

Objective video quality metric performance assessment tool user guide

1. Required OS

Ubuntu 18.04.2 LTS or any other Linux based OS

3. The language used in the tool

Python 3.6

2. Required tools and dependencies

FFmpeg with VMAF, VQMT-master, Numpy, Pandas, Opencv, Matplotlib, Pyinstaller

3. Full version of the tool

The full version of the assessment tool contains two Python files which are **plot.py** and **calculate.py**. And these two files were already written in a stand-alone executable program namely **Assessment_tool**. When you run the assessment tool, you can directly run the **plot.py** or run the **Assessment_tool** in the Linux Terminal. **WARNING:** The full version of the assessment tool is based on all the videos in the IVP Subjective Quality Video Database which will require **98GB** storage space and will take about **6 hours** to complete the measurements. If you want to have a **quick look** of the functions of the assessment tool, please go to **section 4**.

When you run the **Assessment_tool** or the **plot.py**, the things you need to:

(1) Please go to the Image and Video Processing Laboratory (IVPL) of the Chinese University of Hong Kong to find the **IVP Subjective Quality Video Database**: <http://ivp.ee.cuhk.edu.hk/research/database/subjective/index.shtml>.

(2) Please download all the video samples in the portfolio **video_sequences** (except the sets of **bus**) and put them in the same directory of **Assessment_tool** or **plot.py**.

(3) You can directly use the **subjective_score_all.csv** I provided, or you can download the **subjective_score_all.xls** in the portfolio **subjective_scores** and open the **subjective_score_all.xls** with EXCEL and add some contents after line 91 and line 115, see figure 1.

89	toys_calendar_mpeg2_1.yuv	0.27243	0.58277	250
90	toys_calendar_mpeg2_2.yuv	0.98525	0.69103	250
91	toys_calendar_mpeg2_3.yuv	2.4642	0.55334	250
92	toys_calendar_ip_1.yuv	5	0	250
93	toys_calendar_ip_2.yuv	5	0	250
94	toys_calendar_ip_3.yuv	5	0	250
95	toys_calendar_ip_4.yuv	5	0	250
96	tractor_dirac_2.yuv	0.98649	0.57082	250
118	train_mpeg2_3.yuv	1.3507	0.75377	250
119	train_ip_1.yuv	5	0	250
120	train_ip_2.yuv	5	0	250
121	train_ip_3.yuv	5	0	250
122	train_ip_4.yuv	5	0	250
123	tube_dirac_1.yuv	1.3674	0.64522	280
124	tube_dirac_2.yuv	2.331	0.71772	280
125	tube_dirac_3.yuv	3.1556	0.63769	280

Figure 1: adding 8 contents in subjective_score_all.xls

Then save this file in the form of **CSV**: **subjective_score_all.csv** and put it in the same directory of **Assessment_tool** or **plot.py**.

(4) You can directly use the **ffmpeg** and **vqmt** I provided, or you can download the **FFmpeg with VMAF** and **VQMAT-master** by yourself and put these two executable program in the same directory of **Assessment_tool** or **plot.py**.

(5) Ensure your Python has all the required dependencies: Numpy, Pandas, Opencv, Matplotlib, Pyinstaller

(6) Run the **Assessment_tool** or **plot.py** in the same directory of the sample videos and subjective score csv file. You can see this assessment tool can automatically calculated the PSNR, VAMF, SSIM, PSNRHVS, PSNRHVS_M and VIF of the sample videos, see figure 2.

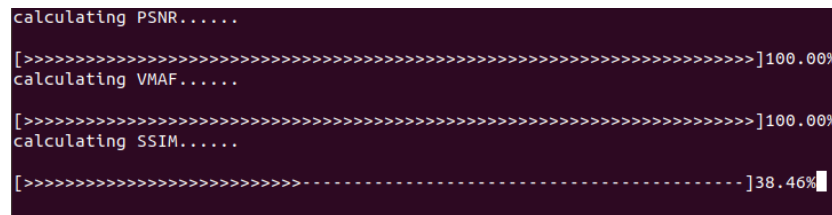


Figure 2: The automatic calculation

(7) After the calculations, the objective scores of each distorted video in each metrics will be stored in the form of CSV: **PSNR.csv**, **VMAF.csv**, **SSIM.csv**, **PSNRHVS.csv**, **PSNRHVSM.csv** and **VIFP.csv**.

(8) The program will then automatically show the objective score-subjective score scatter plots successively, and you don't need to save them, the program will help you automatically save them in the form of png in the same directory of sample videos: **PSNR.png**, **VMAF.png**, **SSIM.png**, **PSNRHVS.png**, **PSNRHVSM.png** and **VIFP.png**, see figure 3.



Figure 3: The objective score-subjective score scatter plot of Assessment_tool

4. Light version of the tool

The light version of the tool **Assessment_tool_light** or **plot_light.py** provides a quick view of the functions of the full version of the assessment tool. The light tool only calculates the objective scores of the **laser** videos set, which only takes about 45 minutes.

When you run the **Assessment_tool_light** or the **plot_light.py**, the things you need to:

(1) Please go to the Image and Video Processing Laboratory (IVPL) of the Chinese University of Hong Kong to find the IVP Subjective Quality Video Database:
<http://ivp.ee.cuhk.edu.hk/research/database/subjective/index.shtml>.

(2) Please download the video set of **laser** in the portfolio video_sequences and put them in the same directory of **Assessment_tool_light** or **plot_light.py**.

(3) You can directly use the **subjective_score_all.csv** I provided, or you can download the **subjective_score_all.xls** in the portfolio **subjective_scores** and open the **subjective_score_all.xls** with EXCEL and add some contents after line 91 and line 115, which was shown in figure 1.

(4) You can directly use the **ffmpeg** and **vqmt** I provided, or you can download the **FFmpeg with VMAF** and **VQMAT-master** by yourself and put these two executable program in the same directory of **Assessment_tool_light** or **plot_light.py**.

(5) Ensure your Python has all the required dependencies: Numpy, Pandas, Opencv, Matplotlib, Pyinstaller.

(6) Run the **Assessment_tool_light** or **plot_light.py** in the same directory of the sample videos and subjective score csv file. You can see this assessment tool can automatically calculated the PSNR, VMAF, SSIM, PSNRHVS, PSNRHVSM and VIF of the sample videos.

(7) After the calculations, the objective scores of the **laser** video set in each metrics will be stored in the form of CSV: **PSNR_light.csv**, **VMAF_light.csv**, **SSIM_light.csv**, **PSNRHVS_light.csv**, **PSNRHVSM_light.csv** and **VIFP_light.csv**.

(8) The program will then automatically show the objective score-subjective score scatter plots successively, and you don't need to save them, the program will help you automatically save them in the form of png in the same directory of sample videos: **PSNR_light.png**, **VMAF_light.png**, **SSIM_light.png**, **PSNRHVS_light.png**, **PSNRHVSM_light.png** and **VIFP_light.png**, see figure 4.

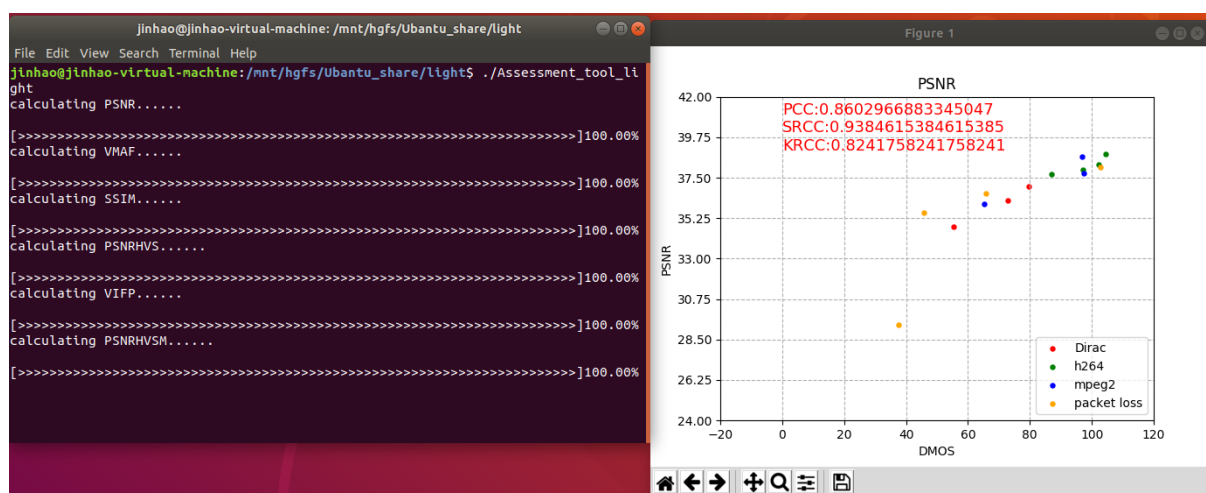


Figure 4: The objective score-subjective score scatter plot of **Assessment_tool_light**

5. Customized version of the tool

The customized version of the tool **Assessment_tool_customized** or **plot_customized.py** supports the user self-input video sets and encoding types.

When you run the **Assessment_tool_customized** or the **plot_customized.py**, the things you need to:

(1) Please prepare the videos you want to test. The name of these videos should obey the following rules:

- 1) The original video's name should not contain any symbols and the form must be **yuv** and the resolution of the videos must be **1920 x 1088**. For example: **sky.yuv**
- 2) The distorted videos should have the same of original video and has the suffix in the form of '**_encoding name_order of the video**'. For example: **sky_h264_1.yuv**, **sky_h264_2.yuv**, **sky_h264_3.yuv**, where the different order represents different bit rate.

Using the videos in the IVP Subjective Quality Video Database as an examples: two video sets, each has two distortion types and each distortion type has 2 videos, see figure 5.



Figure 5: The example user self-input video sets

(2) Please prepare the subjective score file of the distorted videos, the subjective score file must obey the following rules:

- 1) The form of the subjective score file must be **csv**.
- 2) The first row of the file must be Name, DMOS, STD, Number of Frames, which denote the name of the distortion video, the DMOS score of the distortion video, the standard deviation of the DMOS score, and the total frames of the distortion videos.

The example subjective score file of the example user self-input video sets: **customized.csv**, see figure 6.

	Name	DMOS	STD	Number of Frames
1	laser_dirac_1.yuv	1.0207	0.62838	224
2	laser_dirac_2.yuv	1.352	0.7801	224
3	laser_ip_1.yuv	-0.14271	0.74793	224
4	laser_ip_2.yuv	1.7064	1.0313	224
5	overbridge_dirac_1.yuv	1.0332	0.67013	250
6	overbridge_dirac_2.yuv	2.0277	0.70524	250
7	overbridge_ip_1.yuv	0.91564	1.0512	250
8	overbridge_ip_2.yuv	1.6402	1.0645	250

Figure 6: The example subjective score file

(3) When you run the **Assessment_tool_customized** or **plot_customized.py**, please enter the following details as shown in figure 7.

```
jinhao@jinhao-virtual-machine: /mnt/hgfs/Ubuntu_share/CUSTOMIZED
File Edit View Search Terminal Help
jinhao@jinhao-virtual-machine:/mnt/hgfs/Ubuntu_share/CUSTOMIZED$ python ./plot_customize.py
Please input the file name of the subjective score: customized
Please input the name of the video set (input e to exit): laser
Please input the name of the video set (input e to exit): overbridge
Please input the name of the video set (input e to exit): e
Please input the name of the encodings or distortions (input e to exit): dirac
Please input the name of the encodings or distortions (input e to exit): ip
Please input the name of the encodings or distortions (input e to exit): e
Please input the number of the videos in the dirac distortion: 2
Please input the number of the videos in the ip distortion: 2
```

Figure 7: The input of the Assessment_tool_customized

Please input the correct subjective score file, otherwise you need to input again, see figure 8

```
jinhao@jinhao-virtual-machine: /mnt/hgfs/Ubuntu_share/CUSTOMIZED
File Edit View Search Terminal Help
jinhao@jinhao-virtual-machine:/mnt/hgfs/Ubuntu_share/CUSTOMIZED$ ./Assessment_tool_customize
Please input the file name of the subjective score: custom
No such files, please input again
Please input the file name of the subjective score: customized
Please input the name of the video set (input e to exit):
```

Figure 8: Please input correct subjective score file name

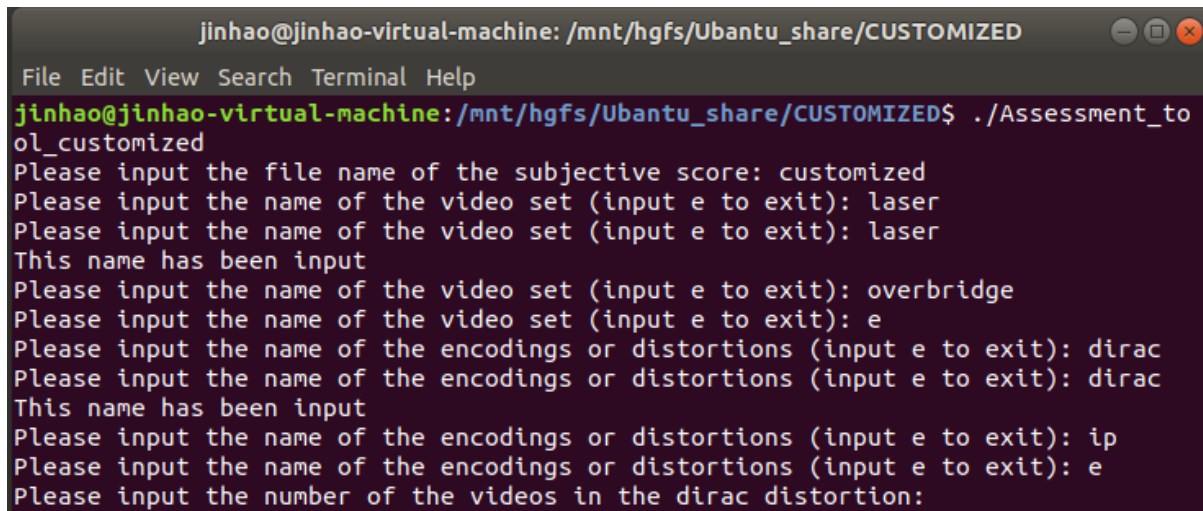
Please note that the maximum numbers of the video set and distortion types are both 10. If you input more than 10 names, the program will discard the extra name, see figure 9.

```
jinhao@jinhao-virtual-machine: /mnt/hgfs/Ubuntu_share/CUSTOMIZED
File Edit View Search Terminal Help
jinhao@jinhao-virtual-machine:/mnt/hgfs/Ubuntu_share/CUSTOMIZED$ ./Assessment_tool_customize
Please input the file name of the subjective score: customized
Please input the name of the video set (input e to exit): laser
Please input the name of the video set (input e to exit): overbridge
Please input the name of the video set (input e to exit): bus
Please input the name of the video set (input e to exit): train
Please input the name of the video set (input e to exit): tractor
Please input the name of the video set (input e to exit): toy_calendar
Please input the name of the video set (input e to exit): shelf
Please input the name of the video set (input e to exit): robot
Please input the name of the video set (input e to exit): tube
Please input the name of the video set (input e to exit): square
Please input the name of the video set (input e to exit): 11th name
This assessment tool only support 10 video sets
Please input the name of the encodings or distortions (input e to exit): h261
Please input the name of the encodings or distortions (input e to exit): h262
Please input the name of the encodings or distortions (input e to exit): h263
Please input the name of the encodings or distortions (input e to exit): h264
Please input the name of the encodings or distortions (input e to exit): h265
Please input the name of the encodings or distortions (input e to exit): mpeg1
Please input the name of the encodings or distortions (input e to exit): moeg2
Please input the name of the encodings or distortions (input e to exit): mpeg3
Please input the name of the encodings or distortions (input e to exit): mpeg4
Please input the name of the encodings or distortions (input e to exit): ip
Please input the name of the encodings or distortions (input e to exit): 11th name
This assessment tool only support 10 types of encodings or distortions
Please input the number of the videos in the h261 distortion: █
```


Figure 9: The program supports maximum 10 video sets and distortion types

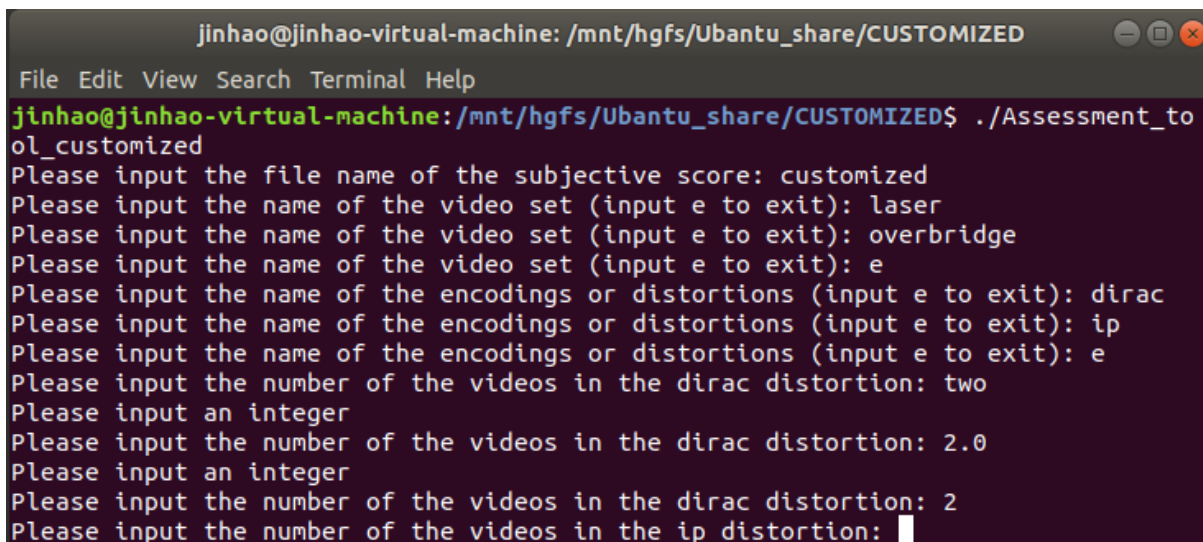
Please don't input duplicate name, see figure 10.

Please only input integer to the number of distorted videos, see figure 11.



```
jinhao@jinhao-virtual-machine: /mnt/hgfs/Ubuntu_share/CUSTOMIZED
File Edit View Search Terminal Help
jinhao@jinhao-virtual-machine:/mnt/hgfs/Ubuntu_share/CUSTOMIZED$ ./Assessment_to
ol_customized
Please input the file name of the subjective score: customized
Please input the name of the video set (input e to exit): laser
Please input the name of the video set (input e to exit): laser
This name has been input
Please input the name of the video set (input e to exit): overbridge
Please input the name of the video set (input e to exit): e
Please input the name of the encodings or distortions (input e to exit): dirac
Please input the name of the encodings or distortions (input e to exit): dirac
This name has been input
Please input the name of the encodings or distortions (input e to exit): ip
Please input the name of the encodings or distortions (input e to exit): e
Please input the number of the videos in the dirac distortion:
```

Figure 10: Please don't input duplicate name



```
jinhao@jinhao-virtual-machine: /mnt/hgfs/Ubuntu_share/CUSTOMIZED
File Edit View Search Terminal Help
jinhao@jinhao-virtual-machine:/mnt/hgfs/Ubuntu_share/CUSTOMIZED$ ./Assessment_to
ol_customized
Please input the file name of the subjective score: customized
Please input the name of the video set (input e to exit): laser
Please input the name of the video set (input e to exit): overbridge
Please input the name of the video set (input e to exit): e
Please input the name of the encodings or distortions (input e to exit): dirac
Please input the name of the encodings or distortions (input e to exit): ip
Please input the name of the encodings or distortions (input e to exit): e
Please input the number of the videos in the dirac distortion: two
Please input an integer
Please input the number of the videos in the dirac distortion: 2.0
Please input an integer
Please input the number of the videos in the dirac distortion: 2
Please input the number of the videos in the ip distortion: 
```

Figure 11: Please only input integer to the number of distorted videos

(4) You can directly use the **ffmpeg** and **vqmt** I provided, or you can download the **FFmpeg with VMAF** and **VQMAT-master** by yourself and put these two executable program in the same directory of **Assessment_tool_customized** or **plot_customized.py**.

(5) Ensure your Python has all the required dependencies: Numpy, Pandas, Opencv, Matplotlib, Pyinstaller.

(6) Run the **Assessment_tool_customized** or **plot_customized.py** in the same directory of the sample videos and subjective score csv file. You can see this assessment tool can automatically calculated the PSNR, VAMF, SSIM, PSNRHVS, PSNRHVSM and VIF of the sample videos.

(7) After the calculations, the objective scores of the **laser** video set in each metrics will be stored in the form of CSV: **PSNR_customized.csv**, **VMAF_ customized.csv**, **SSIM_**

customized.csv, PSNRHVS_ customized.csv, PSNRHVSM_ customized.csv and VIFP_ customized.csv.

