



# EMOTION, AGE AND GENDER DETECTION AND PEOPLE COUNT IN CAMPUS USING OPENCV

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**Abstract:** In this fast-emerging world digital environment plays the crucial role. Every human has stuck into the digital things and its wide range of using applications. In this paper I am going to research about the detection of the emotion, age, gender and the people count in the campus premises using OpenCV with the help of the human facial recognition. For the emotion detection I have used the Deepface library, Keras library for high-level deep learning API and for the age and gender detection Adience dataset is used. NumPy library is used for the numerical values and the TensorFlow library is created for the fast numerical computing values which has represented in the code. And there is a Caffe model which is used for the data processing and Json library is to structing the data. For all the work related to the libraries I have used the python platform. These all aspects are being installed in the python application for getting the accurate and better results. At the time of facial capturing/recognition there must be a camera requirement for the result, it can be a laptop camera or you can use the webcam as of your requirement. This work is used in the colleges and educational institutions and other security related application which can detect the persons male or female, it justifies how many male and female and as well as the total people who are entered inside the campus, leaving the campus and the total how many people still inside the campus.

**Index Terms:** *OpenCV, Caffe model, Json, Keras, NumPy, Adience dataset, Deepface*

## I. INTRODUCTION

Now-a-days the environment grown faster with the help of the Artificial Intelligence and Machine Learning. By utilizing pre-trained models, this work demonstrates how advanced innovation can be applied to everyday tasks, from understanding customer demographics in retail settings to enhancing security systems with emotion recognition capabilities. For age, gender, and emotion detection, deep learning models trained on large datasets are commonly used. These models can analyze images or video frames to identify faces and predict attributes such as age, gender, and emotional expressions. Open-source libraries like OpenCV, TensorFlow, and PyTorch offer pre-trained models and tools for implementing these tasks efficiently. Additionally, cloud-based APIs like Microsoft Azure's Face API or Google Cloud Vision API provide convenient services for age, gender, and emotion recognition, eliminating the need for local model deployment and management. In general, age, gender, and emotion detection are fundamental components of many AI-driven systems, providing valuable insights into human behaviour and preferences. As technology evolves, these capabilities will continue to play a significant role in various fields, contributing to more personalized and intelligently interactive experiences between humans and machines.

## II. LITERATURE REVIEW

- [1] **Mahija Kante and others [1]** The study which detect and identify age and gender with the help of convolutional neural network and using OpenCV. Along with CNN and OpenCV we use Adience dataset so that the output is achieved with accurate values in training and validation.
- [2] **Saumya Salian [9]** The basic aim of this paper is to develop an algorithm that estimates age and gender of a person correctly. One of the most widely used techniques is haar cascade. In this paper we propose a model which can predict the gender of a person with the assistance of Haar Cascade. The model trained the classifier with different male and female images as positive and negative images. Different facial features are extracted. With the assistance of Haar Cascade classifier will determine whether the input image is male or female. We made use of Deep Convolution neural network.
- [3] **Pravin.V.Thakare [4]** The objective of this article is to provide a simpler and easy method in machine technology. The ideal way of recognizing human face opencv, python is a part of deep learning.
- [4] **M.Mamatha [5]** This project deals with detecting age and gender of a person from his or her face features using OpenCV and Deep Learning model. Many people may not have sufficient computing power to train the model on a huge dataset of images.
- [5] **Suresh Samdade and others [3]** study of the age and gender detection classification using the convolutional neural networks and opencv. Using the fields of Artificial Intelligence we can reduce use of hardware components and complexity.
- [6] **Salah Eddine Bekhouche [12]** Our proposed approach is on Multi Level Local Quantization (ML-LPQ) features which are extracted from normalized face images. To predict the age group and gender of a person two different Support Vector Machines (SVM) models are used.

## III. BACKGROUND WORK

In this session we are mainly focusing on the emotion, age, gender and count inside the campus. All the previous works related to the age and gender detection are only predicting the age and gender with the help of giving an input image but here we can able to detect the age and gender in live and with that we have added the emotions to it and the persons count in that one. Human classification is an age-old strategy and being exhausted various areas and innovation such as biometrics, legal sciences, picture processing, identification system and so on.

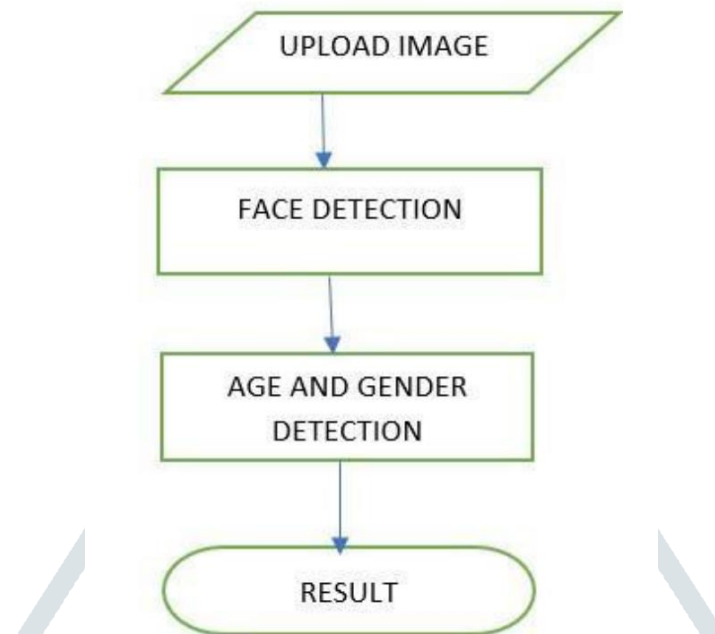
As compared to the previous methods, I have checked some of the age and gender detection methods in which at the output end in the camera it is getting hanged up when the person moves side it will getting stuck that the person like a statue manner with a blur image and as well as the another thing is that to mention is when we close our face with our hands it was not capturing the hands that were closed on our face that means it remains again statue in the video recording it was not at all working well. For all these instances I have observed during my research I made a check-mate for those aspects and further I have added some other things which are really aspiring me.

The thing is to remember that in our paper is I have focused on dealing with major faults which were present in the previous some of the methods which I have seen in that one is rectified and another one is I have added the emotions of a human to detect whether they are neutral or feeling ill and as well as the count representing how many are there in the frame.

In addition to that apart from these, I have done the people count who are entering inside the campus and leaving the campus. In that it will shows the result as how many people still present inside the campus; how many people entered and left the campus with in the given input video.

## IV. METHODOLOGY

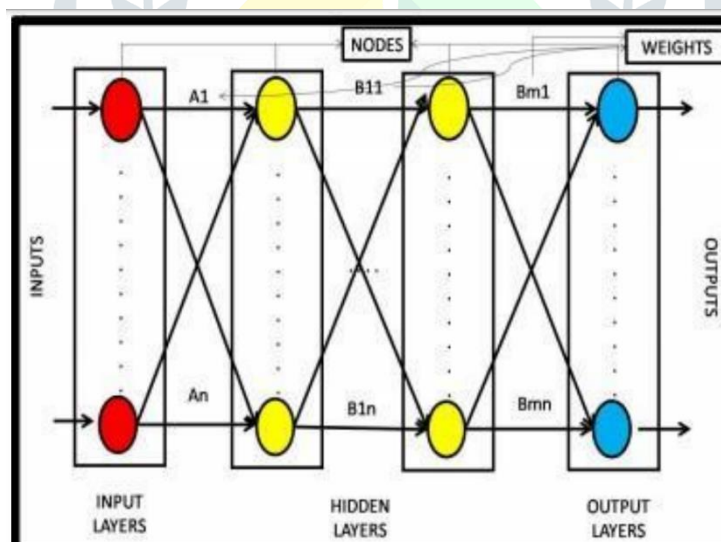
### 4.1 EXISTING MODEL



**Fig 1:** Flow Chart Representation of Existing Model

The representation of the existing model explicit that it starts with the upload image and then undergoes for the face detection technique, after that it will detect the age and gender of the human face and finally the result will appear at the end.

In this model, the convolution neural network is used for the facial detection of the image using OpenCV. They have three layers input layer, hidden layer and output layer. Each layer is having very large number of neurons with certain value of weights.

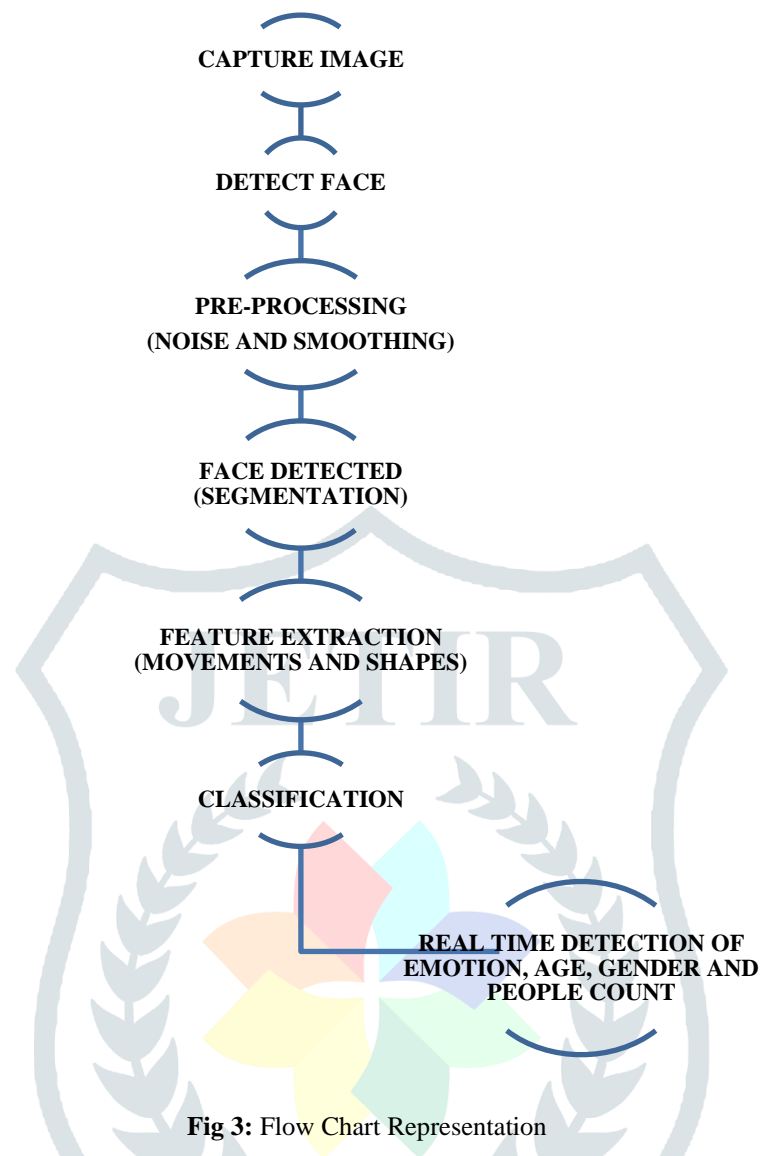


**Fig 2:** Basic Neural Network

The three convolutional layers used in the convolutional neural network are

- ❖ Convolutional layer: 96 nodes, kernel size 7
- ❖ Convolutional layer: 256 nodes, kernel size 5
- ❖ Convolutional layer: 384 nodes, kernel size 3[22]

## 4.2 PROPOSED MODEL



**Fig 3:** Flow Chart Representation

### Capture image

According to the flow chart provided, firstly it will open the camera will capture the image.

### Detect face

After capturing the image, it will be waiting for the face of a person to be detected.

### Pre-processing

Detecting the face of person it will undergo pre-processing (noise and smoothing) stage which will captures the important patterns in our data and leaving out the unimportant patterns (noise).

### Segmentation

In this segmentation process, it provides the fine-grained information about the object boundaries and their regions. The face will be detected at this stage accurately.

### Feature extraction

At this stage, the facial data which was detected that was transferred to numerical values according to the movement and shape of the face detected. It means that the collected raw data can be transferred into numerical feature.

### Classification

In this section, Haar cascade classifier is used for the facial detection model and for the gender detection and age detection models as well. It is a binary classifier which uses a function that runs on the whole image which is represented by a window.

## Real time detection

This is the final output stage which will show the emotion of a person whether angry, neutral, happy, sad, fearful and gender male or female and age group with the Adience dataset and the count of the total people present in the frame.

## V. EXPERIMENTAL PROCEDURE

Primarily, this paper deals with the real time emotion, age, gender and people count in the frame as on the other hand it also deals with the people who are coming and leaving the campus and the people out of entered how many still exists inside the campus by giving the input video.

For all the procedure to begin we need to have the OpenCV-python software first.

### 5.1 OpenCV

OpenCV stands for (Open Source Computer Vision Library). It mainly deals with the programming function on the real time computer vision. It was officially launched on 1999 by the Intel and initial release on 2000, later it was supported by Willow Garage. It is cross-platform and licensed as free and open-source software which can be available for free to all users.

This cross-platform has come up with the programming languages like C, C++, Java, Python, Assembly language. Here I am using OpenCV-Python software. Some of its widely using areas of application are facial recognition, motion video tracking, gesture recognition, augmented reality, object detection, segmentation and recognition. This OpenCV-Python software should be installed first on the laptop or computer.

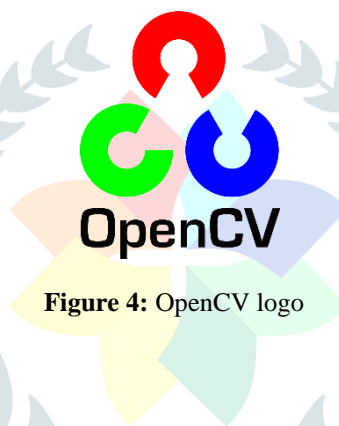


Figure 4: OpenCV logo

### 5.2 MODELS AND LIBRARIES

#### 5.2.1 Libraries

For the execution and running of the program we need some of the libraries and models. They are Keras, NumPy, Deepface, Json, Caffe model, Adience dataset. Those all libraries need to be installed before running the program otherwise error will occur and execution will not happen.

The installation procedure for the libraries is: open the command window. After opening the command window prompt enter the command –

```
pip install opencv-python library-name
```

and then hit enter. For the library you have entered the name that library will be installed step by step. Like this all the libraries need to be installed one after another using the command provided above. All the libraries cannot be installed at once, one after another installation only possible. All the set-up is done it will show the status as successful installation.

**Note:** There must be an active internet connection for the libraries to be installed.

#### 5.2.2 Model

The Caffe model is used in this work. Caffe stands for (Convolutional Architecture for Fast Feature Embedding). It is a deep learning framework origin from the University of California, Berkeley. It is open-source library and it works with the programming languages on C++ with the Python interface.

It deals with the image classification and image segmentation.

#### 5.3 Programming procedure

**Code:** A Python program should be written for the execution of the required output.

**Set of files:** Before compiling the program, some sets of files are required to load the model and data. The below mentioned files are pre-trained models.

- ❖ emotion\_model.h5
- ❖ emotion\_model.json
- ❖ age\_net.caffemodel
- ❖ deploy\_age.prototxt
- ❖ deploy\_gender.prototxt
- ❖ gender\_net.caffemodel

**Location:** All mentioned above files - python program and the pre-trained models are to be located on a single Folder.

**Run or Compile:** After writing the code, hit the run or F5 button.

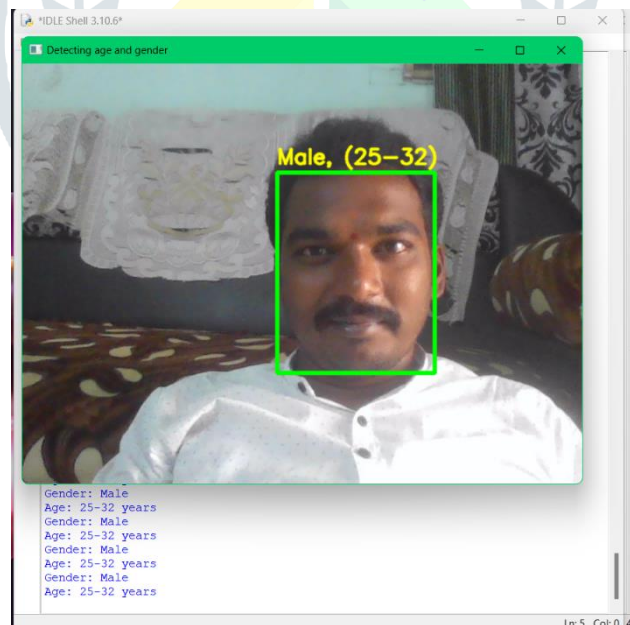
**Output:** A prompt window will open and it load the pre-trained given models from the given folder location and if it executes webcam will open and the results will be taken.

## VI. RESULTS AND DISCUSSIONS

As we can clearly observe the difference between the existing and proposed method which are mentioned below. In the existing results whereas, only the age and gender detection are happened in that method and also the input of the image given within the preferred folder to fetch the data of the image.

In the proposed method, the addition of emotion, number of persons and the people count in the campus is captured through the webcam. It will capture all the aspects in live video recording of the webcam or camera.

### 6.1 EXISTING METHOD RESULTS IN REAL TIME



**Figure 5:** Male (25-32)

Here the output of the image showing the gender as male and the age ranging between (25-32). No emotions are detected.

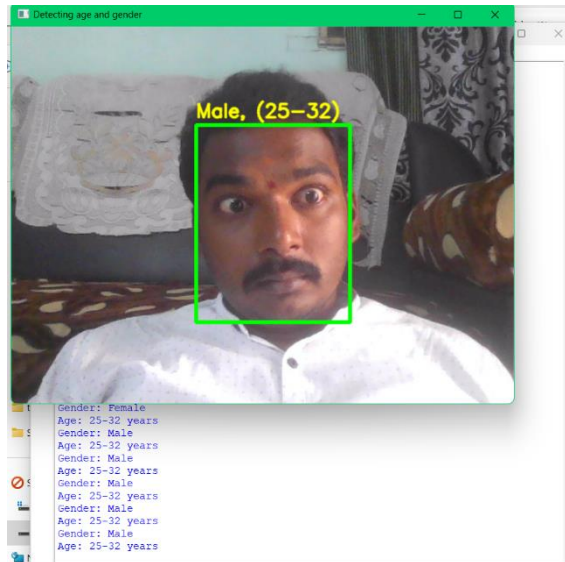


Figure 6: Male (25-32)

Here also the output of the image showing the gender as male and the age ranging between (25-32). We can clearly observe that no emotions are detected.

### 6.2 PROPOSED RESULTS

#### Test Case – 1: Neutral Face

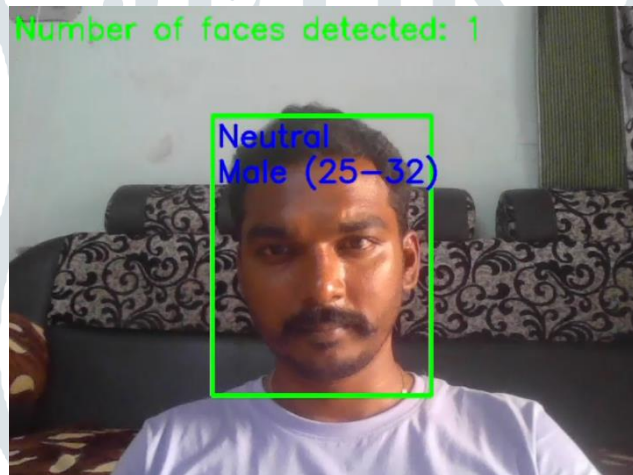


Figure 7: Male (25-32)

Here, the output of the image showing the emotion as neutral, age ranging between (25-32), gender as male and the number of faces detected count in the webcam is 1(one).

#### Test Case – 2: Happy Face

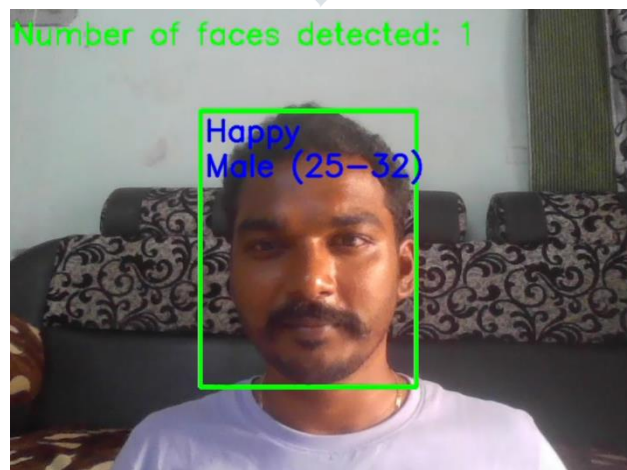
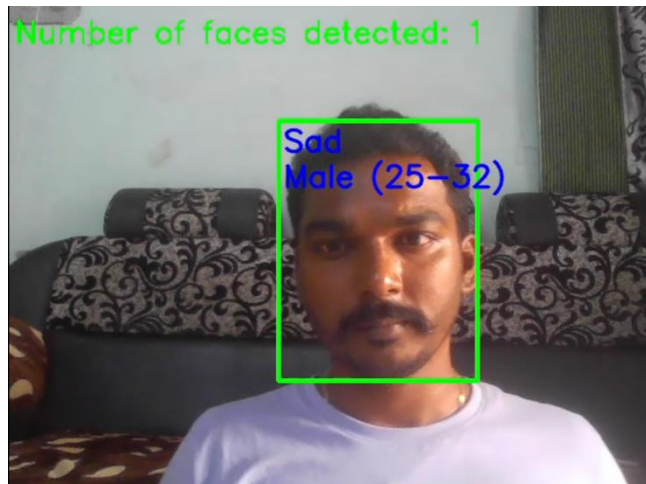


Figure 8: Male (25-32)

Here, the output of the image showing the emotion as happy, age ranging between (25-32), gender as male and the number of faces detected count in the webcam is 1(one).

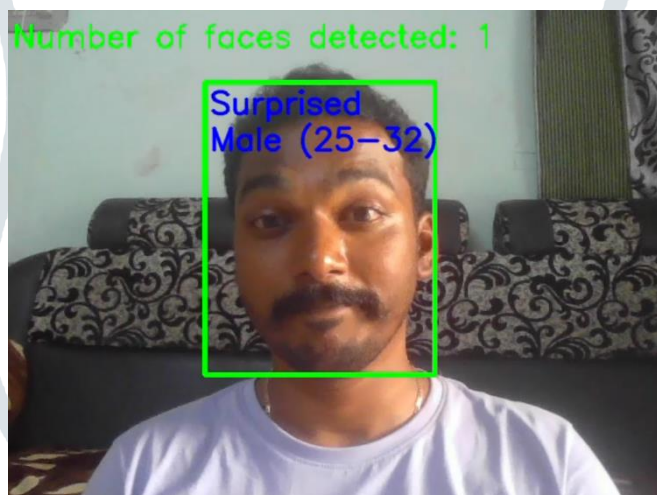
**Test Case – 3: Sad Face**



**Figure 9: Male (25-32)**

Here, the output of the image showing the emotion as sad, age ranging between (25-32), gender as male and the number of faces detected count in the webcam is 1(one).

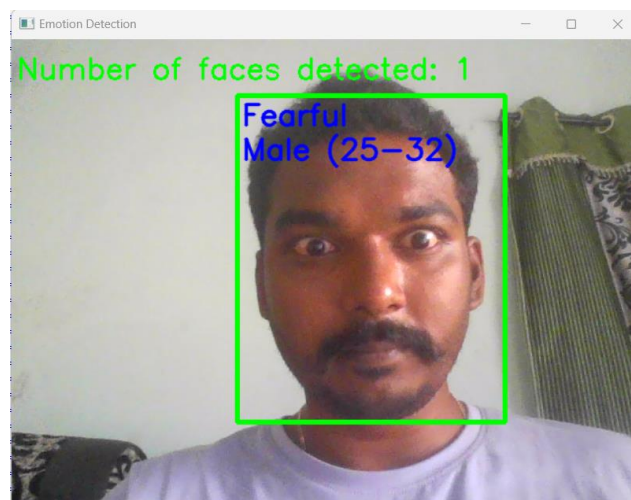
**Test Case – 4: Surprised Face**



**Figure 10: Male (25-32)**

Here, the output of the image showing the emotion as surprised, age ranging between (25-32), gender as male and the number of faces detected count in the webcam is 1(one).

**Test Case – 5: Fearful Face**



**Figure 11: Male (25-32)**



Here, the output of the image showing the emotion as fearful, age ranging between (25-32), gender as male and the number of faces detected count in the webcam is 1(one).

#### Test Case – 6: Bunch of Faces



**Figure 12:** Male (25-32) and (38-43)

Here, there are bunch of people presence in the image. The output of the image showing the emotion of first person as angry, age ranging between (38-43), gender as male and the number of faces detected count in the webcam is 3(three).

The output of the image showing the emotion of second person as neutral, age ranging between (25-32), gender as male and the number of faces detected count in the webcam is 3(three).

The output of the image showing the emotion of third person as neutral, age ranging between (25-32), gender as male and the number of faces detected count in the webcam is 3(three).

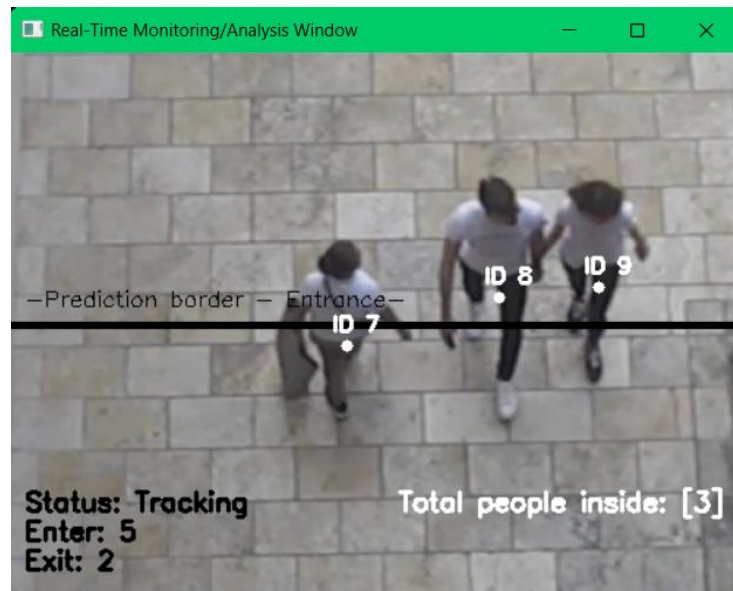
#### Test Case – 7: No Face



**Figure 13:** No Face

Here, the output of the image showing “No Face Found”. It remains as a blank screen.

## Test Case – 8: Output Video



**Figure 14:** Real-Time Monitoring window

Here, the output of the video showing status as tracking. How many people entered inside the campus is 5(five) and left the campus is 2(two). The total people remained inside the campus is 3(three). There is a prediction border which acts as an entrance for the campus.

## VII. CONCLUSION

The detection of emotion, gender and age of a person will be helpful for the educational institutions and security purposes. In educational institutions for taking the attendance, male and female count and illness of a person. In security purposes whom the person entering inside and the age criteria will be helpful for finding the culprit.

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