

# Installing DL Streamer on Windows through Docker and running the Face Detection and Classification model

This installation guide provides instructions on how to begin working with the open source version of GStreamer Video Analytics (GVA) plugin or DL Streamer, which is a part of the Intel® Distribution of OpenVINO™ Toolkit.

One can build pipelines using various and more than one GStreamer elements. There are options to run the inference operations such as detection, classification, tracking. Also, there are options for the displaying the results using various output inference such as either storing the results in a file or publishing the results through message brokers such as MQTT or Kafka.

Note: DL Streamer is not directly supported on Windows. DL Streamer can be run using Docker for Windows.

Following are the steps to run DL Streamer on Windows:

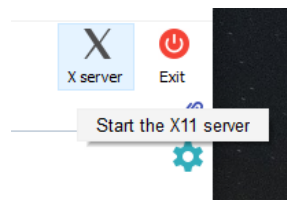
## Step 1: Install Docker

Download and Install Docker for Windows using the instructions provided at <https://docs.docker.com/docker-for-windows/install/>

## Step 2: Install Moba XTerm

This is required to display the output of the DL Streamer. Install the MobaXterm Home Edition (Installer Edition) from <https://mobaxterm.mobatek.net/download-home-edition.html>

Start the XServer:



Step 3: Start docker in the Windows PowerShell and pull the openvino image from dockerhub using the following command:

```
Cmd 1: docker pull openvino/ubuntu18_data_dev
```

```

Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\ShradhaH> docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
app                 latest             d0d48cf07d24       2 days ago         1.44GB
streamlit-docker-master_streamlit latest             6b1785c5dc4d       3 days ago         1.31GB
ubuntu             latest             adafe2e596e        6 days ago         73.9MB
python             3.7               014d597185ae       12 days ago        919MB
marcskovmadsen/awesome-streamlit latest             cb4db907fee6       4 weeks ago        2.22GB
eclipse-mosquitto  latest            e19bf2a13315       5 weeks ago        6.77MB
openvino/ubuntu18_data_dev latest             f076a894a6f        6 weeks ago        6.04GB
ruimarinho/mosquitto latest             740139b5894b       2 years ago        4.74MB
PS C:\Users\ShradhaH>

```

**Step 4:** Run the openvino image in docker using following command:

**Cmd 2:** `docker run -it --rm -e https_proxy -e http_proxy --network=host --entrypoint /bin/bash --name dstreamer_test --privileged --user root openvino/ubuntu18_data_dev`

```

root@default:/opt/intel/openvino_2020.3.194
Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\ShradhaH> docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
app                 latest             d0d48cf07d24       2 days ago         1.44GB
streamlit-docker-master_streamlit latest             6b1785c5dc4d       3 days ago         1.31GB
ubuntu             latest             adafe2e596e        6 days ago         73.9MB
python             3.7               014d597185ae       12 days ago        919MB
marcskovmadsen/awesome-streamlit latest             cb4db907fee6       4 weeks ago        2.22GB
eclipse-mosquitto  latest            e19bf2a13315       5 weeks ago        6.77MB
openvino/ubuntu18_data_dev latest             f076a894a6f        6 weeks ago        6.04GB
ruimarinho/mosquitto latest             740139b5894b       2 years ago        4.74MB
PS C:\Users\ShradhaH> docker run -it --rm -e https_proxy -e http_proxy --network=host --entrypoint /bin/bash --name dstreamer_test --privileged --user root openvino/ubuntu18_data_dev
[setupvars.sh] OpenVINO environment initialized
root@default:/opt/intel/openvino_2020.3.194#

```

**Step 5:** Then set the display settings. We export the settings. We do this using the following commands:

**Cmd 3:** `export DISPLAY=192.168.0.49:0.0`

**Cmd 4:** `export no_proxy=192.168.0.49`

```

root@default:/opt/intel/openvino_2020.3.194
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

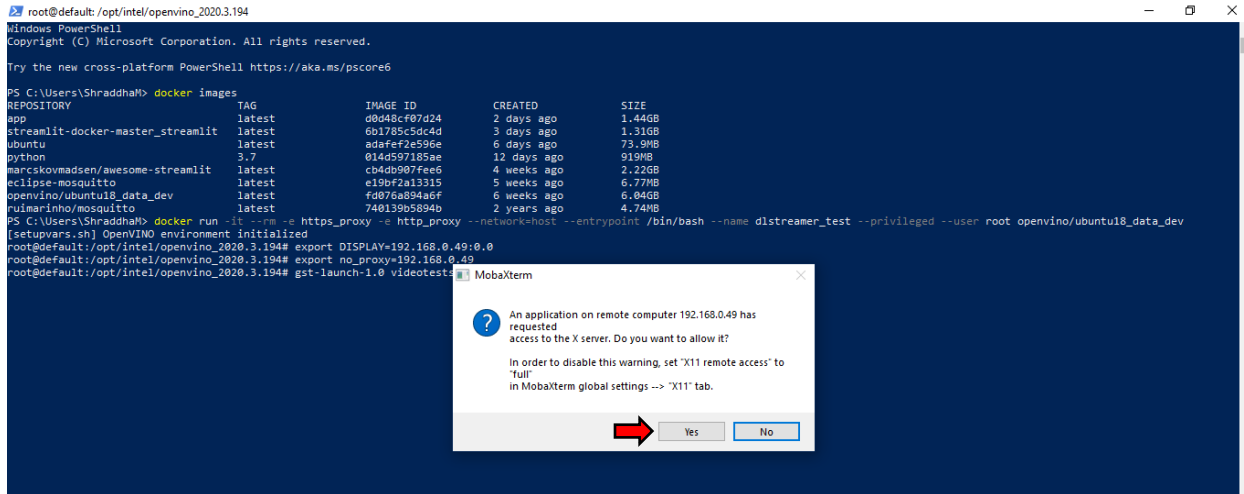
Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\ShradhaH> docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
app                 latest             d0d48cf07d24       2 days ago         1.44GB
streamlit-docker-master_streamlit latest             6b1785c5dc4d       3 days ago         1.31GB
ubuntu             latest             adafe2e596e        6 days ago         73.9MB
python             3.7               014d597185ae       12 days ago        919MB
marcskovmadsen/awesome-streamlit latest             cb4db907fee6       4 weeks ago        2.22GB
eclipse-mosquitto  latest            e19bf2a13315       5 weeks ago        6.77MB
openvino/ubuntu18_data_dev latest             f076a894a6f        6 weeks ago        6.04GB
ruimarinho/mosquitto latest             740139b5894b       2 years ago        4.74MB
PS C:\Users\ShradhaH> docker run -it --rm -e https_proxy -e http_proxy --network=host --entrypoint /bin/bash --name dstreamer_test --privileged --user root openvino/ubuntu18_data_dev
[setupvars.sh] OpenVINO environment initialized
root@default:/opt/intel/openvino_2020.3.194# export DISPLAY=192.168.0.49:0.0
root@default:/opt/intel/openvino_2020.3.194# export no_proxy=192.168.0.49
root@default:/opt/intel/openvino_2020.3.194#

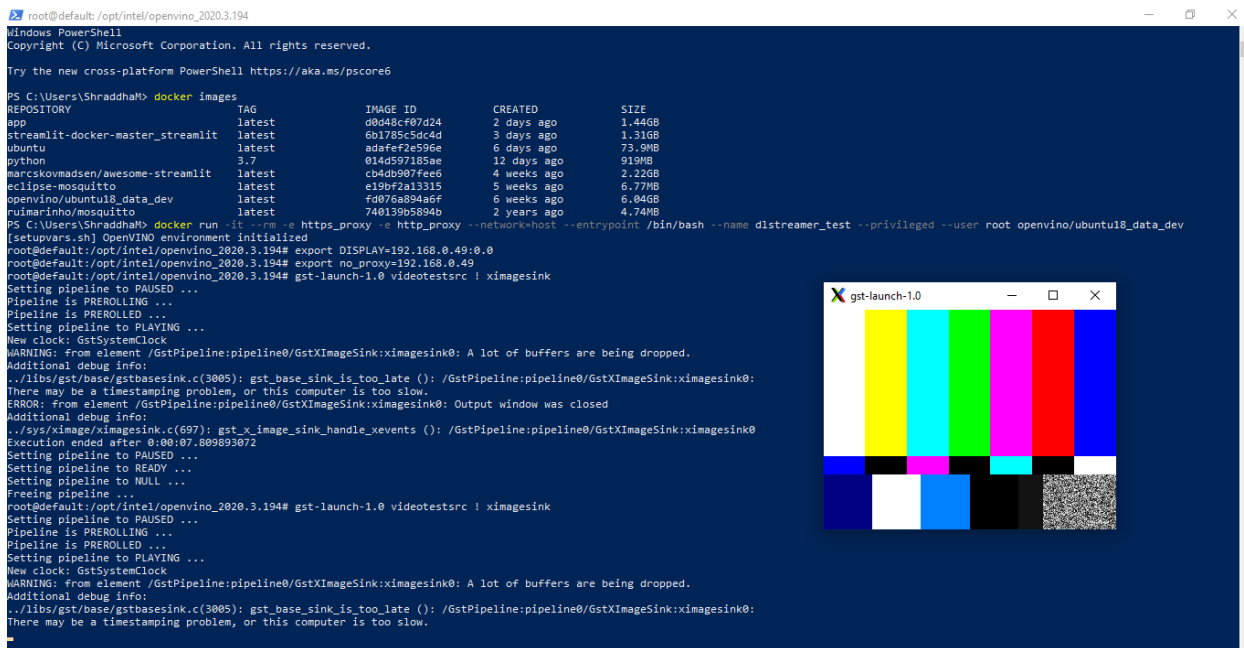
```

**Step 6:** We next test the pipeline using the following command:

**Cmd 5:** `gst-launch-1.0 videotestsrc ! ximagesink`



The above command gives us the following output:



The above output verifies that we have connected to the display properly. To get the desired output, we need to edit the face detection sample to use *ximagesink* instead of *xvimagesink*. To do this we will first install our favorite editor.

**Step 7:** Installing the editor using the following commands:

**Cmd 6:** apt-get update

```
root@default:/opt/intel/opencvino_2020.3.194# apt-get update
Get:1 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Get:2 http://archive.canonical.com/ubuntu bionic InRelease [10.2 kB]
Get:3 http://archive.ubuntu.com/ubuntu bionic InRelease [242 kB]
Get:4 http://archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
Get:5 http://security.ubuntu.com/ubuntu bionic-security/multiverse Sources [3234 B]
Get:6 http://security.ubuntu.com/ubuntu bionic-security/main Sources [203 kB]
Get:7 http://archive.ubuntu.com/ubuntu bionic-backports InRelease [74.6 kB]
Get:8 http://security.ubuntu.com/ubuntu bionic-security/universe Sources [219 kB]
Get:9 http://security.ubuntu.com/ubuntu bionic-security/restricted Sources [8943 B]
Get:10 http://security.ubuntu.com/ubuntu bionic-security/restricted amd64 Packages [89.0 kB]
Get:11 http://security.ubuntu.com/ubuntu bionic-security/multiverse amd64 Packages [9282 B]
Get:12 http://security.ubuntu.com/ubuntu bionic-security/main amd64 Packages [1003 kB]
Get:13 http://archive.canonical.com/ubuntu bionic/partner Sources [1800 B]
Get:14 http://security.ubuntu.com/ubuntu bionic-security/universe amd64 Packages [869 kB]
Get:15 http://archive.ubuntu.com/ubuntu bionic/universe Sources [11.5 MB]
Get:16 http://archive.ubuntu.com/ubuntu bionic/main Sources [1063 kB]
Get:17 http://archive.ubuntu.com/ubuntu bionic/multiverse Sources [216 kB]
Get:18 http://archive.ubuntu.com/ubuntu bionic/restricted Sources [5023 B]
Get:19 http://archive.ubuntu.com/ubuntu bionic/main amd64 Packages [1344 kB]
Get:20 http://archive.ubuntu.com/ubuntu bionic/multiverse amd64 Packages [106 kB]
Get:21 http://archive.ubuntu.com/ubuntu bionic/universe amd64 Packages [11.3 MB]
Get:22 http://archive.ubuntu.com/ubuntu bionic/restricted amd64 Packages [13.5 kB]
Get:23 http://archive.ubuntu.com/ubuntu bionic-updates/universe Sources [373 kB]
Get:24 http://archive.ubuntu.com/ubuntu bionic-updates/restricted Sources [10.5 kB]
Get:25 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse Sources [6201 B]
Get:26 http://archive.ubuntu.com/ubuntu bionic-updates/main Sources [418 kB]
Get:27 http://archive.ubuntu.com/ubuntu bionic-updates/universe amd64 Packages [1495 kB]
Get:28 http://archive.ubuntu.com/ubuntu bionic-updates/restricted amd64 Packages [103 kB]
Get:29 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse amd64 Packages [13.5 kB]
Get:30 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 Packages [1303 kB]
Get:31 http://archive.ubuntu.com/ubuntu bionic-backports/universe Sources [3566 B]
Get:32 http://archive.ubuntu.com/ubuntu bionic-backports/main Sources [4301 B]
Get:33 http://archive.ubuntu.com/ubuntu bionic-backports/main amd64 Packages [8208 B]
Get:34 http://archive.ubuntu.com/ubuntu bionic-backports/universe amd64 Packages [6158 B]
Fetched 32.3 MB in 45s (720 kB/s)
Reading package lists... Done
root@default:/opt/intel/opencvino_2020.3.194#
```

## Cmd 7: apt-get install nano

```
root@default:/opt/intel/opencvino_2020.3.194# apt-get install nano
Reading package lists... Done
Building dependency tree
Reading state information... Done
Suggested packages:
  spell
The following NEW packages will be installed:
  nano
0 upgraded, 1 newly installed, 0 to remove and 58 not upgraded.
Need to get 231 kB of archives.
After this operation, 778 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu bionic/main amd64 nano amd64 2.9.3-2 [231 kB]
Fetched 231 kB in 1s (311 kB/s)
debconf: delaying package configuration, since apt-utils is not installed
Selecting previously unselected package nano.
(Reading database ... 49303 files and directories currently installed.)
Preparing to unpack .../nano_2.9.3-2_amd64.deb ...
Unpacking nano (2.9.3-2) ...
Setting up nano (2.9.3-2) ...
update-alternatives: using /bin/nano to provide /usr/bin/editor (editor) in auto mode
update-alternatives: warning: skip creation of /usr/share/man/man1/editor.1.gz because associated file /usr/share/man/man1/nano.1.gz (of link group editor) doesn't exist
update-alternatives: using /bin/nano to provide /usr/bin/pico (pico) in auto mode
update-alternatives: warning: skip creation of /usr/share/man/man1/pico.1.gz because associated file /usr/share/man/man1/nano.1.gz (of link group pico) doesn't exist
root@default:/opt/intel/opencvino_2020.3.194#
```

**Step 8:** Next, we change the directory to locate the face detection sample file to be edited.

Cmd 8: `cd /opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/`

```
root@default:/opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification#
root@default:/opt/intel/opencvino_2020.3.194# cd /opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/
root@default:/opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification# ls
README.md  face_detection_and_classification.sh  model_proto
root@default:/opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification#
```

Open the file to be edited using the following command:

Cmd 9: `nano face_detection_and_classification.sh`

```
root@default:/opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification#
root@default:/opt/intel/opencvino_2020.3.194# cd /opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/
root@default:/opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification# ls
README.md  face_detection_and_classification.sh  model_proto
root@default:/opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification# nano face_detection_and_classification.sh
root@default:/opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification#
```

Make changes in the file as mentioned above.

```

root@default: /opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification
GNU nano 2.9.3 face_detection_and_classification.sh Modified
# cat 1
#
PROC_PATH() {
    echo $(dirname "$0" /model_proc/$1.json)
}

DETECT_MODEL_PATH=$(GET_MODEL_PATH $MODEL1)
CLASS_MODEL_PATH=$(GET_MODEL_PATH $MODEL2)
CLASS_MODEL_PATH1=$(GET_MODEL_PATH $MODEL3)
CLASS_MODEL_PATH2=$(GET_MODEL_PATH $MODEL4)

MODEL2_PROC=$(PROC_PATH $MODEL2)
MODEL3_PROC=$(PROC_PATH $MODEL3)
MODEL4_PROC=$(PROC_PATH $MODEL4)

PIPELINE="gst-launch-1.0 $SOURCE_ELEMENT
decodebin videoconvert video/x-raw,format=BGRx \
gvadetect model $DETECT_MODEL_PATH device $DEVICE queue \
gvaclassify model $CLASS_MODEL_PATH model-proc $MODEL2_PROC device $DEVICE queue \
gvaclassify model $CLASS_MODEL_PATH1 model-proc $MODEL3_PROC device $DEVICE queue \
gvaclassify model $CLASS_MODEL_PATH2 model-proc $MODEL4_PROC device $DEVICE queue \
gwatermark videoconvert fpsdisplaysink video-sink ximagesink sync=false"

echo $(PIPELINE)
$(PIPELINE)

```

**Step 9:** We then download the models using the following commands:

**Cmd 10:** `cd /opt/intel/openvino/data_processing/dl_streamer/samples/`

```

root@default: /opt/intel/openvino/data_processing/dl_streamer/samples
root@default: /opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification# cd /opt/intel/openvino/data_processing/dl_streamer/samples/
root@default: /opt/intel/openvino/data_processing/dl_streamer/samples# ls
README.md download_models.sh models_list.txt
root@default: /opt/intel/openvino/data_processing/dl_streamer/samples#

```

**Cmd 11:** `/opt/intel/openvino/data_processing/dl_streamer/samples/download_models.sh`

```

root@default: /opt/intel/openvino/data_processing/dl_streamer/samples
... 100%, 169 KB, 83354 KB/s, 0 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/person-attributes-recognition-crossroad-0230/FP16/person-attributes-recognition-crossroad-0230.bin
... 100%, 1435 KB, 1102 KB/s, 1 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/vehicle-attributes-recognition-barrier-0039/FP32/vehicle-attributes-recognition-barrier-0039.xml
... 100%, 32 KB, 34465 KB/s, 0 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/vehicle-attributes-recognition-barrier-0039/FP32/vehicle-attributes-recognition-barrier-0039.bin
... 100%, 2445 KB, 1524 KB/s, 1 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/vehicle-attributes-recognition-barrier-0039/FP16/vehicle-attributes-recognition-barrier-0039.xml
... 100%, 32 KB, 28591 KB/s, 0 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/vehicle-attributes-recognition-barrier-0039/FP16/vehicle-attributes-recognition-barrier-0039.bin
... 100%, 1222 KB, 1203 KB/s, 1 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/vehicle-attributes-recognition-barrier-0039/FP16-INT8/vehicle-attributes-recognition-barrier-0039.xml
... 100%, 98 KB, 54004 KB/s, 0 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/vehicle-attributes-recognition-barrier-0039/FP16-INT8/vehicle-attributes-recognition-barrier-0039.bin
... 100%, 616 KB, 1430 KB/s, 0 seconds passed
===== Downloading /root/intel/dl_streamer/models/public/mobilenet-ssd/mobilenet-ssd.prototxt
... 100%, 28 KB, 9443 KB/s, 0 seconds passed
===== Downloading /root/intel/dl_streamer/models/public/mobilenet-ssd/mobilenet-ssd.caffemodel
... 100%, 22605 KB, 1589 KB/s, 14 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/head-pose-estimation-adas-0001/FP32/head-pose-estimation-adas-0001.xml
... 100%, 49 KB, 27242 KB/s, 0 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/head-pose-estimation-adas-0001/FP32/head-pose-estimation-adas-0001.bin
... 100%, 7468 KB, 1480 KB/s, 5 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/head-pose-estimation-adas-0001/FP16/head-pose-estimation-adas-0001.xml
... 100%, 49 KB, 35964 KB/s, 0 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/head-pose-estimation-adas-0001/FP16/head-pose-estimation-adas-0001.bin
... 100%, 3734 KB, 2032 KB/s, 1 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/head-pose-estimation-adas-0001/FP16-INT8/head-pose-estimation-adas-0001.xml
... 100%, 81 KB, 50768 KB/s, 0 seconds passed
===== Downloading /root/intel/dl_streamer/models/intel/head-pose-estimation-adas-0001/FP16-INT8/head-pose-estimation-adas-0001.bin
... 100%, 2026 KB, 2765 KB/s, 0 seconds passed
##### Post-processing #####
root@default: /opt/intel/openvino/data_processing/dl_streamer/samples#

```

**Step 10:** Now, we will run the face detection and classification pipeline, using the following command:

Cmd 12: cd

/opt/intel/openvino/data\_processing/dl\_streamer/samples/gst\_launch/face\_detection\_and\_classification/

```
root@default:/opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification#  
root@default:/opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/  
root@default:/opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification# ls  
README.md face_detection_and_classification.sh model_proc  
root@default:/opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification#
```

Cmd 13:

/opt/intel/openvino/data\_processing/dl\_streamer/samples/gst\_launch/face\_detection\_and\_classification/face\_detection\_and\_classification.sh

```
root@default:/opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification#  
#####|| Post-processing ||#####  
root@default:/opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/  
root@default:/opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification# ls  
README.md face_detection_and_classification.sh  
root@default:/opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification# /opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/face_detection_and_classification.sh  
gst-launch-1.0 urisourcebin buffer-size=4096 uri=https://github.com/intel-iot-devkit/sample-videos/raw/master/head-pose-face-detection-female-and-male.mp4 ! decodebin ! videoconvert ! video/x-raw,format=BGRx ! gvadetect model=/root/intel/dl_streamer/models/intel/face-detection-adas-0001/FP32/face-detection-adas-0001.xml device=CPU ! queue ! gvaclassify model=/root/intel/dl_streamer/models/intel/age-gender-recognition-retail-0013/FP32/age-gender-recognition-retail-0013.xml model-proc=/opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/model_proc/age-gender-recognition-retail-0013.json device=CPU ! queue ! gvaclassify model=/root/intel/dl_streamer/models/intel/emotions-recognition-retail-0003/FP32/emotions-recognition-retail-0003.xml model-proc=/opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/model_proc/emotions-recognition-retail-0003.json device=CPU ! queue ! gvaclassify model=/root/intel/dl_streamer/models/intel/landmarks-regression-retail-0009/FP32/landmarks-regression-retail-0009.xml model-proc=/opt/intel/openvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/model_proc/landmarks-regression-retail-0009.json device=CPU ! queue ! gvawatermark ! videoconvert ! fpsdisplaysink video-sink=xim ! agesink sync=false  
Setting pipeline to PAUSED ...  
  
MobaXterm  
An application on remote computer 192.168.0.49 has requested access to the X server. Do you want to allow it?  
In order to disable this warning, set 'X11 remote access' to 'full' in MobaXterm global settings -> 'X11' tab.  
[Yes] [No]
```

Following is the screenshot of how the output looks like:

```
root@default:/opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification# /opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification.sh
gst-launch-1.0 urisourcebin buffer-size=4096 uri=https://github.com/intel-iot-devkit/sample-videos/raw/master/head-pose-face-detection-female-and-male.mp4 ! decodebin ! videoconvert ! video/x-raw,format=BGRx ! gvadetect model=/root/intel/dl_streamer/models/intel/face-detection-adas-0001/FP32/face-detection-adas-0001.xml device=CPU ! queue ! gvaclassify model=/root/intel/dl_streamer/models/intel/age-gender-recognition-retail-0013/FP32/age-gender-recognition-retail-0013.xml model-proc=/opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/model_proc/age-gender-recognition-retail-0013.json device=CPU ! queue ! gvaclassify model=/root/intel/dl_streamer/models/intel/emotions-recognition-retail-0003/FP32/emotions-recognition-retail-0003.xml model-proc=/opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/model_proc/emotions-recognition-retail-0003.json device=CPU ! queue ! gvaclassify model=/root/intel/dl_streamer/models/intel/landmarks-regression-retail-0009/FP32/landmarks-regression-retail-0009.xml model-proc=/opt/intel/opencvino/data_processing/dl_streamer/samples/gst_launch/face_detection_and_classification/model_proc/landmarks-regression-retail-0009.json device=CPU ! queue ! gwatermark ! videoconvert ! fpsdisplaysink video-sink=ximagesink sync=false
Setting pipeline to PAUSED ...
Pipeline is PREROLLING ...
Got context from element 'source': gst.soup.session=context, session=(SoupSession)NULL, force=(boolean)false;
Redistribute latency...
Redistribute latency...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Buffering, setting pipeline to PAUSED ...
Done buffering, setting pipeline to PLAYING ...
Buffering, setting pipeline to PAUSED ...
Done buffering, setting pipeline to PLAYING ...
Buffering, setting pipeline to PAUSED ...
Done buffering, setting pipeline to PLAYING ...
rendered: 302, dropped: 0, current: 19.39, average: 14.26
```

## References:

- [1] <https://docs.docker.com/docker-for-windows/install/>
- [2] <https://github.com/opencv/gst-video-analytics>
- [3] <https://github.com/opencv/gst-video-analytics/issues/75>
- [4] <https://mobaxterm.mobatek.net/download-home-edition.html>