

# Real Time Face Recognition Age and Gender Detection Using OpenCV and Python

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**Abstract** - This project gives an ideal way of recognizing human face using Open CV, and Python which is part of deep learning. This report contains the ways in which deep learning an important part of computer science field can be used to determine the face using several libraries in Open CV along with python. This report will contain a proposed system which will help in the recognizing the human face in real time. This implementation can be used at various platforms in machines and smartphones, and several software applications. This kind of systems can be used in photos, videos, or in real time machines. The objective of this article is to provide a simpler and easy method in machine technology. With the help of such a technology one can easily recognize the face.

Age and gender prediction from real time images is an important application of computer vision. Based on our results we develop an application for age and gender classification. We show a glimpse of such automated experience with this project. In this project we show how easy it is to detect faces and identify gender along with gender with the help of CNN (Convolutional Neural Networks) and Open CV. Using these fields of Artificial Intelligence, we can reduce the use of hardware components and complexities in this project. Along with CNN and Open CV. For the output to be determined even with multiple parameters we use pre-trained model that is coffee model, Haar Cascade Classifier along with Open CV.

**Keywords**:- Python, Open CV, Deep Learning, Face detection, machine learning, computer vision, classification, image analysis.

## INTRODUCTION

Artificial Intelligence (AI) is a computing technique which imitates human brain for the actions that are performed. These actions can be performed by the AI algorithms with the assistance of Machine Learning (ML) and Deep Learning (DL) algorithms. In order to be able to make decisions/predictions human-like, the model is required to be trained and then verified to decide the outputs. Testing is done to validate over what it has learnt at the training and verify the functionality. Based on input data, the neural network can use the algorithms of machine learning to improve accuracy. Machine learning algorithms like Regression, Classification for Supervised Learning and Clustering for unsupervised learning etc. can be used which help to improve the model's efficiency and accuracy as a supporting algorithm for the output prediction to the main model being developed. The output prediction depends on the present inputs

for those algorithm. Deep Learning improves the overall performance and the efficiency of the model which has to detect characteristics of the person like age and gender by developing a neural network. The model being developed can be used for surveillance purposes. Deep learning's neural networks form the basis for the entire model and then entire decision making process is done by the neurons of the neural network.

Face recognition is the technique in which the identity of a human being can be identified using one's individual face. Such kind of systems can be used in photos, videos, or in real time machines. The objective of this article is to provide a simpler and easy method in machine technology. With the help of such a technology one can easily detect the face by the help of dataset in similar matching appearance of a person. The method in which with the help of python and Open CV in deep learning is the most efficient way to detect the face of the person. This method is useful in many fields such as the military, for security, schools, colleges and universities, airlines, banking, online web applications, gaming etc. this system uses powerful python algorithm through which the detection and recognition of face is very easy and efficient.

## 1.1 OBJECTIVES

The main objective of the paper is to determine the parameters like the age, gender of the person by using the model being developed. It makes it easier for the sake of the video analytics, for medical purposes for the surveillance purposes and it can be achieved by the use of the computer vision.

## 1. METHODOLOGY

In order to create this system first, we will have to make the datasets. When the image quality becomes favorable different procedures will take place in the face recognition system the tasks are performed using the python queries "python encode\_faces.py".

Following are the steps involved in architecture.

1. Webcam and Image Acquisition: Here, read the image from input camera at any given frame rate.
2. Image Resize: Resize the image input image into standard image format.
3. Efficient image processing in next subsequent steps.

4. CLACHE: CLACHE is algorithm is used for Histogram Equalization to balance the light intensity in the input image.
5. HAAR Classifier: This algorithm is use to detecting the faces from input GRAY scale image which returns face as region of interest.
6. Histogram Oriented Gradients: This algorithm is used for feature extraction purpose and this algorithm focuses on shape and texture of extraction faces. This is used for gender detection.
7. CNN AND SVM: This algorithm is decision making and makes prediction on input images base on pre-trained model. CNN predict the age according to given face image.SVM predict the gender according to shape and texture of face.

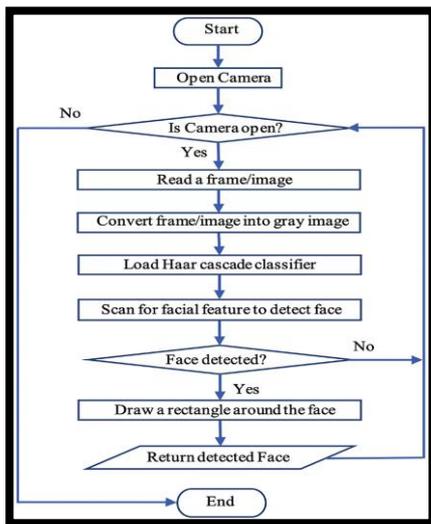


Fig.1. Flowchart of Face Detection

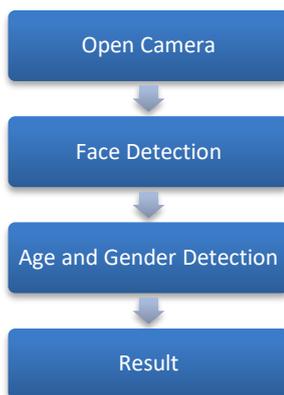


Fig. 2. Flowchart of Methodology

**1.1 Installation-** First it is necessary to install all the dependencies. We suggest installing them inside a virtual environment. The easiest way to do it is to use Anaconda Python 3.7 distribution. To install all dependencies run pip install -r requirements.txt inside a virtual environment. After successful installation the application is ready to be used.

**1.2 Python Module -** The simplest way to use our application is to import class Predictor from predict

module. Creating an instance of the object without any arguments will initialize the object with our trained models. Alternatively, the user can specify arguments:

- age model \_path - The path to trained weights for age prediction model
- gender model \_path - The path to trained weights for gender prediction model
- integral - Specifies whether to use models trained with integral images for prediction

**1.2.1 - Age Prediction**

In the past, the problem of age prediction has been studied as a sub problem of facial ageing. Many approaches developed in facial ageing research are directly transferable to the problem of age classification. One of the first research into age classification was done by authors Kwon and Lobo [9]. In their proposed approach they first find an initial oval of the face and eyes. Then using the boundaries of the initial oval, they find the chin and the sides of the face. After finding all facial features various ratios are computed. Using the computed ratios, the face is then classified. The approach also uses the presence of wrinkles in an area of face to infer the age.

Classifier	Optimizer	No. of epochs	Initial learning rate	Momentum term	L2 weight decay
Age group	Adam	150	0.0001	-	0.0005
Gender	SGD	140	0.01	0.9	0.0005

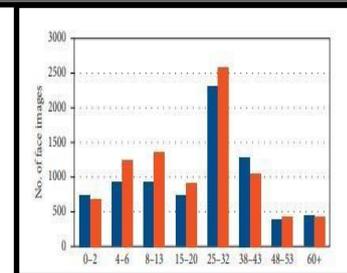


Fig:1.2.1 – Age classification

**1.2.2- Gender Prediction: -**

The problem of gender prediction and classification is closely related to face detection. One of the first method for gender classification was SEXNET introduced by Golomb et al. It classified images sampled at 30 x 30 pixels using a fully connected neural network with 3 layers of 900, 40 and 900 neurons. Another method introduced by Moghaddam and Yang uses Support Vector Machines to classify gender. The method used subsampled images of 21 x 21 pixels and classified them using SVM with radial basis function kernel. More recently the gender classification problem has been treated as a sub problem of age prediction. Current approaches use the same neural network architecture for age as well as gender prediction. Gender can be easily modelled as a binary classification problem. If the gender is modelled using regression, we can view the output number as confidence.

**1.2.3-Datasets:-**

There are various publicly available datasets suitable for age and gender estimation.

**2.Installation**

The face images of persons are captured by means of a camera (Web cam) and some images are collected from net data set images. This proposed a novel and effective age group estimation using face features from human face images. This process involves three stages: Preprocessing, Normalization, Feature Extraction, and Classification.

**2.1 Processing**

The face image of a person is captured by a digital camera.

**2.2 Normalization**

In normalization process the system crop the detected rectangular face area as shown in Fig.2.1 using Matlab in-built object function. Then, detect the eye pair, mouth, nose, and chin. It gives the specific images of left eye, right eye, left eyebrow, right eyebrow, mouth i.e. image of lips & also detects chin hair line part of face image and also gives the nose image.

**2.3 Feature Extraction**

A combination of global and grid features are extracted from face images. The global features such as distance between two eye balls, eye to nose tip, eye to chin, and eye to lip is calculated using four distance values, four features are calculated.

Four features F1, F2, F3, and F4 denotes the global features and the feature F5 is calculated for grid features.

The canny edge detection technique is used for finding the grid features. The four features F1, F2, F3, and F4 are calculated as follows:

$$F1 = (\text{distance from left to right eye ball}) / (\text{distance from eye to nose})$$

$$F2 = (\text{distance from left to right eye ball}) / (\text{distance from eye to lip})$$

$$F3 = (\text{distance from eye to nose}) / (\text{distance from eye to chin})$$

$$F4 = (\text{distance from eye to nose}) / (\text{distance from eye to lip})$$

$$F6 = \text{the angle between right eyeball, mouth point, and left eye ball in face image.}$$

Using the Grid features of face image, feature F5 is calculated. It is entirely based on wrinkle geography in face image. The grid feature includes forehead portion, eyelid regions, upper portion of cheeks and eye corner regions . To calculate feature F5, the following steps have to be followed: The color face image is converted into gray scale image. Then canny edge detection technique is applied on gray scale face image. It gives a binary face image with wrinkle edges.

**4. CLASSIFICATION: -**

Age ranges are classified dynamically depending on number of groups based on the above six features F1 to F6. Support vector machine (SVM) is used as age classifier technique. Age classification is done into 2, 3, and 4 age range groups. Using

five features F1 to F5, age classification is done into 5 age range groups.

The recognition accuracy is given in equation as below:

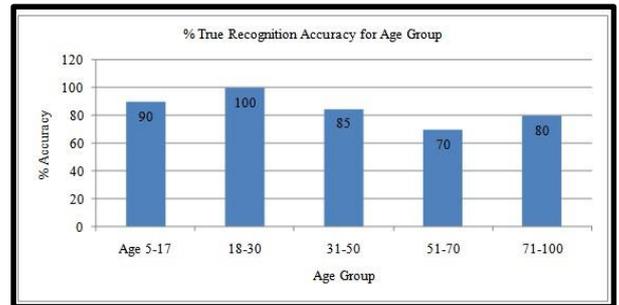
$$\text{Recognition accuracy} = \frac{\text{No. of correct recognized face images}}{\text{Total no. of testing faces images}} * 100$$

Table 1.True recognition accuracy(age)

Sr no.	Age group	% True accuracy
1	5-17	90%
2	18-30	100%
3	31-50	85%
4	51-70	70%
5	71-100	80%
True Recognition Accuracy		85%

Table 5.2 True recognition accuracy(gender)

Sr No.	Class	% True accuracy	
		LBP	MLBP
1	Female	100%	80%
2	Male	90%	70%
True Recognition Accuracy		95%	75%



**3.Test Cases**

**Test case 1: Picture of a child**

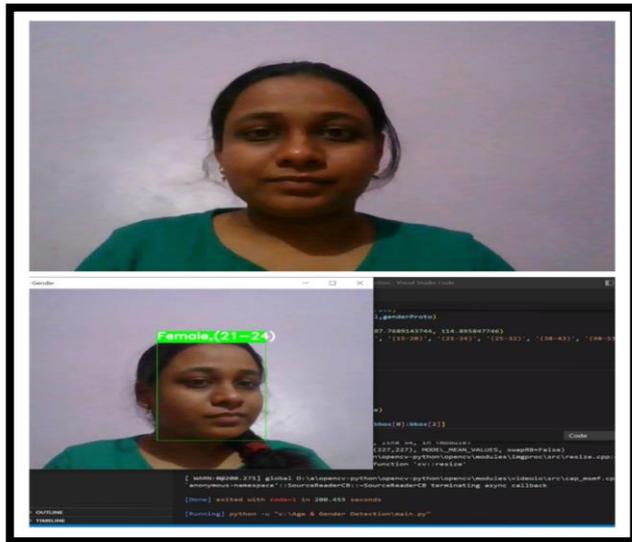
From the above figures when given a picture, the child's face is detected and the age, gender is shown. The child in the image is of the age group 4-6 who is a male. The output satisfies the age and gender. The output is shown with a green square box that shows the face of the child and above the box are the gender and age.



**Fig 3.1 Picture of child**

**Test case 2: Picture of an adult**

In the above figure when given an image of an adult the face is detected and age ,gender of the person are shown .The person in this image is of the age group 38-43 who is a female. The output satisfies the age and gender. The output is shown with a green square box that shows the face of the woman and above the box are the gender and age.



**Fig 3.2 Picture of an Adult**

**4.CONCLUSION**

Age, gender and other facial traits represent information important to a wide range of tasks. Our work leads us to the conclusion that wrinkle geography analysis has been the best procedure to estimate human age range of an individual. For proper eye and eyeball detection, face in the image should be without spectacle. Image should be of a straight frontal face. Image should contain single human face only. This paper works with 85% accuracy for age group clusters, and 95% accuracy for gender recognition. SVM classifier is used for age group estimation and we finalize LBP technique for gender identification .

Here, we are primarily motivated by the observation that the amount of data available for the study of a computer vision problem, in particular the problems considered here, can have an immense impact on the machine capabilities developed to solve it. In answer to this, we provide two contributions: a new and extensive data set and for the study of age and gender estimation, and a classification pipeline designed with an emphasis on making the most of what little data is available.

The age and gender detection using Open CV will be very beneficial in authorization purposes, medical purposes or surveillance purposes. The CNN and Open CV combined can give great results. The OIU-Audience dataset used in the project gives result with greater accuracy. We used protocol buffer and caffe model files. This project shows how Open CV can be used for face detection without any other complicated process.

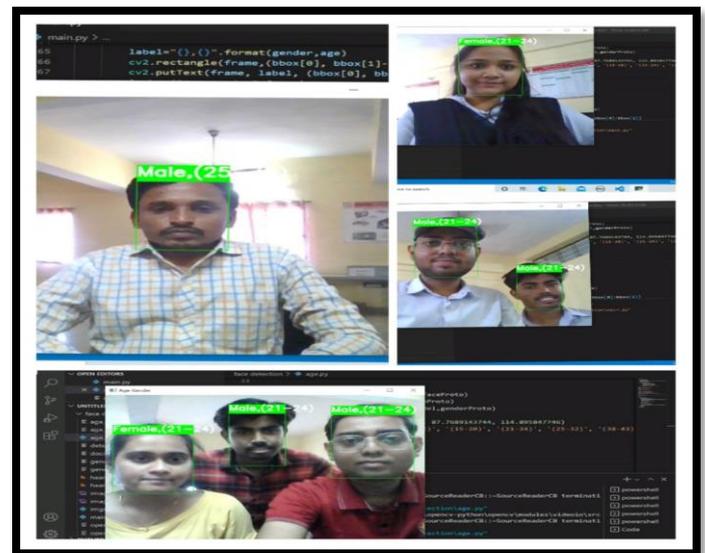
Face recognition systems are currently associated with many top technological companies and industries making the work of face recognition easier. The use of python programming and Open CV makes it an easier and handy tool or system which can be made by anyone according to their

requirement. The proposed system discussed in this project will be helpful for many as it is user friendly and cost efficient system. Hence by the use of python and Open CV the face recognition system can be designed for various purposes.

**5.Result**

The required output is obtained after the classification process, thus the obtained desired output recognizes age and gender and is shown in the figure.

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**Fig.5.1 Face Detected with Age and Gender**

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