

# Review of Face Detection using HAAR Cascade with Static and Live Detection Functionality

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**Abstract:** Human facial recognition is characterized as a method of identifying facts or affirmations of a test personality. Face recognition is available for PC devices with some implementation that can recognize faces in images. Usually face recognition is achieved by using the "correct" data from the frontal photo. While there are often enough cases where a full frontal cannot be obtained, a working example is a defective face from a CCTV camera. The three stages of the proposed face recognition method include a face data collection (FDG) process, a training stored image (TSI) stage, a face recognition using a local (FRUL) binary pattern histogram (LBPH) algorithm, and the classification calculation has been divided into four stages by the division test.

**Keywords:** Face Detection, Haar Cascade, Viola-Jones Algorithm, OpenCV, Integral Image, etc.

## I. INTRODUCTION

Face recognition is an artificial intelligence-based computing technology that detects and locates the presence of human faces in digital photos and videos. It can be viewed as a special case of object class detection, where the task is to determine the location and size of all objects of a certain class (faces in this case) in an image or images. Facial recognition tells facial analysis algorithms which parts of an image (or video) to focus on when recognizing age, detecting gender, and analyzing emotions based on facial expressions. In the context of facial analysis, facial detection tells the facial analysis algorithm which part of an image (or video) to focus when identifying age, recognizing sex, and analyzing emotions based on facial expressions. And when it comes to face recognition, facial detection is needed for algorithms to find out which parts of an image (or video) will be used to produce molds that are compared to the molds that are previously stored to determine whether there is a compatibility or not.

## II. BACKGROUND

As we all know that previously there are lots of obstacles for teachers to take the attendance manually and there might be situations where students give proxy for their friends which is wrong. So, we came with the solution that we should implement the attendance using face detection so that there won't be any kind of malpractice's carried out in the school or colleges, universities. This project is highly efficient and if we came up with proper resources then this can also be implemented in the offices and one day there will be a neutral method to check the attendance or carry out other functionalities with face detection. We can also use this method to allow only authorized person to let in some highly secure places where authorized entry is mandatory. Hence, we can see that there are lot of functionalities available to carry out with this face detection method.

### Objectives:

1. The Main objective is to provide a full authenticated platform for carrying out face detection of static images as well as live face detection.
2. Real-time face recognition systems are able to identify or verify people from video frames.

### Goal:

The main goal of our project is to provide a system who can perform the task of face recognition. The whole goal is to make the work of humans easy by making the computer do the task of humans which is the goal behind machine learning.

Also, the machine gets intelligent from the data which we provide and learns from it. Which is the goal of Artificial intelligence.

### III. METHODOLOGY

Technology Used – Python, OpenCV.

Algorithm Used – Haar Cascade.

According to the Viola-Jonas algorithm, to detect features such as haar in an image, under the formula must give closer results to 1. The closer value with 1, the greater the change in detecting the haar features in the image.

Equation: -

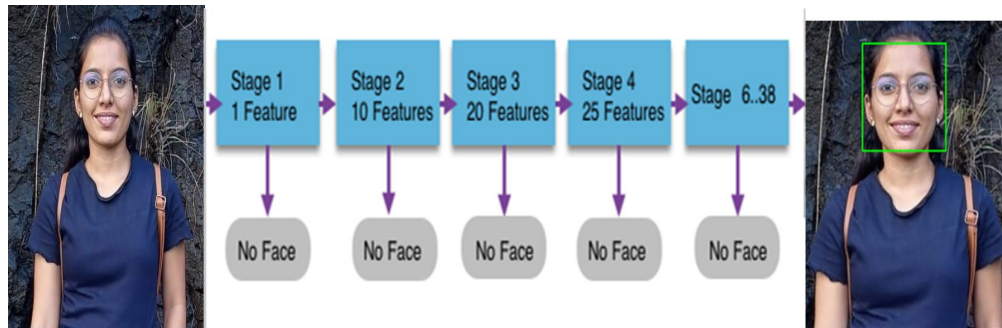
$$\Delta = \text{dark-white} = \frac{1}{n} \sum_{\text{dark}} I(x) - \frac{1}{n} \sum_{\text{white}} I(x)$$

For image (refer first box below), pixel values are 0 or 1 (*ideal case*) but in real cases we have normalized greyscale image as shown in bottom box containing pixel.

0	0	1	1
0	0	1	1
0	0	1	1
0	0	1	1

0.1	0.2	0.6	0.8
0.3	0.2	0.6	0.8
0.2	0.1	0.8	0.6
0.2	0.1	0.8	0.9

Using a sliding window and the number of Haar features (increases with the number of stages), eventually leads to detecting the face or not. There are a total of 38 stages specified for the Viola Jonas method. Depending on the size of the sliding window and the location of the face, the number of features, the face can be detected at a certain stage.



#### Static Face Detection:

- In this Module the images are load into the directory whose faces have to be detected.
- Enter the below command to execute the functionality:

“Python haar\_face\_detector.py --image images/dance.png”

```
Command Prompt - python haar_face_detector.py --image images/dance.png
Microsoft Windows [Version 10.0.19044.1045]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Pallavi>
C:\Users\Pallavi>cd python
C:\Users\Pallavi>cd python\haar-face-detection
C:\Users\Pallavi>python\haar-face-detection\python haar_face_detector.py --image images/dance.png
[INFO] loading face detector...
[INFO] performing face detection...
[INFO] 4 faces detected...
```

Figure 1: Command Prompt View

**Detecting Multiple Static Face:**

- After entering the command, it shows loading face detector, performing face detection.
- Then the number of faces that are detected will be displayed.

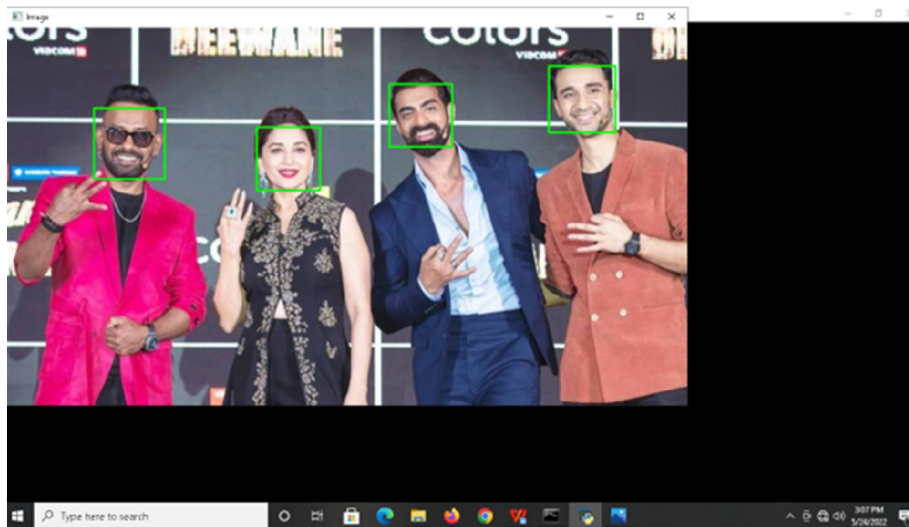


Figure 2: Output View

**Single Face Static Detection:**

- In this Module the images are load into the directory whose faces have to be detected.
- Enter the below command to execute the functionality:  
“python haar\_face\_detector.py --image images/gauri.png”

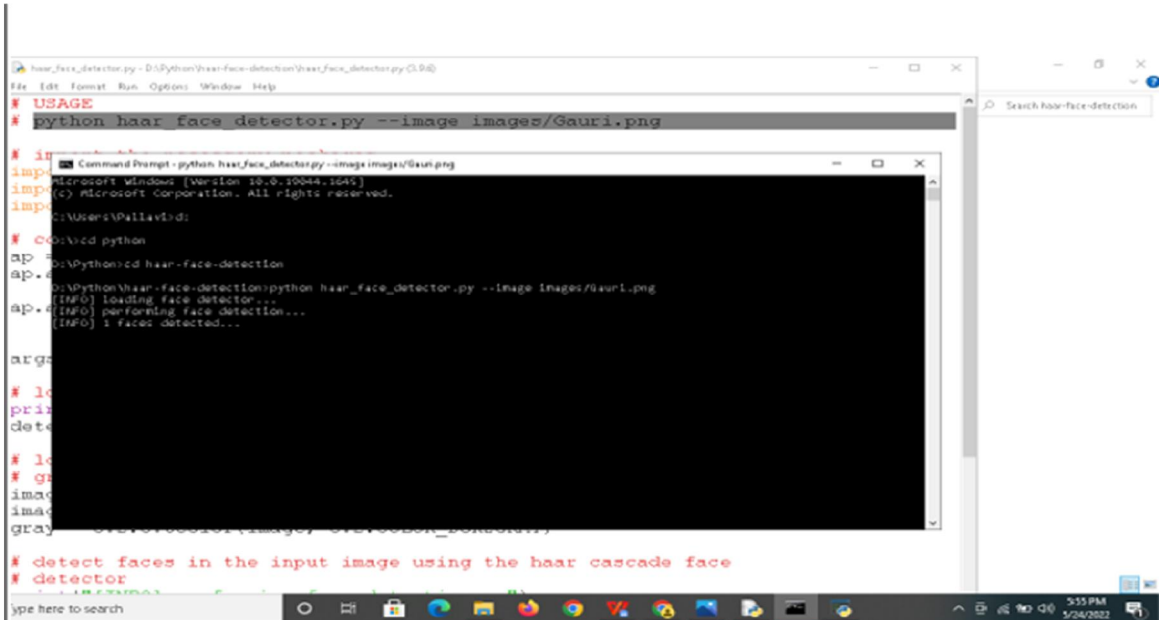


Figure 3: Single Face Detection View

**Detecting Single Static Face:**

- After entering the command, it shows loading face detector, performing face detection.
- Then the number of faces that is detected will be displayed.

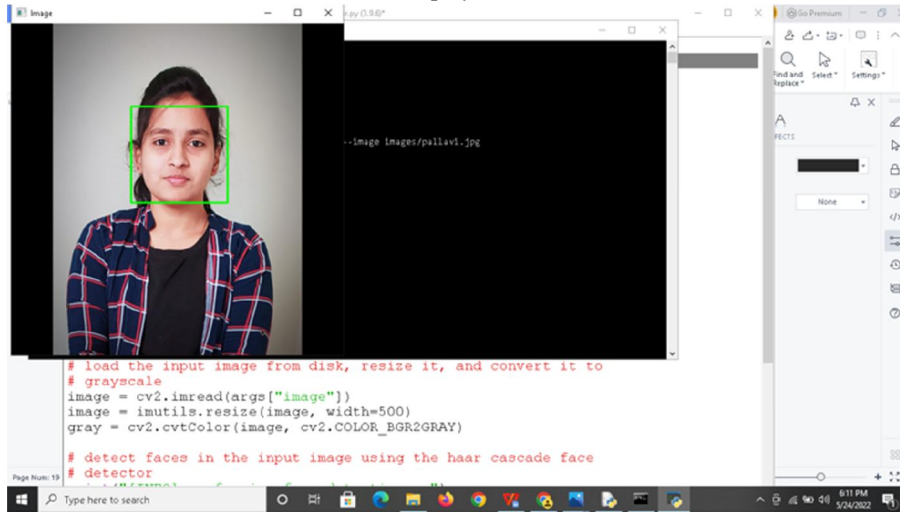
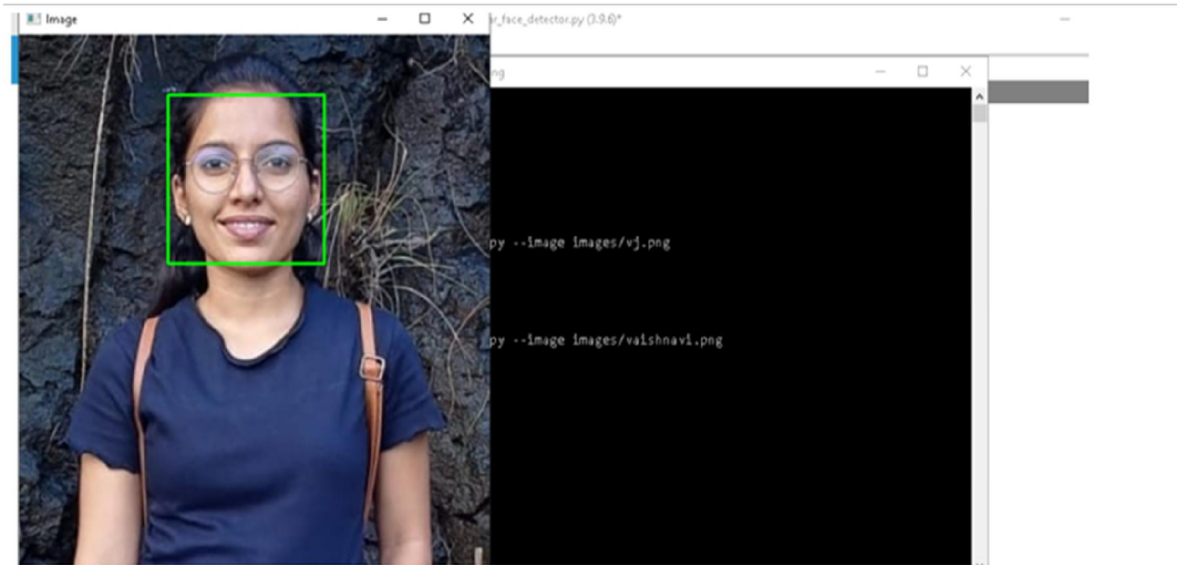


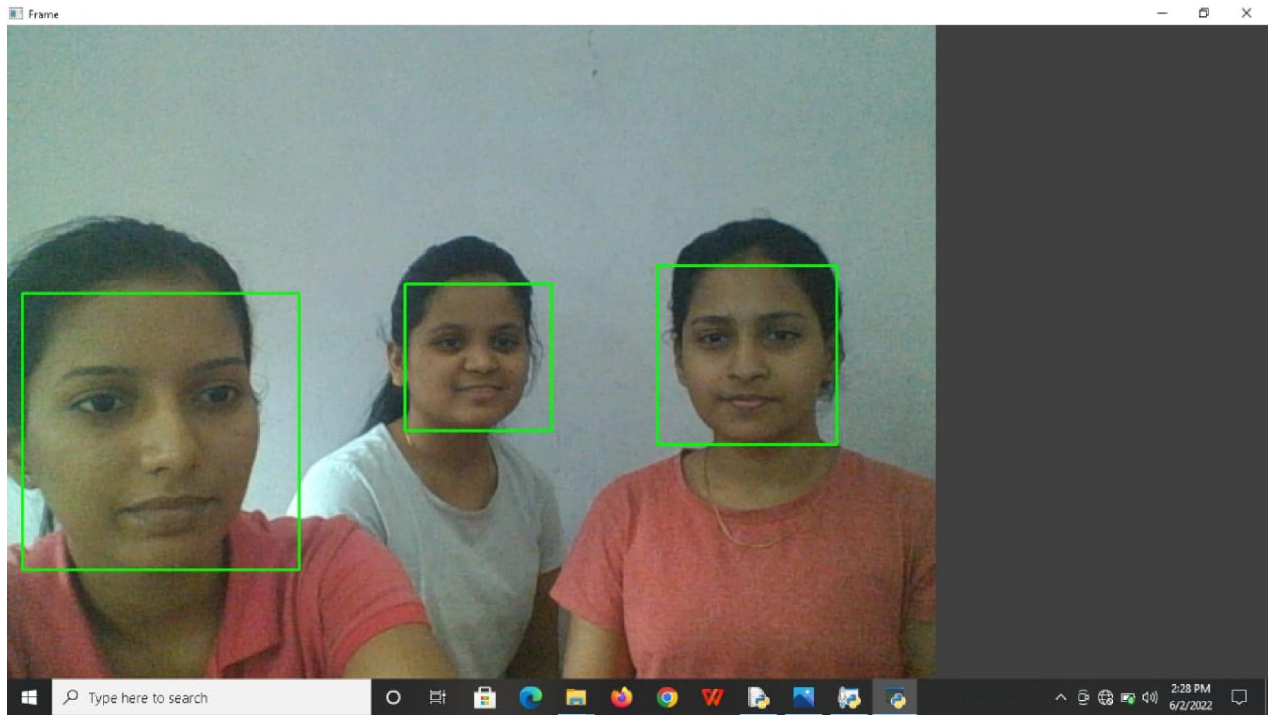
Figure 4: Face Detected



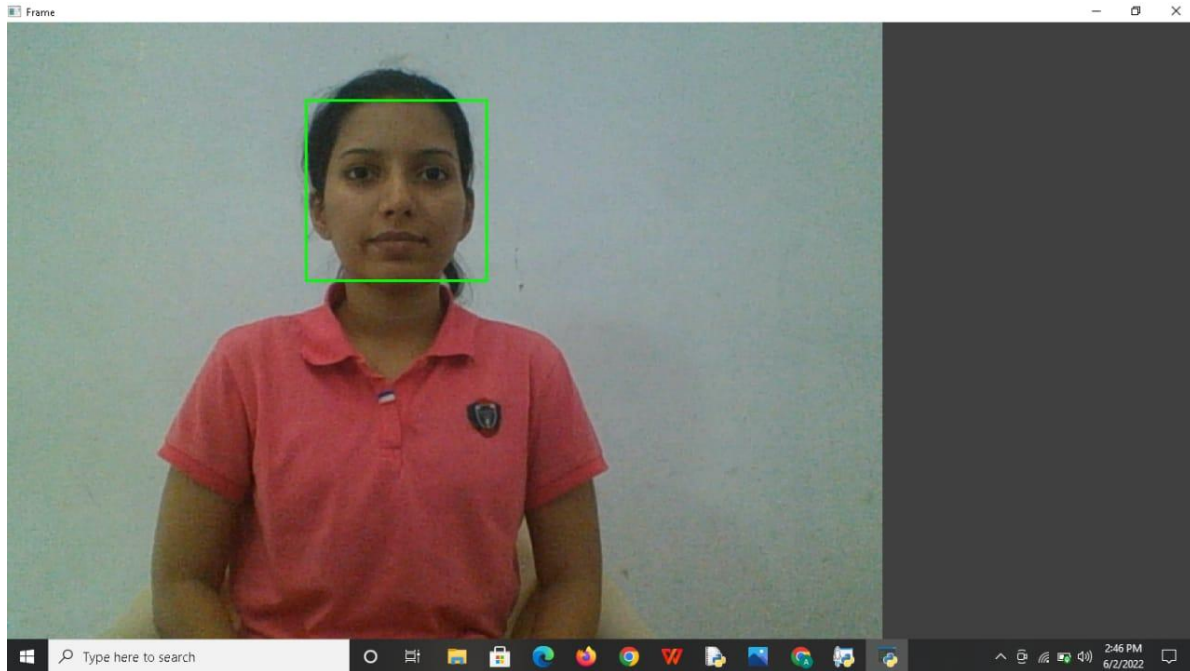
**Figure 5:** Face Detected with Unstable Background

**Live Video Detection:**

In this module the live face is detected.



**Figure 6:** Multiple Live Faces Detected



**Figure 7: Single Live Face Detection**

#### IV. CONCLUSIONS

Thus, facial detection is influenced by the clarity of the image, color image or black and white. This can only support frontal image detection. Training does require a lot of time to separate the negative face from a positive face using an adaptive boost algorithm and cascading which helps in faster detection. The face detection and recognition system will definitely improve the process of checking students' presence compared to other biometrics authentication methods and in the right circumstances it will be able to match the accuracy. At present there are various kinds of software, whether it is a face like Microsoft face or library such as OpenCV, which makes face detection and introduction of access and can be relied upon and continue to improve. Each software imposes various limits, so the limited number of calls that you can do to Microsoft's Face API. However, using one software can reduce this limit and produce better results.

#### V. FUTURE SCOPE

The proposed system is the computerized and advanced version of the existing system. Provides easy and quick access over the data. Able to have eagle's view the faces detected statically as well as live and ensuring guidelines are met to standards. This System can be extended from multiple departments to multiple Institutes on subscription Basis as SaaS.

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