

## 7.TensorRT USB camera real-time image recognition tutorial

### 1.Preparation

Before we start this step, we need to make sure that we have completed all the steps in Tutorials 4 and 5 and can test simple examples.

It is best to unplug the on-board camera, plug in the USB camera then open the power.

### 2.Check camera service

If you are in **jeston-inference** directory, you can input the following command:

**ls /dev**

```

initctl          nvhost-gpu      rfkill           tty43            vcs1
input            nvhost-isp      rtc              tty44            vcs2
keychord         nvhost-isp.1    rtc0             tty45            vcs3
kmem             nvhost-msenc     rtc1             tty46            vcs4
kmsg             nvhost-nvdec     shm              tty47            vcs5
log              nvhost-nvjpg     snd              tty48            vcs6
loop0            nvhost-prof-gpu stderr           tty49            vcsa
loop1            nvhost-sched-gpu stdin            tty5             vcsa1
loop2            nvhost-tsec      stdout           tty50            vcsa2
loop3            nvhost-tsecb     tegra_camera_ctrl tty51            vcsa3
loop4            nvhost-tsg-gpu   tegra-crypto     tty52            vcsa4
loop5            nvhost-vi        tegra_dc_0        tty53            vcsa5
loop6            nvhost-vic       tegra_dc_1        tty54            vcsa6
loop7            nvmap            tegra_dc_ctrl     tty55            vfio
loop-control     port             tegra_mipi_cal    tty56            vchi
mapper           ppp              tty               tty57            video0
max_cpu_power    psaux            tty0              tty58            watchdog
max_gpu_power    ptmx             tty1              tty59            watchdog0
max_online_cpus  pts              tty10             tty6             zero
  
```

We need to determine if there is video0 in here, it is possible to have multiple cameras. They have different numbers behind.

### 3.Parameter introduction

Similar to the previous imagenet-console example, the camera application is built in this **/aarch64/bin** directory. They run on a live camera stream with OpenGL rendering and accept 4 optional command line arguments:

- -- network flag sets the classification model (default is GoogleNet)
- See Download other classification models for available networks.
- -- camera flag sets the camera device to be used
- Use MIPI CSI cameras by specifying the sensor index (0 or 1 etc.)
- The V4L2 USB camera is used by specifying its **/dev/video** node (**/dev/video0**, **/dev/video1**, etc.).
- Default is to use MIPI CSI sensor 0 (--camera = 0)
- -- width and -- height flags set the camera resolution (default is 1280x720)
- Resolution should be set to a format supported by the camera.
- Query the available formats using:  

```
sudo apt-get install v4l-utils
```

```
v4l2-ctl --list-formats-ext
```

You can combine these flags as needed, and there are other command line parameters available for loading custom models. Launch the application with the --help flag for more information, or see the Examples readme.

Here are some typical scenarios for start programs:

#### C ++

```
$ ./imagenet-camera # Use GoogleNet, default MIPI CSI camera (1280 × 720)
$ ./imagenet-camera - - network = RESNET-18 # Use RESNET-18, default MIPI CSI
camera (1280 × 720)
$ ./imagenet-camera - - camera = /dev /video0 # Use GoogleNet, V4L2 camera /
dev / video0 (1280x720)
$ ./imagenet-camera - - width = 640 - - height = 480 # Use GoogleNet, default is
MIPI CSI camera (640x480)
```

#### Python

```
$ ./imagenet-camera.py # Using GoogleNet, the default MIPI CSI camera
(1280x720)
$ ./imagenet-camera.py - - network = RESNET-18 # Use RESNET-18, the default
MIPI CSI camera (1280x720)
$ ./ imagenet-camera.py - - camera = /dev /video0 # Use GoogleNet, V4L2 camera
/dev/video0 (1280x720)
$ ./imagenet-camera.py - - width = 640 - - height = 480 # Use GoogleNet, default is
MIPI CSI camera (640x480)
```

### 4.Execute image recognition command

At this point we are better able to execute by the remote desktop, otherwise you may not see the camera interface, or connect by VNC remote desktop.

```
nano@nano-desktop:~/jetson-inference$ cd build/aarch64/bin/
nano@nano-desktop:~/jetson-inference/build/aarch64/bin$ ls
airplane_0.jpg      drone_0255.png      homography-console  red_apple_0.jpg
banana_0.jpg        drone_0427.png      imagenet-camera     segnet-batch.sh
bird_0.jpg          drone_0428.png      imagenet-console    segnet-camera
black_bear.jpg      drone_0435.png      networks            segnet-console
bottle_0.jpg        drone_0436.png      orange_0.jpg        superres-console
brown_bear.jpg      fontmapA.png        orange_1.jpg        trt-bench
cat_0.jpg           fontmapB.png        output_0.jpg        trt-console
detectnet-camera    gl-display-test     peds-001.jpg        v4l2-console
detectnet-console   granny_smith_0.jpg  peds-001.jpg        v4l2-display
dog_0.jpg           granny_smith_1.jpg  peds-003.jpg
dog_1.jpg           gst-camera          peds-004.jpg
dog_2.jpg           homography-camera   polar_bear.jpg
nano@nano-desktop:~/jetson-inference/build/aarch64/bin$
```

Enter the bin directory:

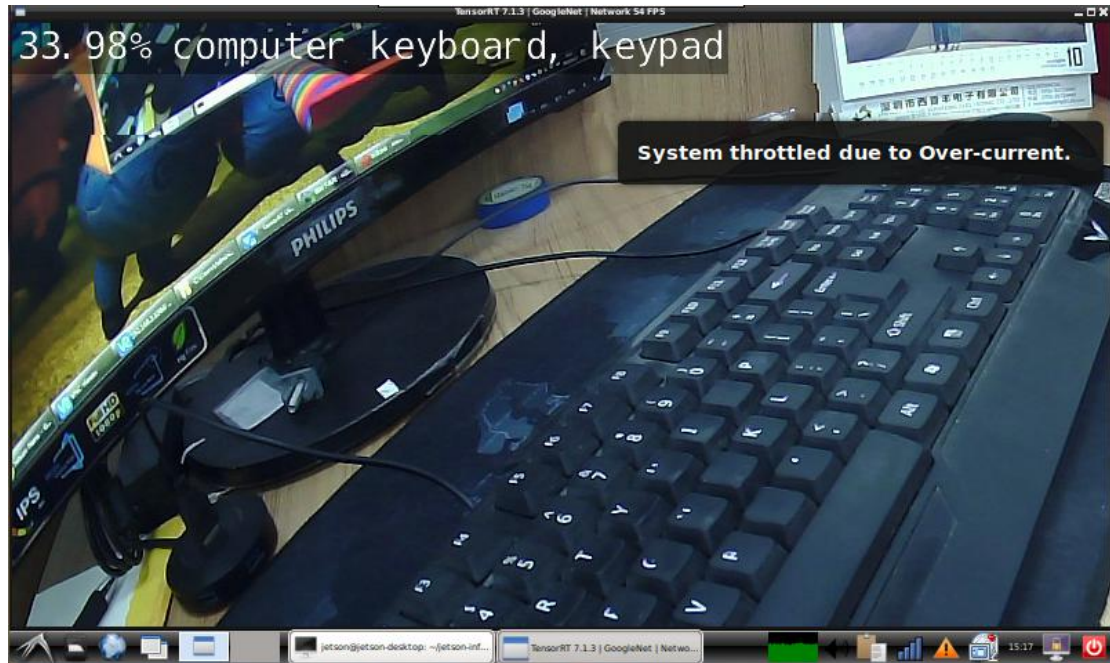
The live image recognition demo is located in **/aarch64/bin** and call **imagenet-camera**. It runs on the live camera stream and loads googlenet or alexnet using TensorRT based on user parameters.

```
$ ./imagenet-camera - - network=googlenet - - camera=/dev/video1 #
Run with googlenet USB camera
$ ./imagenet-camera - - network=alexnet - - camera=/dev/video1 #
Run with alexnet
```

Frames per second (FPS), the classification object name from the video and the

confidence of the classification object are printed to the OpenGL window title bar. By default, the application can recognize up to 1000 different types of objects, name mappings for 1000 types of objects, which can be found under repo:

[data/networks/ilsrvrc12\\_synset\\_words.txt](#)



When an object is recognized, the English name of the object is displayed on the interface, and the percentage is the matching percentage.