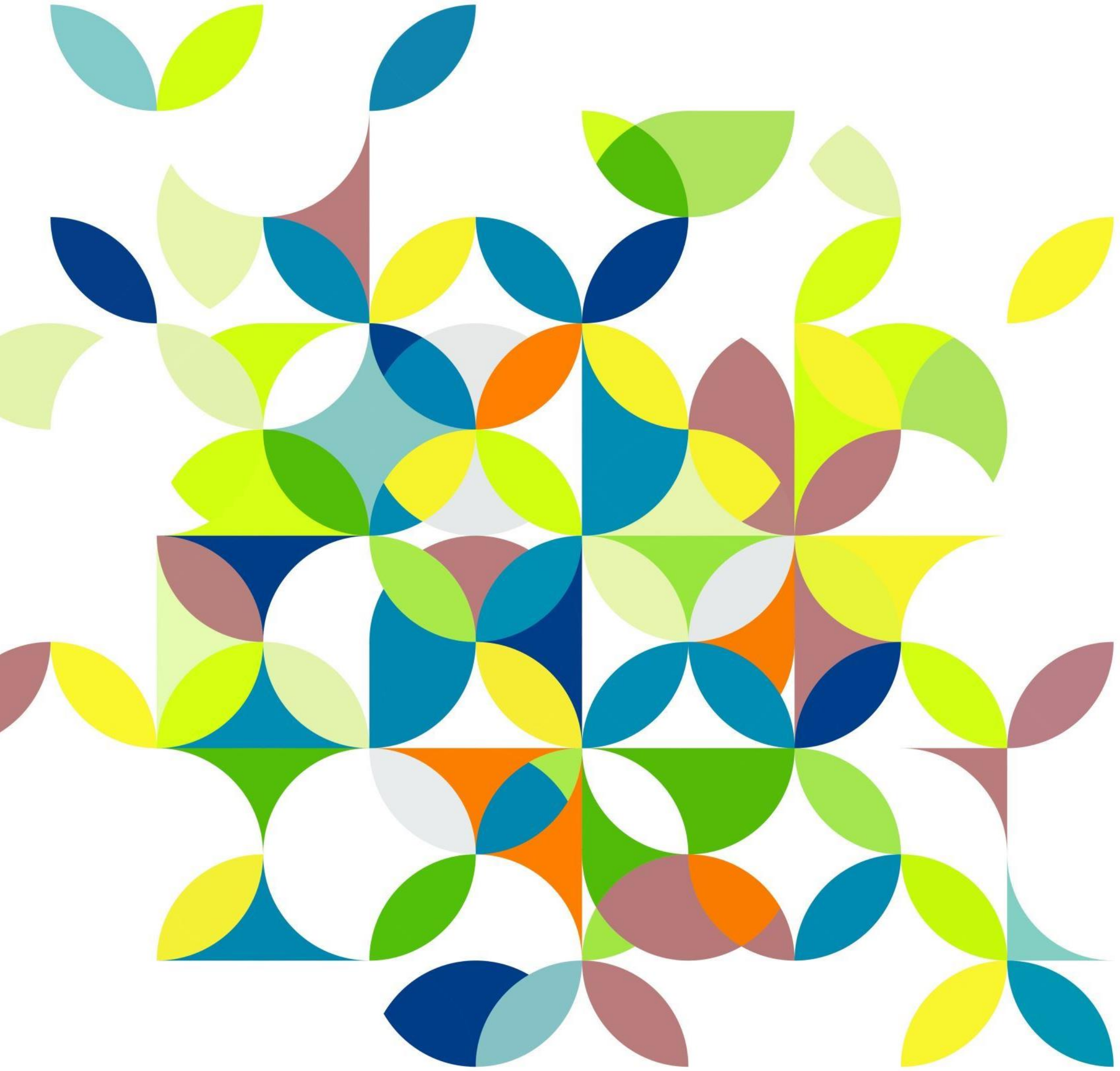


Project Report

-Team United

(By: Sudip Dhungana)

Project Objective

– Face-detection using Viola Jones Algorithm using Haar Cascade using thousands of positive and negative samples.

Data Sets

We have used 2 types of data-sets : Public and Self-Made data sets. Public data sets were used from data sets of Kaggle and Self-Made data sets were created using capturing images ourselves in the desired quality (low).

Team Members

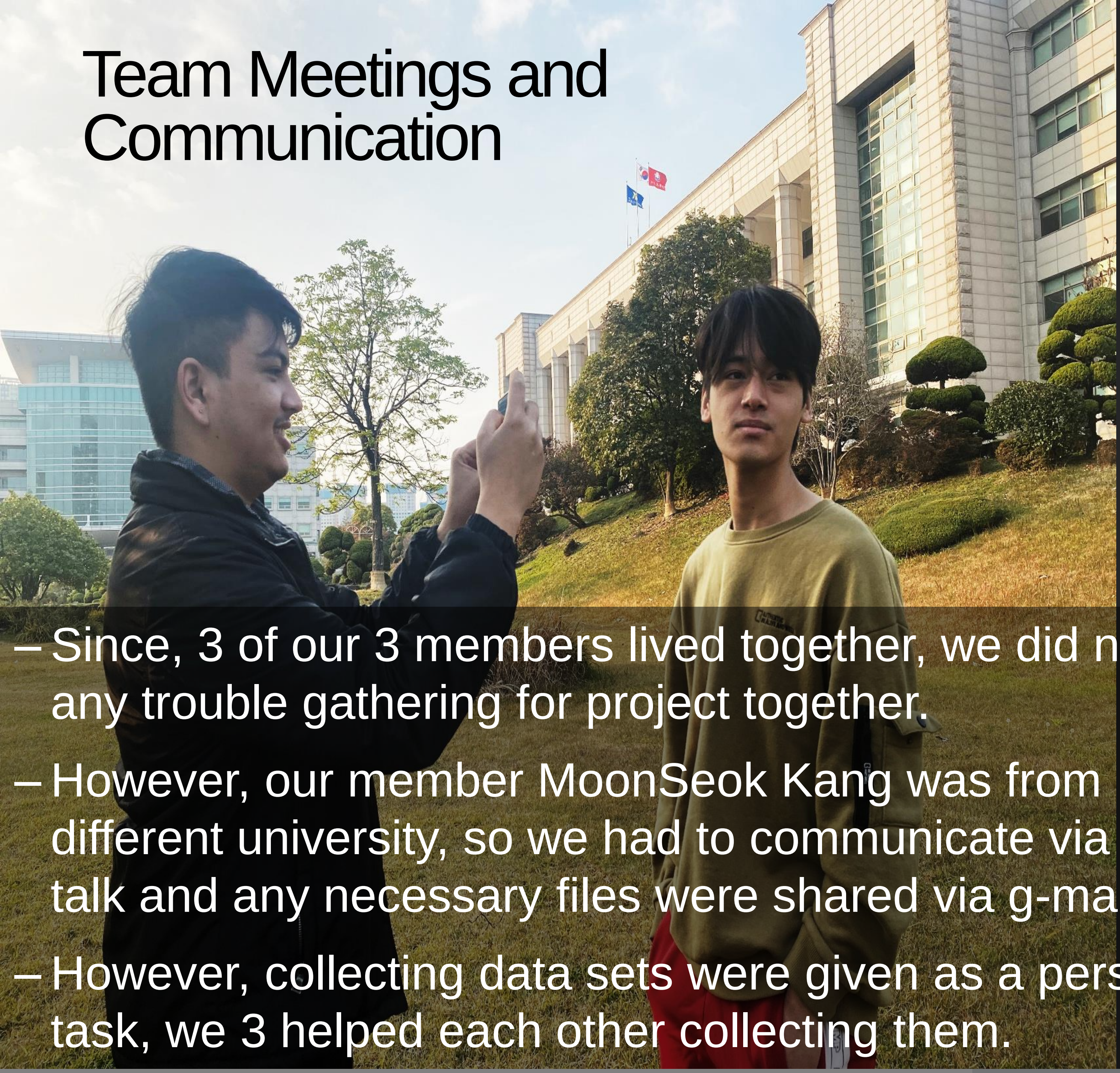
– Sudip Dhungana (Team Leader)
  (12194823)
– Ritik Deuja
  (12194824)
– Sanjib Tamang
  (12194939)
– Moonseok Kang
  (12225864)

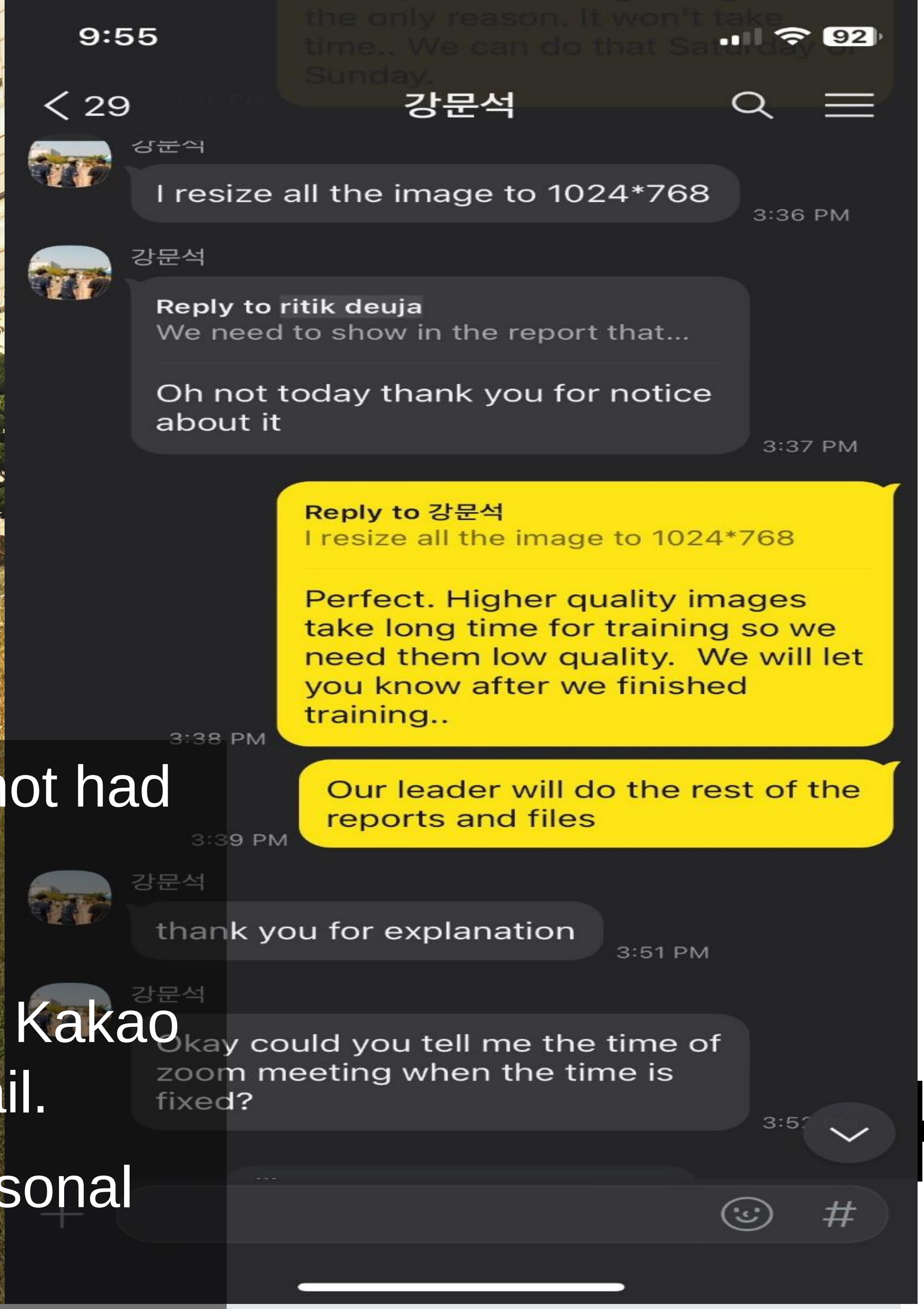
Team Members Roles

- Being a team leader, it was my responsibility to keep track on everyone's equal participation in the project so I came up with the idea of splitting certain tasks. Since data collection was the most important part of the project, it was important for all members to collect their personal data themselves.

- Individual Data Collection by all the members(Positive Samples) and submission to me (team leader)
- I confirmed the images in the criteria mentioned by professor such as Orientations, Illuminations and others.
- Ritik Deuja : Collection of public data set
- Sanjib Tamang : GitHub Link Creation
- Sudip Dhungana : After collecting all the samples, including mine, I proceeded with training and testing process, and I did the guthub management.
- After finalizing the project, GitHub link were shared among all teammates to have final confirmation by everyone before submitting the file.

Team Meetings and Communication





the only reason. It won't take time.. We can do that Saturday or Sunday.

9:55 92

< 29 강문석

강문석

I resize all the image to 1024*768 3:36 PM

강문석

Reply to ritik deuja
We need to show in the report that...

Oh not today thank you for notice about it 3:37 PM

Reply to 강문석
I resize all the image to 1024*768

Perfect. Higher quality images take long time for training so we need them low quality. We will let you know after we finished training.. 3:38 PM

Our leader will do the rest of the reports and files 3:39 PM

강문석

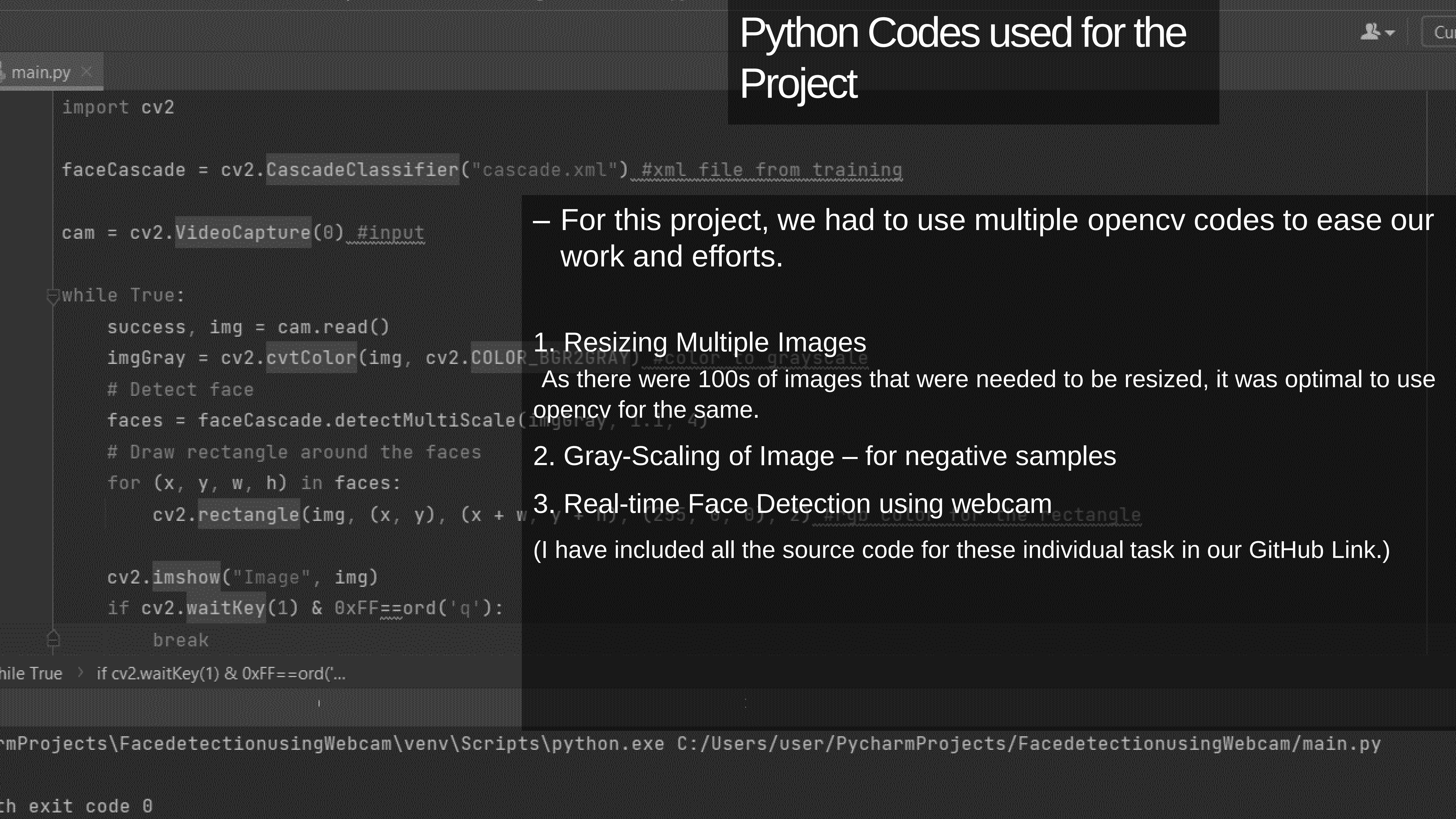
thank you for explanation 3:51 PM

강문석

Okay could you tell me the time of zoom meeting when the time is fixed? 3:5

- Since, 3 of our 3 members lived together, we did not had any trouble gathering for project together.
- However, our member MoonSeok Kang was from different university, so we had to communicate via Kakao talk and any necessary files were shared via g-mail.
- However, collecting data sets were given as a personal task, we 3 helped each other collecting them.

Python Codes used for the Project



```
import cv2

faceCascade = cv2.CascadeClassifier("cascade.xml") #xml file from training

cam = cv2.VideoCapture(0) #input

while True:
    success, img = cam.read()
    imgGray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY) #color to grayscale
    # Detect face
    faces = faceCascade.detectMultiScale(imgGray, 1.1, 4)
    # Draw rectangle around the faces
    for (x, y, w, h) in faces:
        cv2.rectangle(img, (x, y), (x + w, y + h), (255, 0, 0), 2) #rgb color for the rectangle

    cv2.imshow("Image", img)
    if cv2.waitKey(1) & 0xFF==ord('q'):
        break
```

```
rmProjects\FacedetectionusingWebcam\venv\Scripts\python.exe C:/Users/user/PycharmProjects/FacedetectionusingWebcam/main.py

th exit code 0
```

– For this project, we had to use multiple opencv codes to ease our work and efforts.

1. Resizing Multiple Images

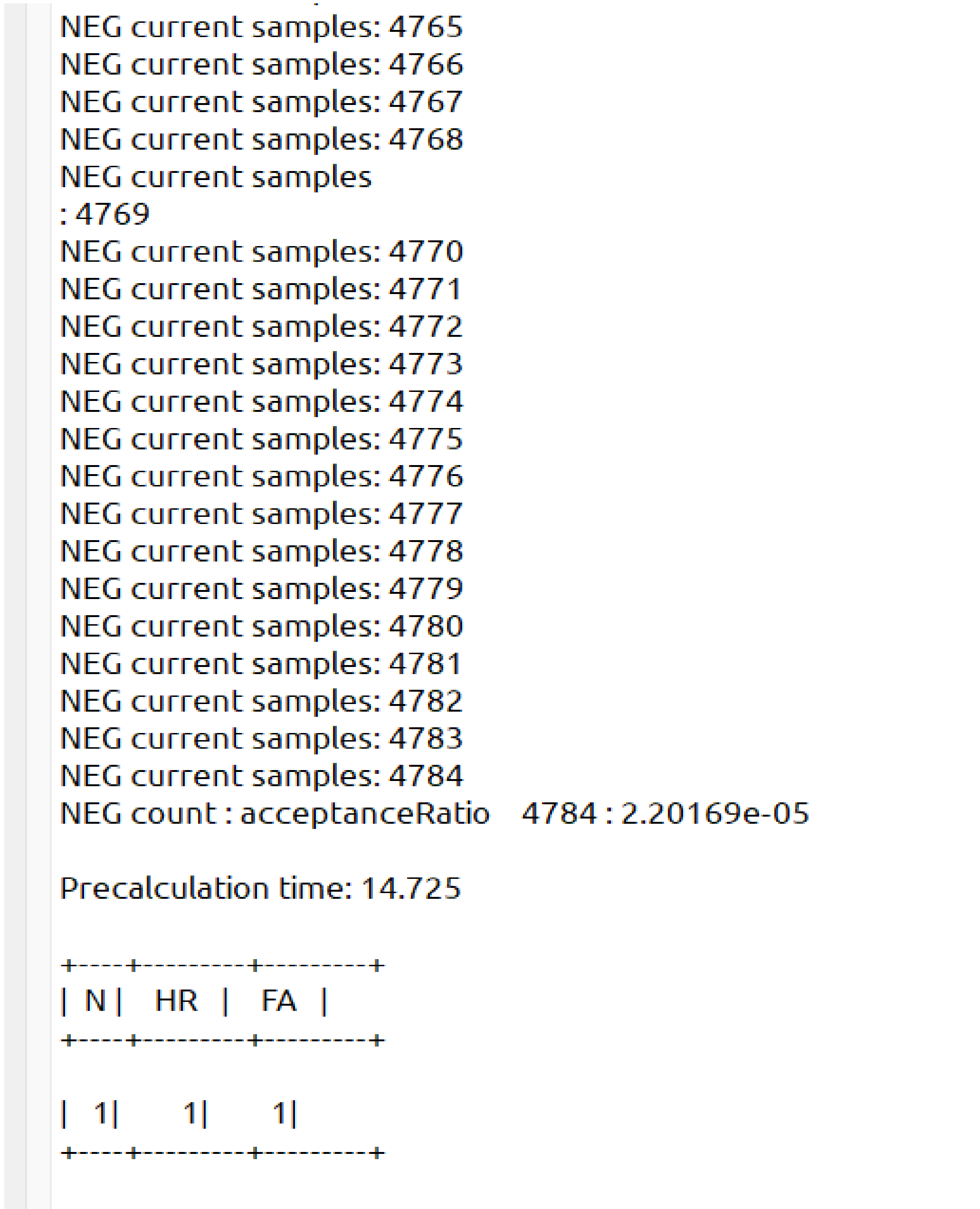
As there were 100s of images that were needed to be resized, it was optimal to use opencv for the same.

2. Gray-Scaling of Image – for negative samples

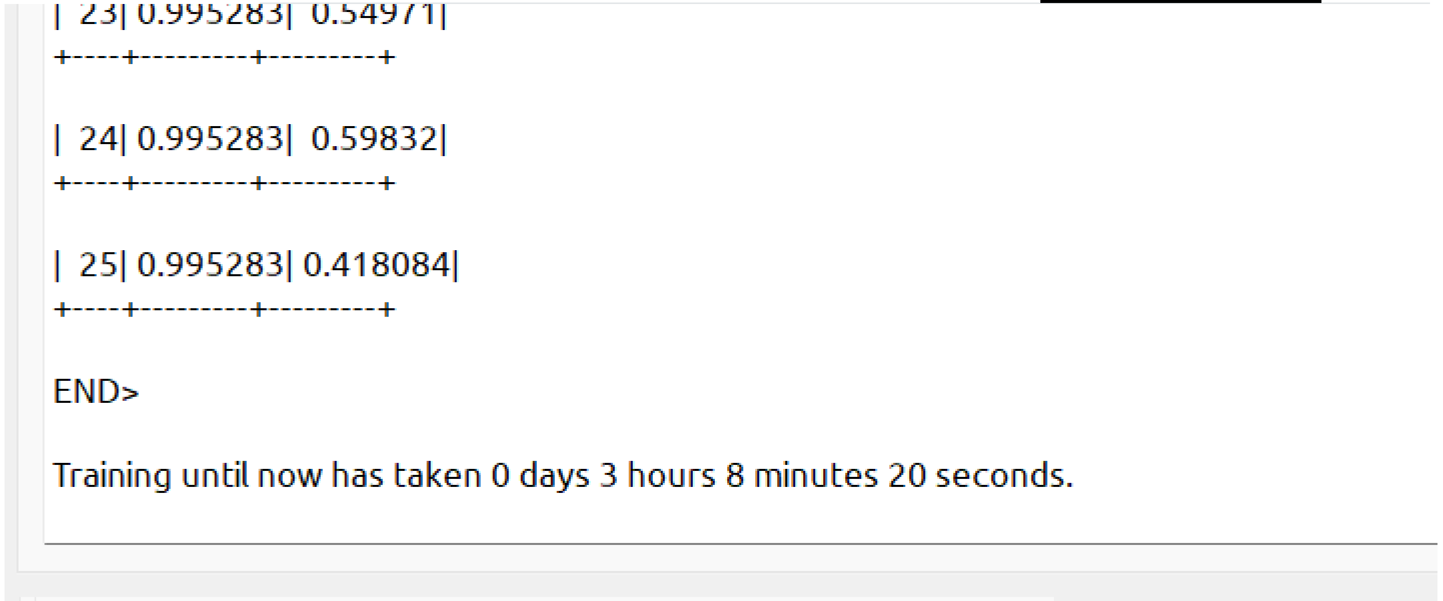
3. Real-time Face Detection using webcam

(I have included all the source code for these individual task in our GitHub Link.)

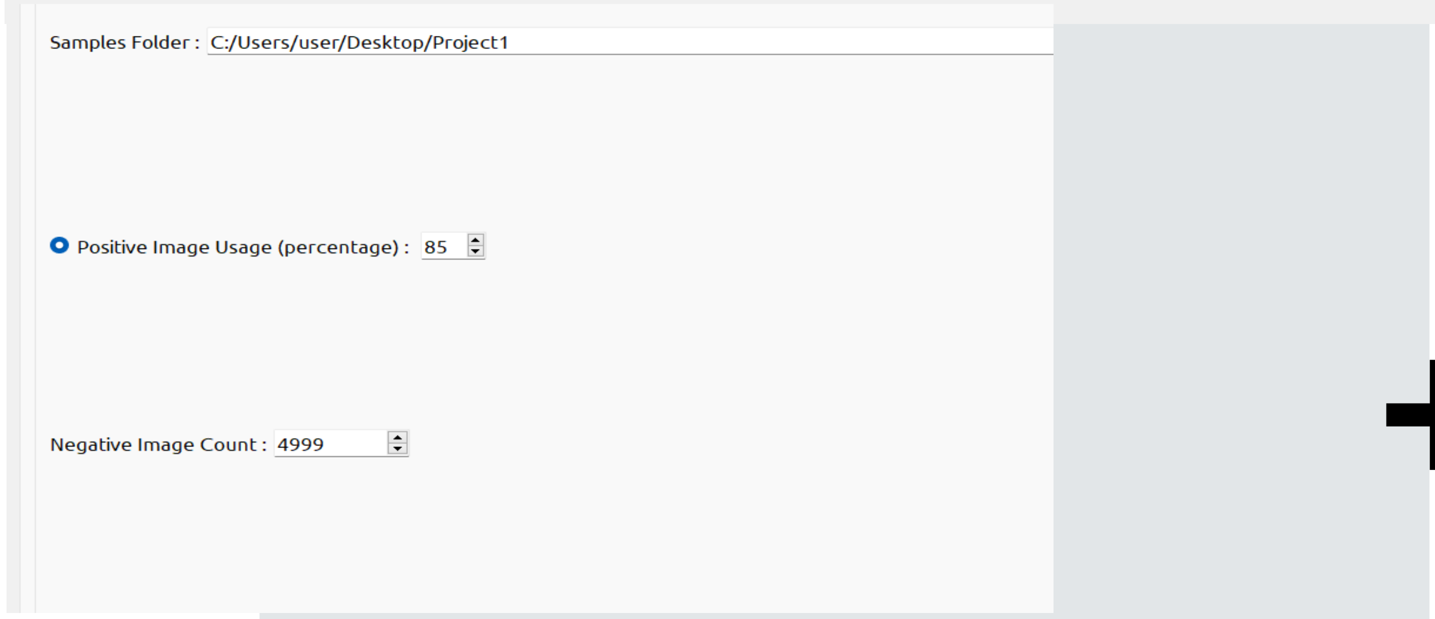
Training of Data using GUI



```
NEG current samples: 4765
NEG current samples: 4766
NEG current samples: 4767
NEG current samples: 4768
NEG current samples
: 4769
NEG current samples: 4770
NEG current samples: 4771
NEG current samples: 4772
NEG current samples: 4773
NEG current samples: 4774
NEG current samples: 4775
NEG current samples: 4776
NEG current samples: 4777
NEG current samples: 4778
NEG current samples: 4779
NEG current samples: 4780
NEG current samples: 4781
NEG current samples: 4782
NEG current samples: 4783
NEG current samples: 4784
NEG count : acceptanceRatio    4784 : 2.20169e-05

Precalculation time: 14.725

+----+---------+---------+
|  N |    HR   |    FA   |
+----+---------+---------+

|   1|        1|        1|
+----+---------+---------+
```



```
|  23| 0.995283|  0.54971|
+----+---------+---------+

|  24| 0.995283|  0.59832|
+----+---------+---------+

|  25| 0.995283| 0.418084|
+----+---------+---------+

END>

Training until now has taken 0 days 3 hours 8 minutes 20 seconds.
```



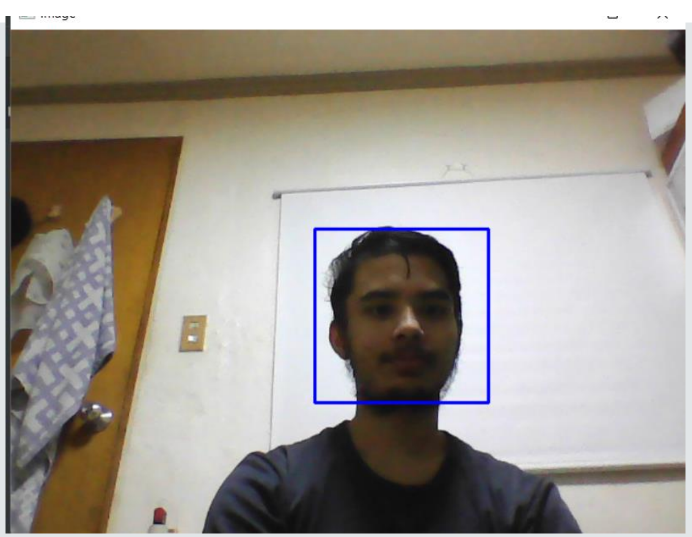
Samples Folder : C:/Users/user/Desktop/Project1

● Positive Image Usage (percentage) : 85

Negative Image Count : 4999

Testing of .xml file

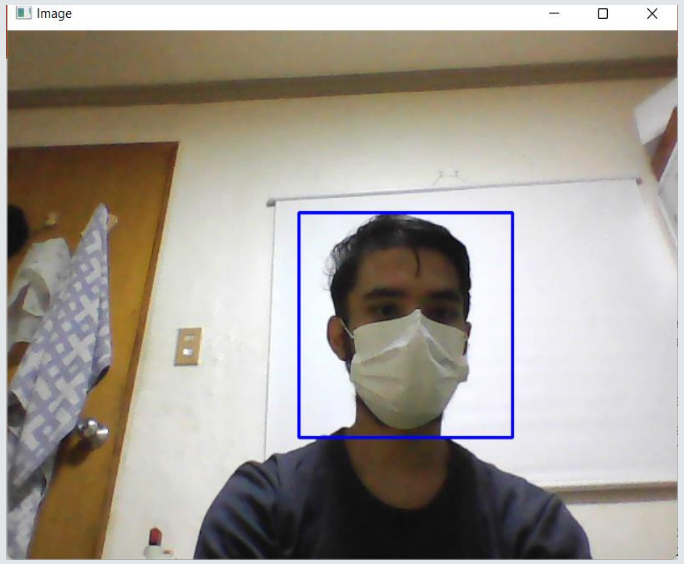
– After the training process, the created .xml file is used to test real-time face-detection using open-cv.
The observation were made based on following 6 limitations:



1. Viewpoint Variation

Viewpoint Variation refers to the camera angle orientation towards the face. Camera might or might not be able to detect while there is variation in the camera's angle of view.

Our Observation during testing : Due to lack of positive samples, the camera could detect only to certain orientation. Adding extra samples might solve the problem.



2. Deformation

3. Occlusion

Faces with glasses, masks, or face covered to certain aspect falls under deformation and occlusion.

Our Observation during Testing: It was taking abit time to process but was able to detect it successfully.

Testing of .xml file

4. Illumination Conditions

Detection of faces in different stages of illumination: bright or dark. Our observation during testing : It couldn’t detect in the extreme dark.. But in extra light into the face and in some low illumination condition, the .xml file could detect the face.

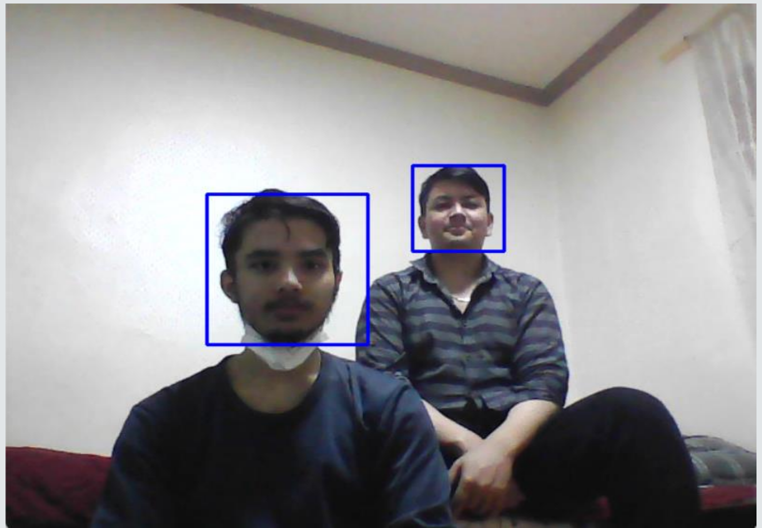
5. Cluttered or textured background

Detection of objects in the background as a face.

Our observation during testing : Only the faces were detected while testing ours.

6. Intra-Class Variation
Multiple class inside the frame of video capture and detection of the faces that falls under that.

Our observation during testing : It was able to detect multiple faces inside the frame of the



Errors / Problems during the Project & Things We got to Learn

– Initially we had trouble collecting good data. Due to presence of noises in the positive data set, we did not had any result as expected and we had to redo the entire process and cropped the images to avoid more of the background noises.

What we learnt is that, presence of little noises can have some huge impact while working with our real life scenarios like Face Detection.

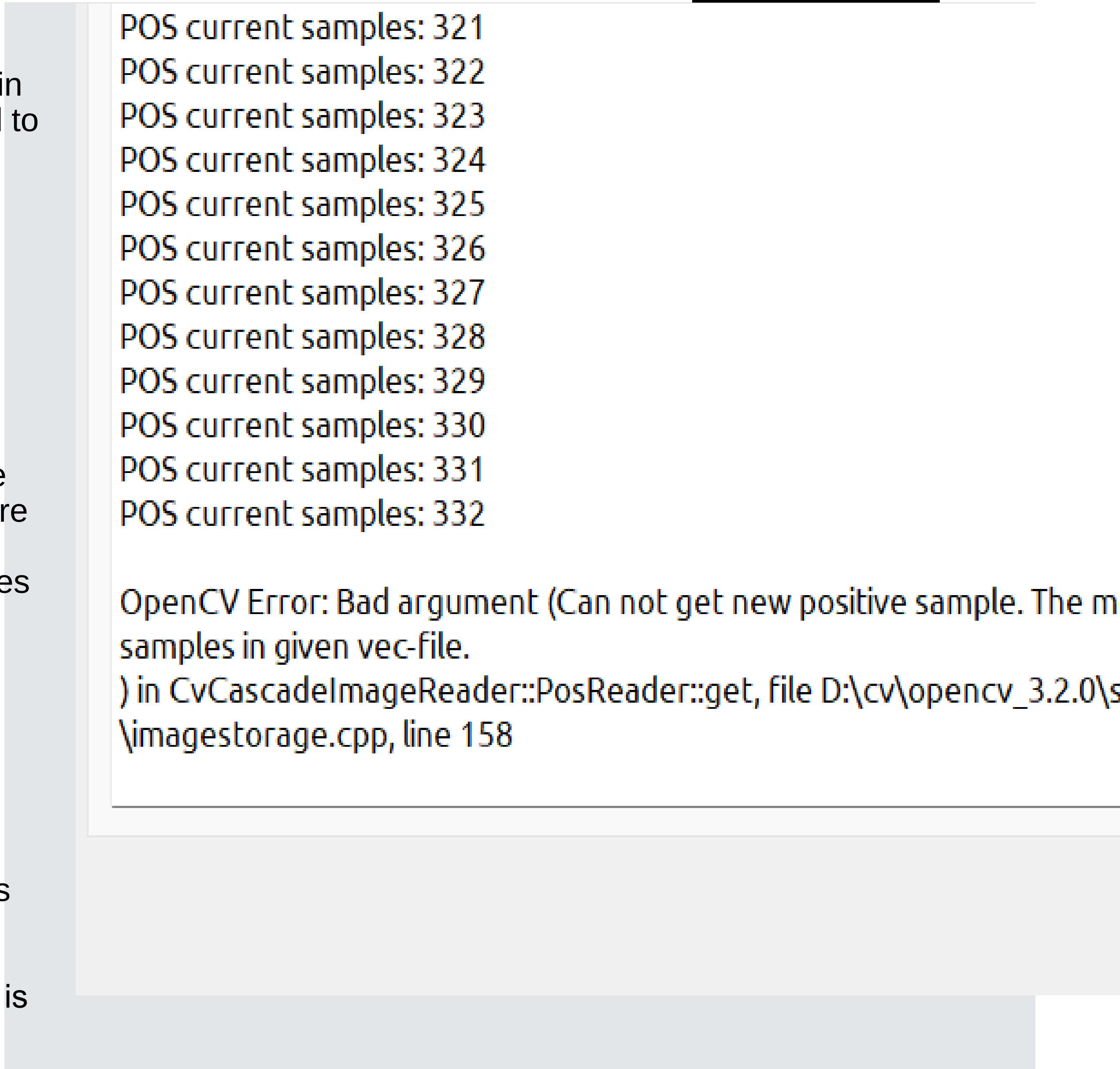
– After Data Collection, During training process, multiple times we were having open-cv error as shown in the image aside.

– After troubleshooting the error from web, we could only find the possible solution is to reduce the number of positive samples so despite having lots of positive samples, we could not use them all. While we were using certain samples of positive data, we were having the error so the cascade file is made with 1000 positive samples and over 5000 negatives but the percentage is set to 87%.

Professor mentioned to keep it 100% but it was having error over 90%. We spent hours of training trying to find the limit and it was 87%.

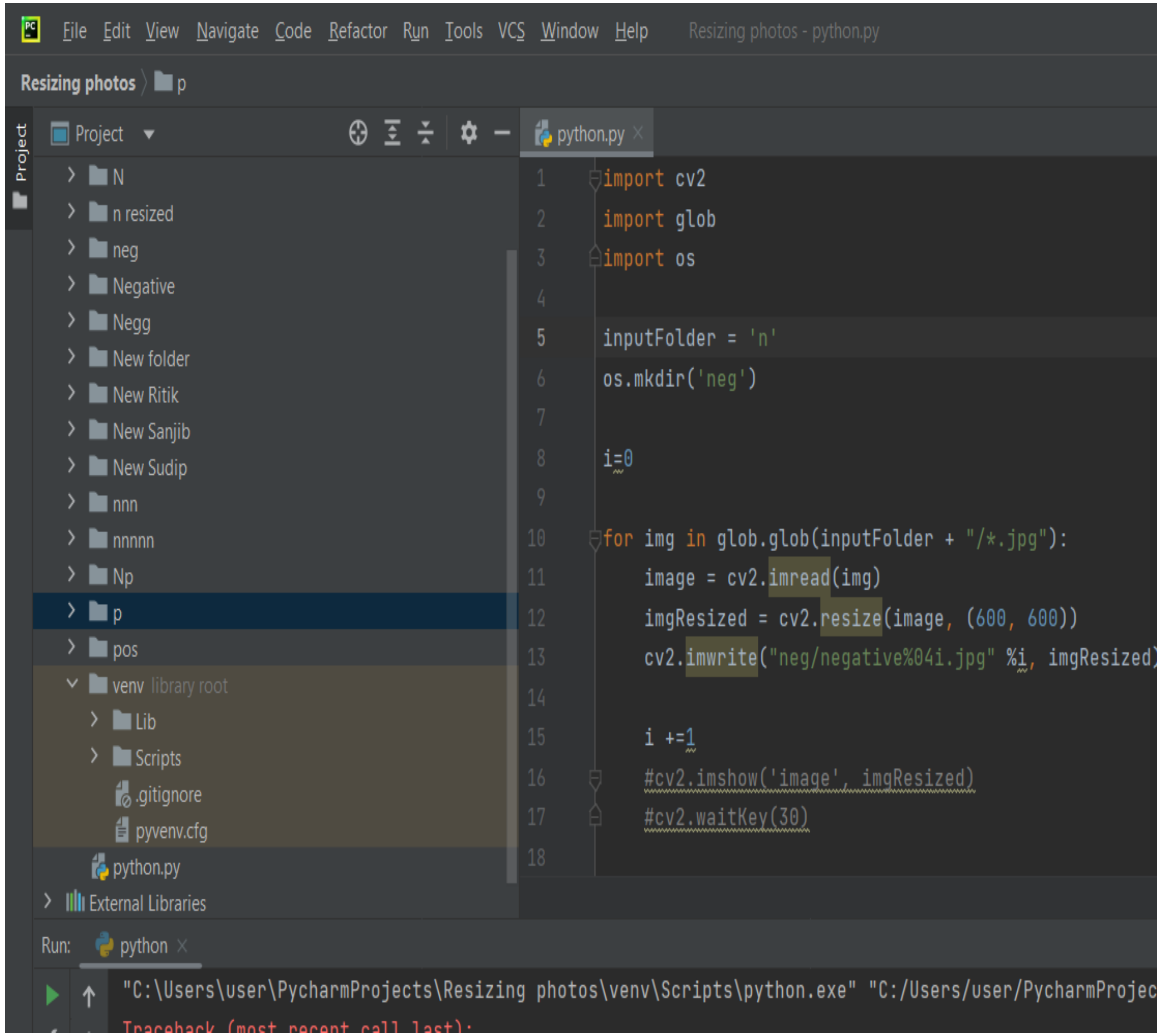
There is still some confusion about this error so small guidance from professor would help a lot.

– Higher Quality and High Numbers of Samples takes the training process so long and sometimes it was crashing the PC.. So despite knowing where the error is and even though we wanted to improve the quality of detection, we couldn't do that because of such problems. However, this is a great practice for the team.



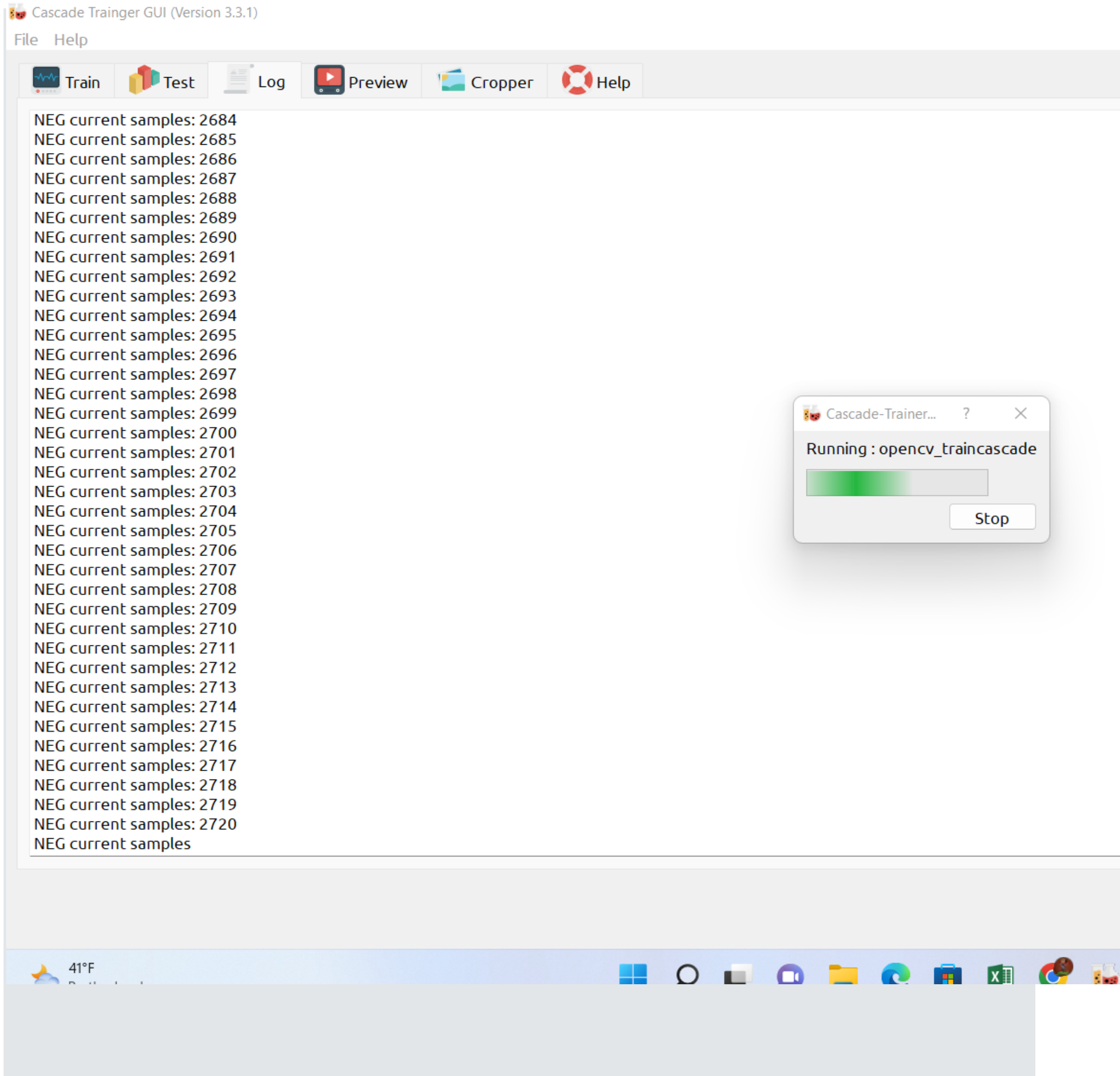
```
POS current samples: 321
POS current samples: 322
POS current samples: 323
POS current samples: 324
POS current samples: 325
POS current samples: 326
POS current samples: 327
POS current samples: 328
POS current samples: 329
POS current samples: 330
POS current samples: 331
POS current samples: 332

OpenCV Error: Bad argument (Can not get new positive sample. The m
samples in given vec-file.
) in CvCascadeImageReader::PosReader::get, file D:\cv\opencv_3.2.0\s
\imagestorage.cpp, line 158
```

Images Related to Project



```python
import cv2
import glob
import os

inputFolder = 'n'
os.mkdir('neg')

i=0

for img in glob.glob(inputFolder + "/*.jpg"):
    image = cv2.imread(img)
    imgResized = cv2.resize(image, (600, 600))
    cv2.imwrite("neg/negative%04i.jpg" %i, imgResized

    i +=1
    #cv2.imshow('image', imgResized)
    #cv2.waitKey(30)

```

```
"C:\Users\user\PycharmProjects\Resizing photos\venv\Scripts\python.exe" "C:/Users/user/PycharmProjec
Traceback (most recent call last):
```



```
NEG current samples: 2684
NEG current samples: 2685
NEG current samples: 2686
NEG current samples: 2687
NEG current samples: 2688
NEG current samples: 2689
NEG current samples: 2690
NEG current samples: 2691
NEG current samples: 2692
NEG current samples: 2693
NEG current samples: 2694
NEG current samples: 2695
NEG current samples: 2696
NEG current samples: 2697
NEG current samples: 2698
NEG current samples: 2699
NEG current samples: 2700
NEG current samples: 2701
NEG current samples: 2702
NEG current samples: 2703
NEG current samples: 2704
NEG current samples: 2705
NEG current samples: 2706
NEG current samples: 2707
NEG current samples: 2708
NEG current samples: 2709
NEG current samples: 2710
NEG current samples: 2711
NEG current samples: 2712
NEG current samples: 2713
NEG current samples: 2714
NEG current samples: 2715
NEG current samples: 2716
NEG current samples: 2717
NEG current samples: 2718
NEG current samples: 2719
NEG current samples: 2720
NEG current samples
```

Running : opencv_traincascade