY:~/depthai-
ros_ws/install/depthai_examples/share/depthai_examples/launch\$
ros2 launch rgbs_stereo_node.launch.py
launches
retry Freedomrobotics dashboard
FR flips between /color/image and /stereo/depth
attempted upgrade to webrtc fails

in another window:

```
$ rviz2 rviz2  
shows Image for multiple frames:  
    oak-d-base-frame  
    oak-d_frame  
    oak_imu_frame  
    oak_left_camera_frame  
    oak_left_camera_optical_frame  
    oak_model_origin  
    oak_rgb_camera_frame  
    oak_rgb_camera_optical_frame  
    oak_right_camera_frame  
    oak_right_camera_optical_frame
```

Stereo shows either No Image or black rectangle (w/ few white dots?)

[INFO] [...] [rviz2]: Stereo IS NOT SUPPORTED

Google: “**rviz2 stereo is not supported**”

<https://staff.fnwi.uva.nl/a.visser/research/roboresc/Labbook2021.html>

According to [this old post](#) that error seems to be related with OpenGL support. rviz2 opens with rviz2]: OpenGL version: 4.6 (GLSL 4.6), followed by [rviz2]: Stereo is NOT SUPPORTED. That could indicate that point-clouds are also not supported :-).

<https://github.com/ros-visualization/rviz/issues/624>

This indicates that your graphics driver does not support GLSL 1.20, which is needed for any kind of point cloud rendering. Judging from the log output you provided, you have OpenGL 1.4 with GLSL 1.0 supported as an extension. It might be possible that our current shaders are actually compatible with that and we could relatively easily handle this case in RViz.

So, just so I understand this correctly - with the last public RViz release in Groovy (I believe that was 1.9.24) it used to work on that computer?

Google “ubuntu 20.04 display opengl version”

<https://askubuntu.com/questions/47062/terminal-command-to-show-opengl-version>

To Check OpenGL Version,

glxinfo | grep "OpenGL version"

You will get the output as follows,

glxinfo | grep "OpenGL version"

OpenGL version string: 1.4 (2.1 Mesa 7.7.1)

Edit:

You may have better luck with modern OpenGL just grepping for "version" instead of "OpenGL version" given the differences between the core and compat profiles, as well as the various GLSL and GLES versions:

```
glxinfo | grep 'version'
```

```
$ glxinfo | grep 'version'
```

server glx version string: 1.4

client glx version string: 1.4

GLX version: 1.4

Max core profile version: 0.0

Max compat profile version: 2.1

Max GLES1 profile version: 1.1

Max GLES[23] profile version: 3.1

OpenGL version string: 2.1 Mesa 21.0.3

OpenGL shading language version string: 1.20

OpenGL ES profile version string: OpenGL ES 3.1 Mesa 21.0.3

OpenGL ES profile shading language version string: OpenGL ES GLSL ES 3.10

GL_EXT_separate_shader_objects,

GL_EXT_shader_implicit_conversions,

to install latest Mesa OpenGL:

<https://itsfoss.com/install-mesa-ubuntu/>

```
$ glxinfo | grep Mesa
```

client glx vendor string: Mesa Project and SGI

OpenGL version string: 2.1 Mesa 21.0.3

OpenGL ES profile version string: OpenGL ES 3.1 Mesa 21.0.3

Install the latest stable version of Mesa driver in Ubuntu
[Latest point release]

The [Kisak-mesa PPA](#) provides the latest point release of Mesa. You can use it by entering the following commands one by one in the terminal:

```
sudo add-apt-repository ppa:kisak/kisak-mesa  
sudo apt update  
sudo apt upgrade
```

```
ubuntu@AUDACITY:~$ sudo add-apt-repository ppa:kisak/kisak-mesa  
It's strongly recommended to remove this PPA before upgrading to  
a newer Ubuntu release or using another mesa PPA.
```

```
sudo apt install ppa-purge  
sudo ppa-purge ppa:kisak/kisak-mesa
```

Note: Using ppa-purge with Ubuntu derivatives needs to include -d <based_on_name> to work safely. For example, Linux Mint 20 is based on Ubuntu Focal, so that would make it:

```
sudo ppa-purge -d focal ppa:kisak/kisak-mesa  
ubuntu@AUDACITY:~$ sudo apt install ppa-purge  
ubuntu@AUDACITY:~$ sudo ppa-purge -d focal ppa:kisak/kisak-mesa  
...PPA purged successfully  
ubuntu@AUDACITY:~$ sudo add-apt-repository ppa:kisak/kisak-mesa  
Reading package lists... Done  
ubuntu@AUDACITY:~$ sudo apt update
```

```
...  
49 packages can be upgraded. Run 'apt list --upgradable' to see  
them.
```

```
ubuntu@AUDACITY:~$ sudo apt upgrade  
..... done  
ubuntu@AUDACITY:~$ sudo reboot
```

2022.01.12

```
ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/share/depthai_examples/launch$ ros2 launch depthai_examples stereo.launch.py
```

Rviz pops up, but this time NO point cloud??

```
...
    Stereo I NOT SUPPORTED.
    OpenGL version: 2.1 (GLSL 1.2)
```

```
$ glxinfo | grep 'version'
server glx version string: 1.4
client glx version string: 1.4
GLX version: 1.4
    Max core profile version: 0.0
    Max compat profile version: 2.1
    Max GLES1 profile version: 1.1
    Max GLES[23] profile version: 3.1
OpenGL version string: 2.1 Mesa 21.0.3
OpenGL shading language version string: 1.20
OpenGL ES profile version string: OpenGL ES 3.1 Mesa 21.0.3
OpenGL ES profile shading language version string: OpenGL ES GLSL ES 3.10
    GL_EXT_separate_shader_objects,
    GL_EXT_shader_implicit_conversions,
```

So, GLSL 3.10 is available, but ros2 launch stereo.launch.py is only making use of 1.2 perhaps causing Stereo failure?

Searching stereo.launch.py for examples of 'rviz' we find:

```
def generate_launch_description():
    default_rviz = os.path.join(get_package_share_directory('depthai_examples'),
                                'rviz', 'stereoPointCloud.rviz')

    rviz_node = launch_ros.actions.Node(
        package='rviz2', executable='rviz2', output='screen',
        arguments=['--display-config', default_rviz])

    ld = LaunchDescription()
    ...
    ld.add_action(rviz_node)
    return ld
```

Which all points to:

```
ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/share/depthai_examples/rviz$ ls
pointCloud.rviz  rgb_camera.rviz  stereoInertial.rviz
stereoPointCloud.rviz  stereo_config.rviz  stereo_nodelet.rviz
```

*Examining **stereoPointCloud.rviz** doesn't indicate any limitation on OpenGL, GLSL, Mesa, or Stereo.*

2022.01.13

Let's try this example for the FR dashboard:

```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3  
rgb_video.py
```

Nothing shows on rviz2 despite appropriate topics showing

```
ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/lib/dep  
thai_examples$ ros2 run depthai_examples stereo_node
```

Nothing shows on rviz2 despite appropriate topics showing

stop rviz2

FR dashboard Pilot view shows R, L, & Stereo cameras and allows manual switching. Stereo is very dark but can tell it's a stereo view. Extremely slow latency, several seconds from movement to visualizing change. Can't connect to webrtc. Then drops Stereo to just R or L camera. Can't drive as rover code not running.

```
ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/lib/dep  
thai_examples$ ros2 run depthai_examples rgb_node
```

rgb image shows on FR dashboard but with, as usual, horrible latency and webrtc failure.

2022.01.16

Google “oak-d imu”:

<https://forum.opencv.org/t/oak-d-info-on-imu/840/3>

>>

<https://docs.luxonis.com/en/latest/pages/faq/?highlight=%22IMU%22#can-i-use-and-imu-with-depthai>

Can I Use an IMU With DepthAI?

Yes, all of our System on Modules (OAK-SoM, OAK-SoM-IoT, and OAK-SoM-Pro) have support for the BN0086 (and BN0080/BN0085) IMU. And OAK-D, OAK-D-IoT-40, OAK-FFC-3P, OAK-D-IoT-75, OAK-D-PoE all have an integrated IMU onboard.

Not that helpful

<https://shop.luxonis.com/products/1098obcenclosure>

This DepthAI variant includes three onboard cameras and the **BN0085 IMU** and interfaces over USB3C to the host, allowing use with your (embedded) host platform of choice, including the Raspberry Pi and other popular embedded hosts.

Not that helpful

<https://www.youtube.com/watch?v=mU5P2AbRSz0>

Demo showing IMU works but no code or instruction. Useless!

Google “how to use oak-d imu”:

<https://docs.luxonis.com/en/latest/pages/faq/>

^F “IMU support here”:

Integrated IMU Support ([here](#))

<https://github.com/luxonis/depthai-hardware/issues/8>

discussed IMU hardware but no implementation

<https://medium.com/augmented-startups/opencv-ai-kit-an-introduction-to-oak-1-and-oak-d-4debb66175ca>

No implementation

It seems the IMU implementation is through the depthai application.

Google “depthai IMU”:

<https://docs.luxonis.com/projects/api/en/latest/components/nodes imu/>

Examples of functionality

[IMU Accelerometer & Gyroscope](#)

[IMU Rotation Vector](#)

I've already installed the depthai-python examples

```
ubuntu@AUDACITY:~/depthai-python/examples/IMU$ python3  
imu_gyroscope_accelerometer.py
```

```
Accelerometer timestamp: 0.000 ms  
Accelerometer [m/s^2]: x: -0.086191 y: -10.544065 z: 0.497994  
Gyroscope timestamp: 0.517 ms  
Gyroscope [rad/s]: x: -0.004261 y: 0.002131 z: 0.014914  
Accelerometer timestamp: 1.991 ms  
Accelerometer [m/s^2]: x: -0.095768 y: -10.563218 z: 0.555455  
Gyroscope timestamp: 2.735 ms  
Gyroscope [rad/s]: x: 0.004261 y: 0.000000 z: 0.003196  
Accelerometer timestamp: 4.244 ms  
Accelerometer [m/s^2]: x: -0.095768 y: -10.544065 z: 0.603339  
Gyroscope timestamp: 4.438 ms  
Gyroscope [rad/s]: x: -0.006392 y: 0.011718 z: -0.009587
```

so it works

```
ubuntu@AUDACITY:~/depthai-python/examples/IMU$ python3  
imu_rotation_vector.py
```

```
Rotation vector timestamp: 0.000 ms  
Quaternion: i: -0.002686 j: -0.689941 k: 0.002563 real: 0.723816  
Accuracy (rad): 3.141602  
Rotation vector timestamp: 4.034 ms  
Quaternion: i: -0.002686 j: -0.689941 k: 0.002563 real: 0.723816  
Accuracy (rad): 3.141602  
Rotation vector timestamp: 4.433 ms  
Quaternion: i: -0.002686 j: -0.689941 k: 0.002563 real: 0.723816  
Accuracy (rad): 3.141602  
Rotation vector timestamp: 6.929 ms  
Quaternion: i: -0.002686 j: -0.689941 k: 0.002563 real: 0.723816  
Accuracy (rad): 3.141602  
Rotation vector timestamp: 9.547 ms  
Quaternion: i: -0.002686 j: -0.689941 k: 0.002563 real: 0.723816  
Accuracy (rad): 3.141602
```

This also works

Exploring depthai-ros examples:

```
ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/lib/dep  
thai_examples$ ros2 run stereo_inertial_node  
usage: ros2 run [-h] [- -prefix PREFIX] package_name executable_name ...  
ros2 run: error: the following arguments are required: executable_name, argv
```

DESKTOP TERMINAL:

```
ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/lib/dep  
thai_examples$ ros2 run depthai_examples stereo_inertial_node  
no error message
```

SEPARATE TERMINAL

```
ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/lib/dep  
thai_examples$ ros2 topic list
```

/imu

```
/left/camera_info  
/left/image_raw  
/parameter_events  
/right/camera_info  
/right/image_raw  
/rosout  
/stereo/camera_info  
/stereo/depth
```

```
ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/lib/dep  
thai_examples$ ros2 topic echo /imu
```

```
header:  
  stamp:  
    sec: 1642360526  
    nanosec: 854938717  
  frame_id: oak_imu_frame  
orientation:  
  x: -0.01470947265625  
  y: 0.61004638671875  
  z: -0.0076904296875  
  w: 0.79217529296875  
orientation_covariance:  
  - 0.0  
  - 0.0  
  - 0.0  
  - 0.0  
  - 0.0  
  - 0.0  
  - 0.0  
  - 0.0  
  angular_velocity:  
    x: -0.009587380103766918  
    y: -0.007456851191818714  
    z: 0.0  
angular_velocity_covariance:  
  - 0.0  
  - 0.0  
  - 0.0  
  - 0.0  
  - 0.0  
  - 0.0  
linear_acceleration:  
  x: -0.26815059781074524  
  y: 8.580819129943848  
  z: 2.212242364883423  
linear_acceleration_covariance:  
  - 0.0  
  - 0.0  
  - 0.0  
  - 0.0  
  - 0.0  
  - 0.0  
---
```

So, clearly OAK-D imu can publish messages in ros2

SEPARATE TERMINAL

ubuntu@AUDACITY:~/depthai-ros_ws/install/depthai_examples/lib/dep
thai_examples\$ **rviz2 rviz2**
doesn't like default and only Fixed Frame map

ubuntu@AUDACITY:~\$ **sudo find ~/ -name *.rviz**

...
/home/ubuntu/depthai-ros_ws/install/depthai_examples/share/deptha
i_examples/rviz/**rgb_camera.rviz**

try above as config file --

still no luck

rviz2 / help =

"This is Rviz version Alpha (ROS.2.0)

Compiled against Qt version 5.12.8.

Compiled against OGRE version 1.12.1 (Rhagorthua)."

ENOUGH ON OAK-D FOR NOW

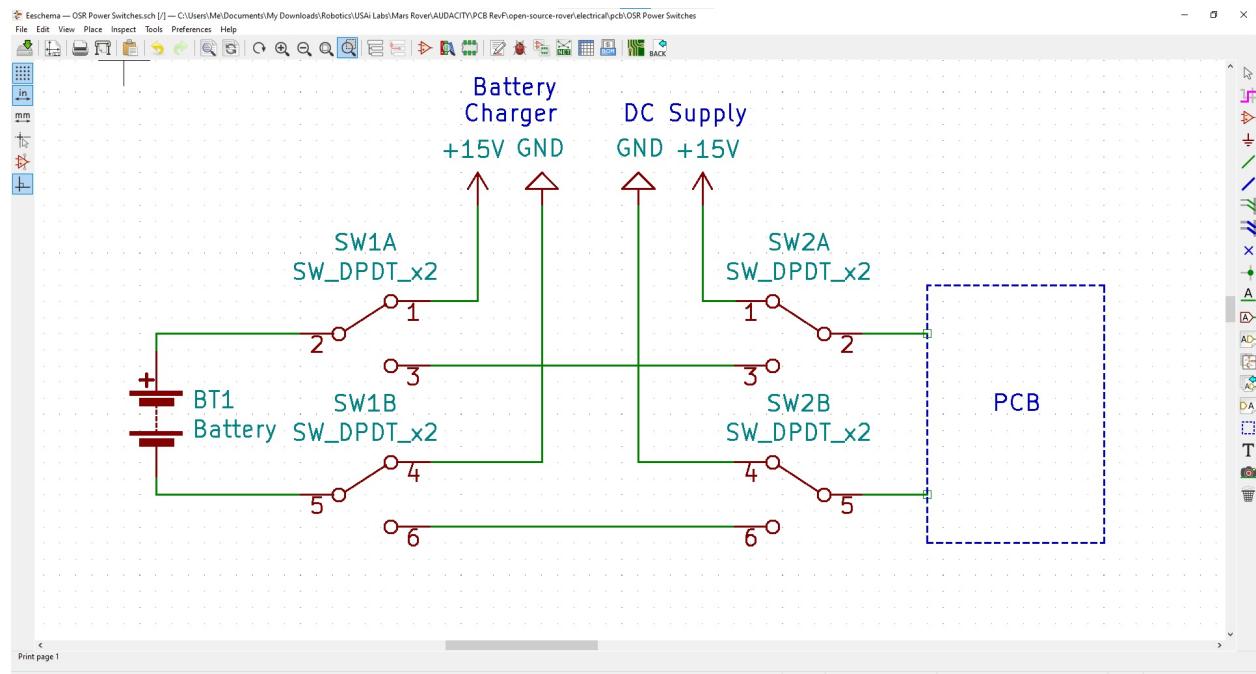
Time to focus on HCC NVIDIA robotics course.

BELOW IMPORTED "Fidelity to AUDACITY" OAK-D experience:

2022.06.10

Sent "dOAK-D Experience" subset of Fidelity to AUDACITY to Steve
"Dillo" Okay.

2022.06.12



<https://opensourcerover.slack.com/archives/C01TU8BFZD3/p1655002369529249>

OAK-D again?

Steve Okay <espressobot@gmail.com>

Re: "OAK-D Experience"

Hey James,

I read through some of your notes. In terms of the forums & user support, a lot of that happens on the Luxonis Discord server.

Here's an invite link that should let you in or at least take you to a registration page if you don't have a Discord account.

<https://discord.gg/D8Fwpfw8>

There are a bunch of different sub-channels on Raspberry Pi, Ubuntu, ROS, Jetson, Docker, etc.

It can be a little chaotic, but I've been able to get answers to questions there within a few hours to a day or so,

Hope that helps,

---Steve " 'dillo" Okay

Renewed membership in Discord & joined group.

Started w/ Ubuntu OS channel:
<https://discord.com/channels/790680891252932659/92479878352143980>
4
which pointed to install:
<https://docs.luxonis.com/projects/api/en/latest/install/>
which, in turn, pointed to ubuntu:
<https://docs.luxonis.com/projects/api/en/latest/install/#ubuntu>
[will have to go down that rabbit hole tomorrow...]

Ubuntu
sudo wget -qO- https://docs.luxonis.com/install_dependencies.sh | bash
I haven't gone this route before
ubuntu@AUDACITY:~\$ **sudo wget -qO-**
https://docs.luxonis.com/install_dependencies.sh | bash
smooth install
...
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: pip in /usr/local/lib/python3.8/dist-packages
(22.1.1)
Collecting pip
 Downloading pip-22.1.2-py3-none-any.whl (2.1 MB)
 2.1/2.1 MB 6.2 MB/s eta 0:00:00
Installing collected packages: pip
Successfully installed pip-22.1.2

Note! If opencv fails with illegal instruction after installing from PyPi,
add:

```
echo "export OPENBLAS_CORETYPE=ARMV8" >> ~/.bashrc
source ~/.bashrc
```

Looking ahead:
ubuntu@AUDACITY:~\$ **sudo find / -name depthai-python**
nothing

Test installation
We have a set of examples that should help you verify if your setup was correct.
First, clone the depthai-python repository and change directory into this repo:
git clone <https://github.com/luxonis/depthai-python.git>
cd depthai-python

```
ubuntu@AUDACITY:~$ git clone
https://github.com/luxonis/depthai-python.git
done
ubuntu@AUDACITY:~$ cd depthai-python
Using a virtual environment (or system-wide, if you prefer), run the following
to install the requirements for this example repository:
ubuntu@AUDACITY:~/depthai-python$ cd examples
```

```
ubuntu@AUDACITY:~/depthai-python/examples$ python3
install_requirements.py
several
Requirement already satisfied: ...
Installing collected packages: depthai
Successfully installed depthai-2.16.0.0
multiple examples downloaded
Now, run the rgb_preview.py script from within examples directory to make sure
everything is working:
```

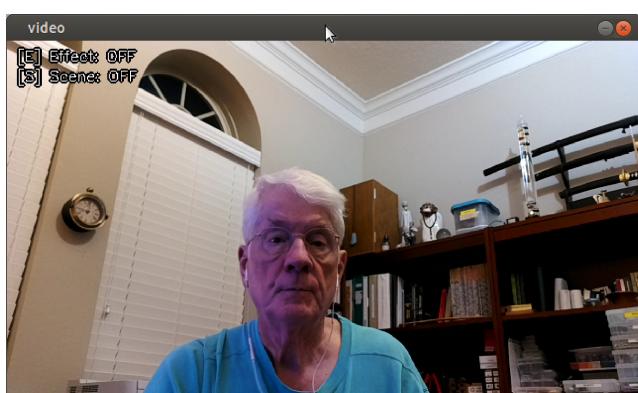
Run from desktop terminal:



```
ubuntu@AUDACITY:~/depthai-python/examples$ python3 ColorCamera/rgb_preview.py
So far, so good!
```

Run Other Examples

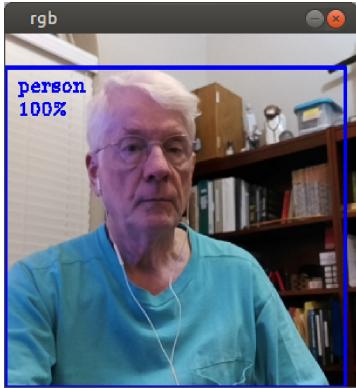
After you have run this example, you can run other examples to learn about DepthAI possibilities.



```
ubuntu@AUDACITY:~/depthai-python/examples$ python3
ColorCamera/rgb_scene.py
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3
rgb_camera_control.py
Shows tightly cropped square &
rectangular scenes.
Below says "Sending new crop -
x: 0 y: 0"
Not sure what to do with that.
```



```
ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera$ python3 rgb_video.py
Shows full-screen video scene
with about 2sec latency:
```

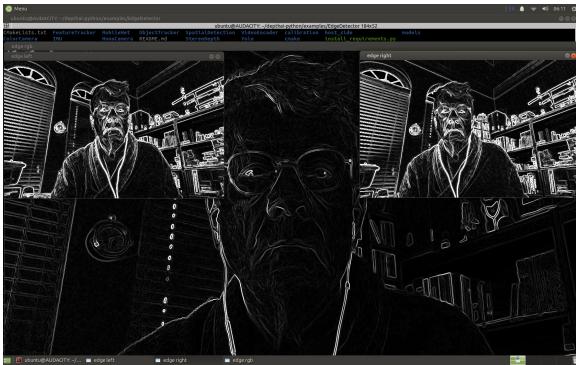


ubuntu@AUDACITY:~/depthai-python/examples/ColorCamera\$ **python3 autoexposure_roi.py**

*It's good at recognizing person.
Terrible at recognizing anything else!*

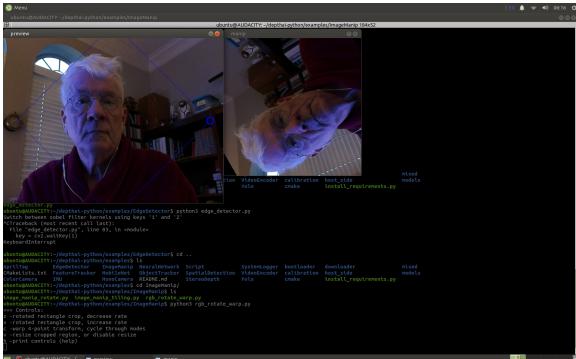


ubuntu@AUDACITY:~/depthai-python/examples/AprilTag\$ **python3 apriltag.py or apriltag_rgb.py**
same result?



2022.06.14

ubuntu@AUDACITY:~/depthai-python/examples/EdgeDetector\$ **python3 edge_detector.py**



ubuntu@AUDACITY:~/depthai-python/examples/ImageManip\$ **python3 rgb_rotate_warp.py**

```
buntu@AUDACITY:~/depthai-python/examples/ImageManip$ python3 image_manip_rotate.py
[ 0%] [ 100%]
[ 0%] [ 100%]
```

buntu@AUDACITY:~/depthai-python/examples/ImageManip\$ **python3 image_manip_rotate.py**

```
buntu@AUDACITY:~/depthai-python/examples/ImageManip$ python3 image_manip_tiling.py
[ 0%] [ 100%]
[ 0%] [ 100%]
```

buntu@AUDACITY:~/depthai-python/examples/ImageManip\$ **python3 image_manip_tiling.py**

```
buntu@AUDACITY:~/depthai-python/examples/NeuralNetwork$ python3 detection_parser.py
[ 0%] [ 100%]
[ 0%] [ 100%]
```

buntu@AUDACITY:~/depthai-python/examples/NeuralNetwork\$ **python3 detection_parser.py**

Recognizes person and bottle, but not tennis ball. Thinks every rectangle is a terminal.

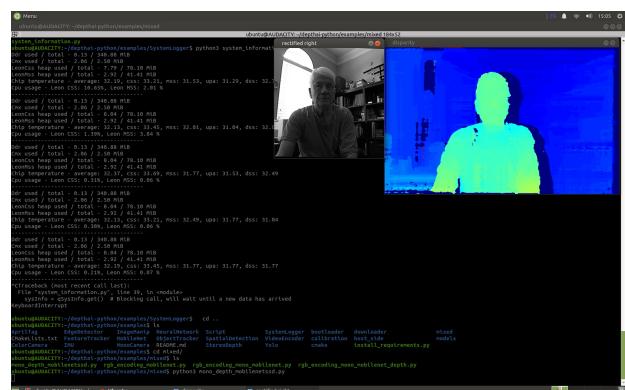
```
buntu@AUDACITY:~/depthai-python/examples/NeuralNetwork$ python3 concat_multi_input.py
[ 0%] [ 100%]
[ 0%] [ 100%]
```

buntu@AUDACITY:~/depthai-python/examples/NeuralNetwork\$ **python3 concat_multi_input.py**

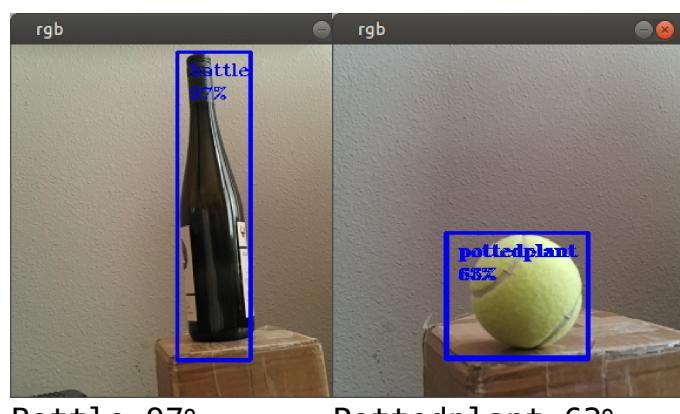
```
ubuntu@AUDACITY:~/depthai-python/examples/Script$ ls -w 1
script_camera_control.py          script_forward_frames.py
script_get_ip.py                  script_http_client.py
script_http_server.py            script_json_communication.py
script_mjpeg_server.py           script_nnadata_example.py
```

These don't seem to do anything at first try

```
ubuntu@AUDACITY:~/depthai-python/examples/SystemLogger$ python3
system_information.py
Ddr used / total - 0.13 / 340.88 MiB
Cmx used / total - 2.06 / 2.50 MiB
LeonCss heap used / total - 7.79 / 78.10 MiB
LeonMss heap used / total - 2.92 / 41.41 MiB
Chip temperature - average: 33.86, css: 35.11, mss: 33.69, upa: 33.45, dss: 33.21
Cpu usage - Leon CSS: 10.52%, Leon MSS: 1.98 %
... repeats
```

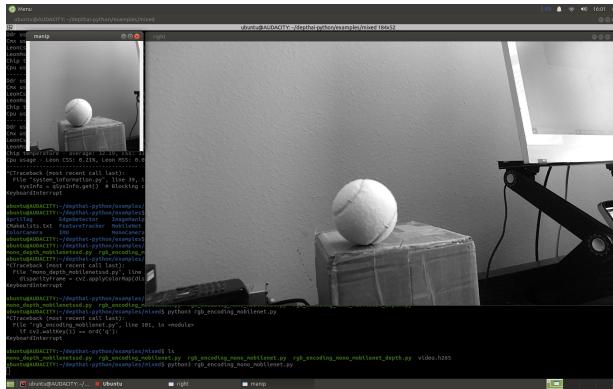


```
ubuntu@AUDACITY:~/depthai-python
/examples/mixed$ python3
mono_depth_mobilenetssd.py
```

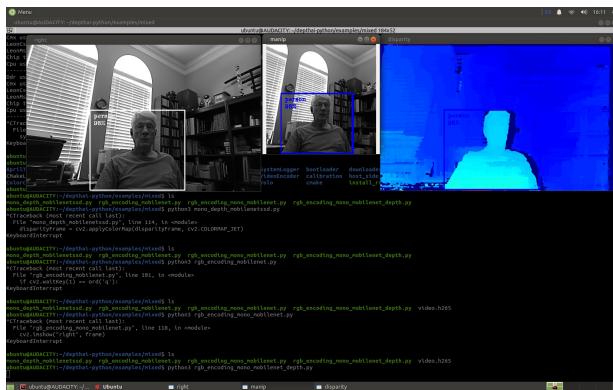


```
ubuntu@AUDACITY:~/depthai-py
hon/examples/mixed$ python3
rgb_encoding_mobilenet.py
```

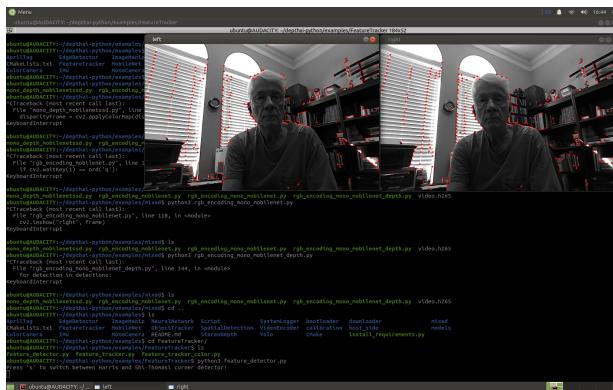
*Sometimes it gets it,
sometimes not!*



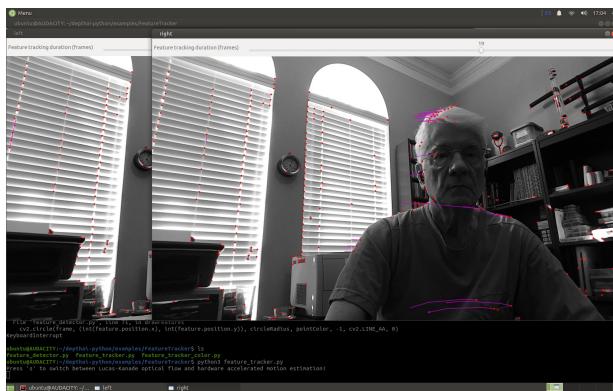
```
ubuntu@AUDACITY:~/depthai-python
/examples/mixed$ python3
rgb_encoding_mono_mobilenet.py
```



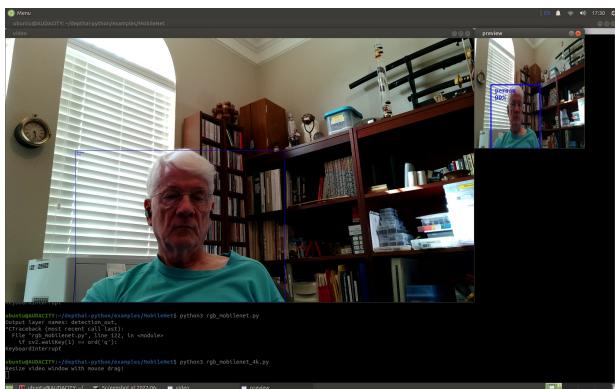
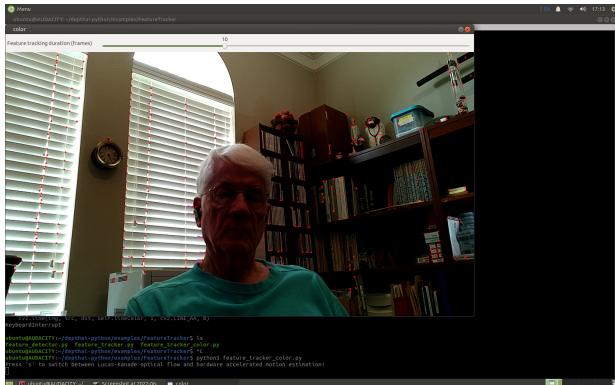
```
ubuntu@AUDACITY:~/depthai-python
/examples/mixed$ python3
rgb_encoding_mono_mobilenet_dept.py
```



```
ubuntu@AUDACITY:~/depthai-python
/examples/FeatureTracker$ python3 feature_detector.py
```



```
ubuntu@AUDACITY:~/depthai-python
/examples/FeatureTracker$ python3 feature_tracker.py
```



ubuntu@AUDACITY:~/depthai-python/examples/FeatureTracker\$
python3 feature_tracker_color.py

ubuntu@AUDACITY:~/depthai-python/examples/MobileNet\$
python3 mono_mobilenet.py

ubuntu@AUDACITY:~/depthai-python/examples/MobileNet\$
python3 rgb_mobilenet.py

ubuntu@AUDACITY:~/depthai-python/examples/MobileNet\$
python3 rgb_mobilenet_4k.py

ubuntu@AUDACITY:~/depthai-python/examples/MobileNet\$
python3 video_mobilenet.py
identifies people in video of hallway

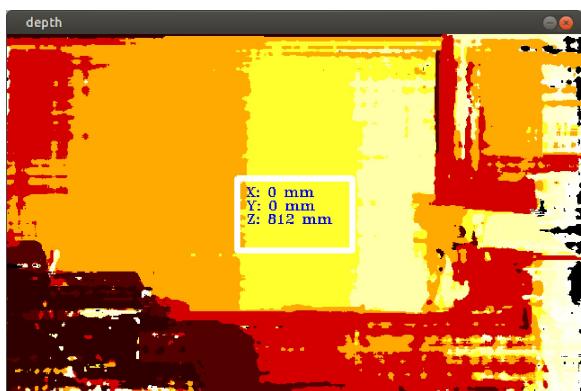


```
ubuntu@AUDACITY:~/depthai-python/examples/0bjectTracker$ python3 object_tracker.py
```

identifies and numbers people appearing together in video of hallway as above but doesn't remember past individuals.



```
ubuntu@AUDACITY:~/depthai-python/examples/0bjectTracker$ python3 spatial_object_tracker.py
```



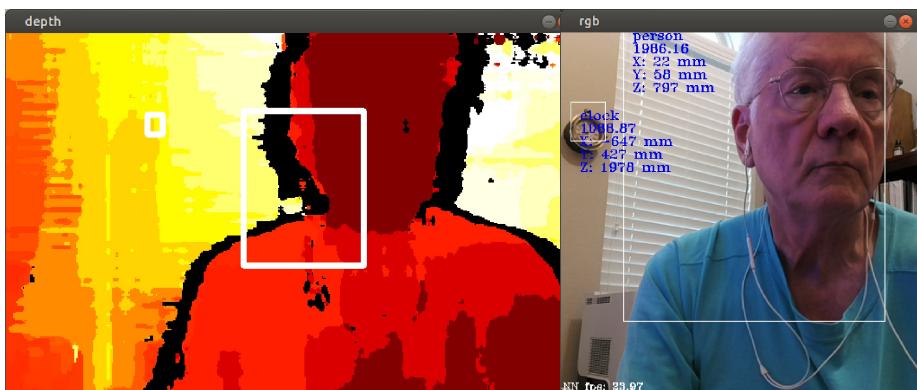
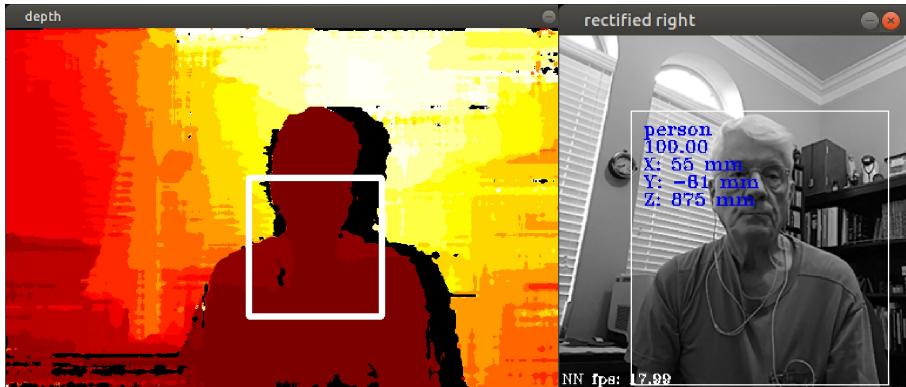
```
ubuntu@AUDACITY:~/depthai-python/examples/SpatialDetection$ python3 spatial_location_calculator.py
```

Provides distance of object at center of screen



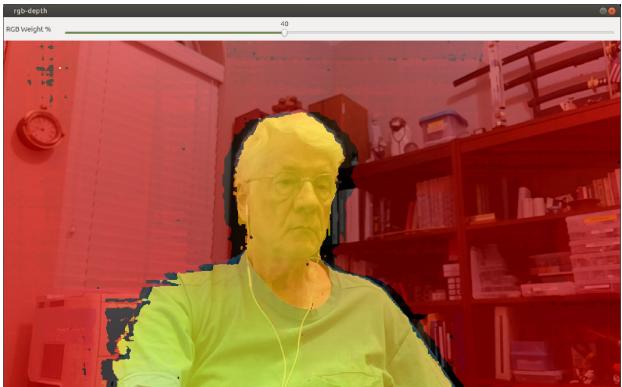
```
ubuntu@AUDACITY:~/depthai-python/examples/SpatialDetection$ python3 spatial_mobilenet.py
```

Provides x,y,z of identified object



```
ubuntu@AUDACITY:~/depthai-python/examples/VideoEncoder$ unable to view results from this directory
ubuntu@AUDACITY:~/depthai-python/examples/calibration$ going to pass on this directory
ubuntu@AUDACITY:~/depthai-python/examples/host_side$ going to pass on this directory
ubuntu@AUDACITY:~/depthai-python/examples/models$ going to pass on this directory
```

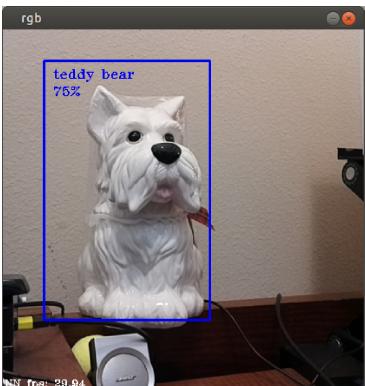
```
ubuntu@AUDACITY:~/depthai-python/examples/IMU$ python3
imu_gyroscope_accelerometer.py
Accelerometer timestamp: 0.000 ms
Accelerometer [m/s^2]: x: -8.188169 y: -0.114922 z: 3.916914
Gyroscope timestamp: 0.996 ms
Gyroscope [rad/s]: x: 0.011718 y: 0.001065 z: 0.014914
ubuntu@AUDACITY:~/depthai-python/examples/IMU$ python3
imu_rotation_vector.py
Rotation vector timestamp: 0.000 ms
Quaternion: i: -0.004761 j: 0.532776 k: -0.002991 real: 0.846252
Accuracy (rad): 3.141602
```



```
ubuntu@AUDACITY:~/depthai-python  
/examples/StereoDepth$ python3  
rgb_depth_aligned.py
```



```
ubuntu@AUDACITY:~/depthai-python  
/examples/StereoDepth$  
python3  
rgb_depth_confidence_aligned.py
```



```
ubuntu@AUDACITY:~/depthai-python/examples/Yolo$  
python3 tiny_yolo.py  
No, it's not a teddy bear
```

With few exceptions, that's the end of the examples.

2022.06.17

You can also proceed to:

Our tutorials, starting with a Hello World tutorial explaining the API usage step by step ([here](#))

https://docs.luxonis.com/projects/api/en/latest/tutorials/hello_world/#hello-world

Our experiments, containing implementations of various user use cases on DepthAI ([here](#))

<https://github.com/luxonis/depthai-experiments>

2022.06.20

Finding very little about OAK-D or Luxonis and ROS2. What examples I find use cmake or catkin make and not the colcon build expected of ROS2 which makes me think they are not fully ported. The one useful reference I found on the Luxonis Discord is to [Linorobot2](#) which I heard about from Homebrew Robotics:

<https://github.com/linorobot>

The trick will be converting the Linorobot2 drive commands to the OSR 6 wheel, 4 steering configuration of the OSR. The package purports to be plug and #uncomment config with various sensors including ydlidar and Intel RealSense D435 depthcamera (supposedly close enough to my D455?). It's recommending upgrading Ubuntu 20.04 from Focal Fossa to 22.04 **Jammy Jellyfish** and ROS2 Foxy Fitzroy to **Humble Hawksbill**.

First flash of JJ failed. Reformatted with overwrite.

Steve Okay <espressobot@gmail.com>

Re: "OAK-D Experience"

Dillo,

Followed the Luxonis Discord link to numerous examples and played with them. They performed poorly compared to the NVIDIA AI course examples but then...!

Then, going back to Discord to find ROS2 examples or code, I found very little.

What I did find referenced cmake or catkin make instead of colcon build as I would have expected for ROS2 which made me think they weren't fully ported.

Do you have any other experience?

The one reference at made sense was to y'all's linorobot2! It promises input from ydlidar (which I have) or RealSense D435 (and hopefully my D455).

The trick there will be to convert the linorobot2 drive commands to the 6-wheel drive, 4 wheel steering of the Open Source Rover.

Figured I'd just load Linorobot2 onto the Rover and see what kind of topics get published and any response on the testbed then worry about the conversion.

Jim

2022.06.27

ubuntu@AUDACITY:~\$ ros2 launch depthai_examples stereo.launch.py

ubuntu@AUDACITY:~\$ ros2 launch osrBringup osr_launch.py

Shows in FR dashboard but latency terrible & connection intermittent.

Open CV OAK-D Camera Experience

James H Phelan MD

2021.11.20 - present

2023.03.03

Informed by Ross Lunan of HBRC that latest code for OAK-D is "relatively straightforward" and much easier than previous nightmare. Here goes....

<https://github.com/luxonis/depthai-ros>

Install from ros binaries

Add USB rules to your system

```
ubuntu@AUDACITY:~$ echo 'SUBSYSTEM=="usb",
ATTRS{idVendor}=="03e7", MODE=="0666"' | sudo tee
/etc/udev/rules.d/80-movidius.rules
```

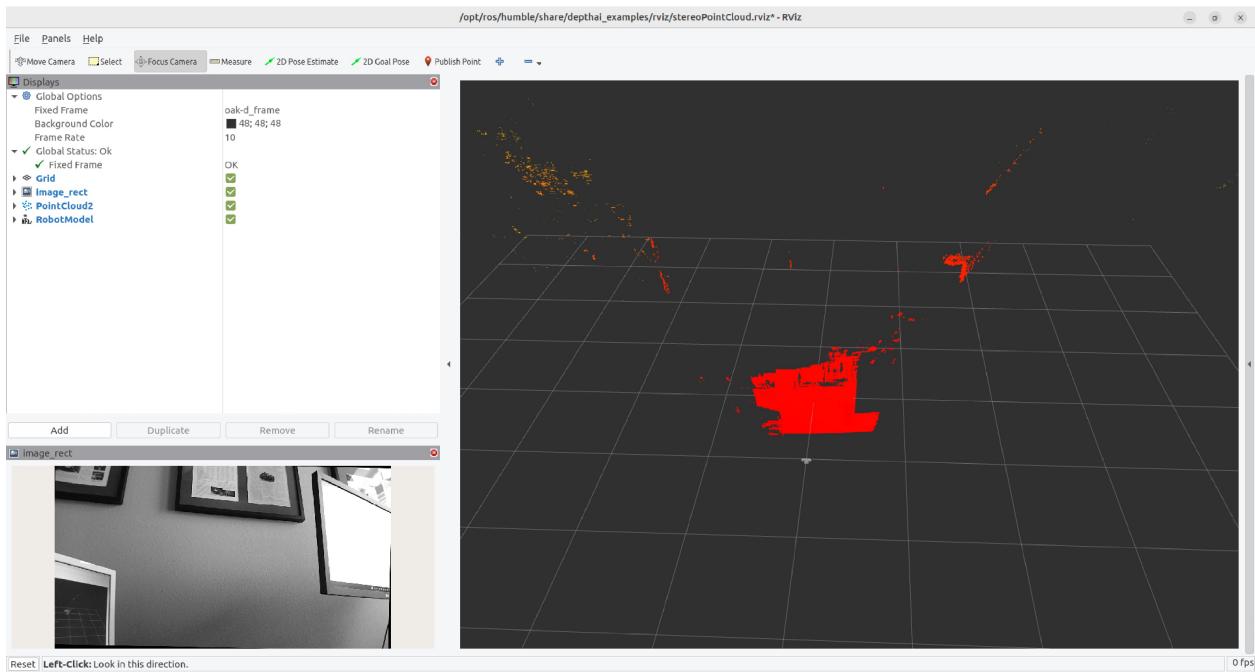
```
ubuntu@AUDACITY:~$ sudo udevadm control --reload-rules && sudo
udevadm trigger
```

Install depthai-ros. (Available for Noetic, foxy, galactic and humble) `sudo apt install ros-<distro>-depthai-ros`
=> `sudo apt install ros-humble-depthai-ros`
ubuntu@AUDACITY:~\$ `sudo apt install ros-humble-depthai-ros`
success.

Bit of trouble finding the programs to launch as are in several files:

```
ubuntu@AUDACITY:/opt/ros/humble/share$ ls depth* -w 1
depth_image_proc:
launch
    convert_metric.launch.py
    crop_foremost.launch.py
    disparity.launch.py
    point_cloud_xyz.launch.py
    point_cloud_xyz_radial.launch.py
    point_cloud_xyzi.launch.py
    point_cloud_xyzi_radial.launch.py
    point_cloud_xyzrgb.launch.py
    point_cloud_xyzrgb_radial.launch.py
    register.launch.py
rviz
[ERROR] [launch]: Caught exception in launch
(see debug for traceback): Caught exception
when trying to load file of format [py]:
Node.__init__() missing 1 required
keyword-only argument: 'executable'
depthai:
depthai-ros:
depthai_bridge:
launch
    urdf.launch.py
    doesn't do anything
rviz
urdf
depthai_examples:
launch
    mobile_publisher.launch.py
    rmb_publisher.launch.py
    rgbd_stereo_node.launch.py
    stereo.launch.py
    stereo_inertial_node.launch.py
    yolov4_publisher.launch.py
params
resources
rviz
depthai_ros_driver:
launch
    calibration.launch.py
    camera.launch.py
    example_marker_publish.launch.py
    example_multicam.launch.py
    example_segmentation.launch.py
    pointcloud.launch.py
    rgbd_pcl.launch.py
    rtabmap.launch.py
depthai_ros_msgs:
depthimage_to_laserscan:
launch
    depthimage_to_laserscan-launch.py
    depthimage_to_laserscan_composed-
    launch.py
```

```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_examples/launch$ ros2 launch depthai_examples stereo.launch.py
```



```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_bridge/launch$ ros2 launch depthai_examples mobile_publisher.launch.py
```

```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_examples/launch$ ros2 topic echo /color/mobilenet_detections
```

```
bbox:  
  center:  
    position:  
      x: 194.0  
      y: 104.5  
      theta: 0.0  
    size_x: 48.0  
    size_y: 67.0  
  id: '20'
```

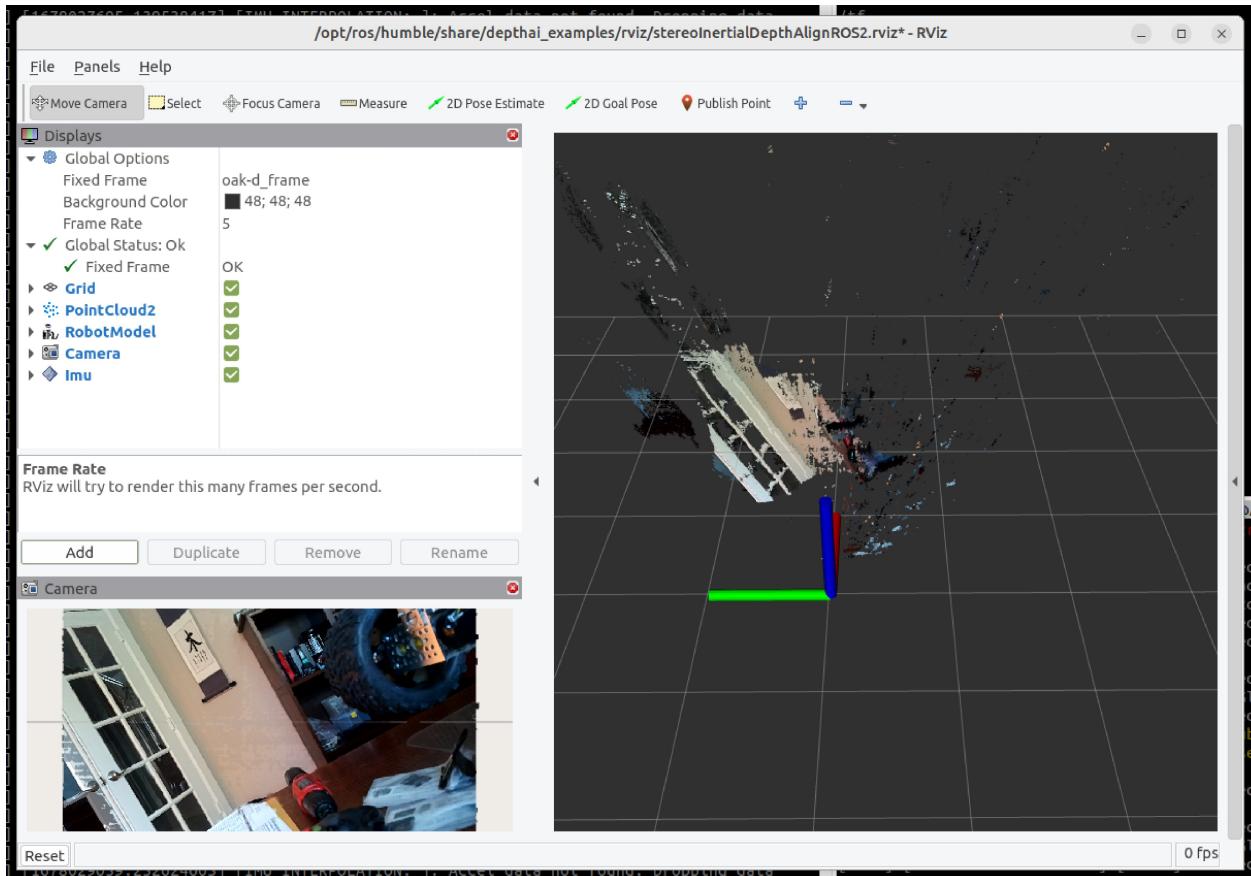
Can't find object detection dictionary for what "id: '20'" is.

```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_bridge/launch$ ros2
topic echo /imu
A message was lost!!!
    total count change:5
    total count: 5---
header:
  stamp:
    sec: 1677956683
    nanosec: 551117840
  frame_id: oak_imu_frame
orientation:
  x: 0.0
  y: 0.0
  z: 0.0
  w: 1.0
orientation_covariance:
- -1.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
angular_velocity:
  x: -0.0021987766958773136
  y: -0.004755327012389898
  z: 0.0012271947925910354
angular_velocity_covariance:
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
linear_acceleration:
  x: -8.858546257019043
  y: 0.0
  z: -0.07661445438861847
linear_acceleration_covariance:
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
```

```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_bridge/launch$ ros2
launch depthai_examples yolov4_publisher.launch.py

ubuntu@AUDACITY:/opt/ros/humble/share/depthai_bridge/launch$ ros2
topic echo /color/yolov4_Spatial_detections
header:
  stamp:
    sec: 1677958460
    nanosec: 479687904
  frame_id: oak_rgb_camera_optical_frame
detections:
- results:
  - class_id: '0'
    score: 0.0
  bbox:
    center:
      position:
        x: 174.0
        y: 293.5
        theta: 0.0
      size_x: 328.0
      size_y: 0.0
    position:
      x: -0.08247452974319458
      y: -0.20572298765182495
      z: 1.299397587776184
    is_tracking: false
    tracking_id: ''
- results:
  - class_id: '73'           [again, no info on class_id dictionary]
    score: 0.0
  bbox:
    center:
      position:
        x: 395.0
        y: 259.0
        theta: 0.0
      size_x: 34.0
      size_y: 0.0
    position:
      x: 0.8238232135772705
      y: -0.22883976995944977
      z: 2.37689471244812
    is_tracking: false
    tracking_id: ''
---
```

```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_bridge/launch$ ros2
launch depthai_examples stereo_inertial_node.launch.py
'ros2 topic echo /imu' produces output that changes w/ camera
movement. Rviz2 tho displaying 'imu' and shows axis doesn't
change w/ moving camera. Suspect it's because 'Fixed Frame' is
that of camera so imu never changes relative to it. 'Map' isn't
allowed as 'Fixed Frame'.
```



```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_bridge/launch$ ros2
launch depthai_ros_driver calibration.launch.py
Brings up window with sliders for camera type 0 pinhole - 1
fisheye and scale 0-100. Doesn't have any effect on image.
```

```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_bridge/launch$ ros2
launch depthai_ros_driver camera.launch.py
```

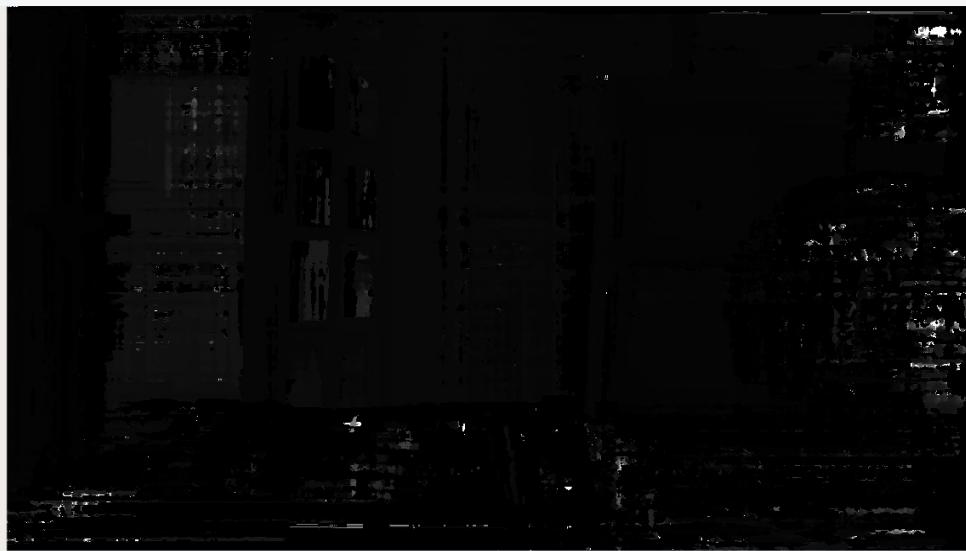
```
[component_container-2] [ERROR] [1677966429.512627212] [oak_container]:
Component constructor threw an exception: [json.exception.parse_error.101]
parse error at line 1, column 1: syntax error while parsing value - unexpected
end of input; expected '[', '{', or a literal
```

```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_ros_driver/launch$  
ros2 launch depthai_ros_driver example_marker_publish.launch.py  
Same error as above
```

```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_ros_driver/launch$  
ros2 launch depthai_ros_driver example_multicam.launch.py  
...  
[component_container-2] [ERROR] [1677966877.843540681] [oak_d_w]: Unable to  
connect to the device, check if parameters match with given info.  
Only 1 camera is attached
```

```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_ros_driver/launch$  
ros2 launch depthai_ros_driver example_segmentation.launch.py  
/nn/image_raw/image show undiscernible blobs of color depending  
on distance
```

```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_ros_driver/launch$  
ros2 launch depthai_ros_driver pointcloud.launch.py  
Rviz2 topic:/stereo/converted_depth/image:
```



```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_ros_driver/launch$  
ros2 launch depthai_ros_driver rgbd_pcl.launch.py  
Nothing interesting
```

```
ubuntu@AUDACITY:/opt/ros/humble/share/depthai_ros_driver/launch$  
ros2 launch depthai_ros_driver rtabmap.launch.py  
[ERROR] [launch]: Caught exception in launch (see debug for traceback):  
"package 'rtabmap_ros' not found, searching: ['/opt/ros/humble']"
```