"FOOTPRINT COUNT USING FACE RECOGNITION"

This project report is submitted to

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution Affiliated to Rashtrasant Tukdoji Maharaj Nagpur University)

In partial fulfillment of the requirement For the award of the degree

of

Bachelor of Engineering in Electronics & Telecommunication Engineering

by

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YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING,

(An autonomous institution affiliated to Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur)

NAGPUR – 441 110

2022-2023

CERTIFICATE OF APPROVAL

Certified that the project report entitled "**Footprint Count Using Face Recognition**" has been successfully completed by **Saloni Giratkar, Yashaswi Rewatkar, Samruddhi Uplapwar, Nikita Parate** under the guidance of **Dr. Yogita Chitriv (Dubey)** in recognition to the partial fulfilment for the award of the degree of Bachelor of Engineering in Electronic & Telecommunication Engineer, **Yeshwantrao Chavan College of Engineering** *(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)*

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Date of Examination

DECLARATION

We certify that

a. The work contained in this project has been done by us under the guidance of our supervisor.

b. The work has not been submitted to any other Institute for any degree or diploma.

c. We have followed the guidelines provided by the Institute in preparing the project report.

d. We have conformed to the norms and guidelines given in the Ethical Code of Conduct of the Institute.

e. Whenever We have used materials (data, theoretical analysis, figures, and text) from other sources, We have given due credit to them by citing them in the text of the report and giving their details in the references. Further, We have taken permission from the copyright owners of the sources, whenever necessary.

Signature of students

Saloni Giratkar

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Date:-

Place:-

ACKNOWLEDGEMENT

Oct 12, 2022

Acceptance Letter for Project

To,
Head of the Department
Electronics & Telecommunication,
Yeshwantrao Chavan College of Engineering, Nagpur.

Subject: Letter of Acceptance of Final year UG project.
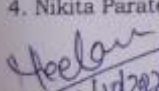
Dear Sir,

I the Undersigned confirm my acceptance as an industry co-guide for the UG project titled **"Footprint Count Using Face Recognition"** under the guidance of **Dr. Yogita Chitriv.**

I will provide the necessary guidance for smooth completion of their project work.
Thanking You.

Name of the Students

1. Saloni Giratkar

2. Samruddhi Uplapwar

3. Yashaswi Rewatkar

4. Nikita Parate

Ms. Neelam Mulmuley

Ajmera Tyres Pvt Ltd

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ABSTRACT

Face detection is one of the extensively evolved technologies in the modern period. This paper proposed a framework for counting people based on facial feature detection and recognition. The live input is taken in video format. This article is made up of four subunits: face detection, face recognition, feature extraction and counting. The viola Jones method used for facial recognition to detect faces in the image. This method tends to be faster than other methods and provide results with greater accuracy then the facial features of person is analyzed using the Adaboost algorithm. It used to determine the facial area and non-facial area. A face is known if it is recognised. If it is unknown, then this person will be counted. Experiment result show that the system has correctly count person with high efficiency and accuracy.

Keywords—Footprint Count, Face detection , Face Matching , Face Classification.

CHAPTER:1

INTRODUCTION

INTRODUCTION

1.1 Overview :

The face recognition mechanism is a signature mechanism, mostly based on the recognition of the facial characteristics of a person. After the Collection of facial images, the recognition tools automatically process the images. The paper presents the related research on face recognition from different interpretations.

In general , there are few stages in the facial recognition process that is detection,face recognition and face extraction. Face detection is a process of identifying the facial features in the entire image or video.

Face recognition in video track has always been a demanding field where it needs to go through a series of analyses to specify a particular face in the video track. After recognising the area, some special characteristics are extracted to identify a face from other people .

Mainly, there are three methods to detect the face from the Viola-Jones algorithm:

1. To extract the characteristics of haar-like features integral image is used.
2. To detect the faces Adaboost machine learning techniques is used. This is mainly used for the enhancement of classification at every stage.
3. After going through a strong classification process , a Cascade classifier is applied to the selected area to capture a facial or non-facial model.

To reduce the error estimation of face detection,W. Y. Lu and M. Yang [1] carried out the research and improved the performance of the Viola-Jones algorithm using Composite characteristics. To acquire correct results, an artificial neural network and principal Component Analysis algorithm is used to detect and recognize the face.

Albiol et al.[2] and Chen et al.[3] Proposed the technique based on image processing. They capture the moving object such as setting the camera perpendicular to the top of the specific gateway through the selected region of the image sequence to attain real-time crowd counting.In the shop we can count the number of visitors through the entrance and provide the information to the shop owner.This paper presents the unknown person counting using face detection.

Gender detection plays a significant role in modern technology. Gender detection has many dynamic applications such as social interaction, security maintenance and surveillance,video games, human-computer interaction, etc.The main purpose of gender detection is to differentiate male and female based on different features of human. For the detection of human gender from facial images we have used an image processing technique for appearance based

feature extraction and Convolution Neural Network (CNN) for the classification of human gender .

Tahmina Akter Sumi and Mohammad Shahadat[4] Hossain proposed human gender detection from facial images using Convolution neural network (CNN) from human face images as it has been recognised as best algorithm in the field of image classification. To implement our system, at first a pre-processing technique has been applied on each image using image processing. The pre-processed image is passed through the Convolution, RELU and Pooling layer for feature extraction and a fully connected layer and a classifier is applied in the classification part of the image. For Classification CNN has been proven to perform as the best algorithm compared with other machine learning algorithms.CNN Architecture has been decomposed into three parts –Pre-processing Technique Feature Extraction Classification.

The survey has been carried out and explore the methodology available for face   detection. This section discuss the face detection algorithm using various methods.

Sarala A. Dabhade & Mrunal S. Bewoor [4] proposed face detection using "Face detection using Haar Based Cascade classifier and recognition using Principle Component analysis." Where the goal was to implement the system (model) for a particular face and distinguish it from a large number of stored faces with some realtime variations as well.

1.2 Literature Survey:

The survey has been carried out and explore the methodology available for face detection.This section discuss the face detection algorithm using various methods.

Sarala A. Dabhade & Mrunal S. Bewoor [5] proposed face detection using "Face detection using Haar Based Cascade classifier and recognition using Principle Component analysis." Where the goal was to implement the system (model) for a particular face and distinguish it from a large number of stored faces with some real time variations as well.

Anusha et al. [6] proposed the method for "Facial expression recognition and gender classification using facial patches" where facial expression recognition and gender classification based on the two expressions anger and joy along with geometric and appearance based method.

V. K and Dr.S.Padmavath [7] Proposed the method for "Facial Parts detection using Viola Jones algorithm" where Numerous feature extraction algorithms in detecting the face detection have been suggested; however inadequate consideration has been given to the detection precision.

H. Monalisa & Veerbhadra Bale [8] Proposed "Face Recognition and Counting using Raspberry Pi with IOT" where this count the number of people in a selected area and recognition of faces to avoid duplicates is the main feature of the presented work.

 Khan MNA, Qureshi SA, Riaz N.[9] present "Gender classification with decision trees" using Convolutional Neural Network (CNN) for different face positions, pixel resolutions and size which shows noticeable increase in performance of gender classification rate.

Elham Arianasab [10] presented his work using Neural Network-based classification algorithm for gender diagnosis and reliability is mainly based on pixel value and geometric facial features.

Mäkinen, E.; Raisamo, R. [11] proposed An experimental comparison of gender classification methods with their classification rate and sensitivity analysis for classifiers by varying translation of the face images.

1.3 Problem statement:

To recognize the face of a person also detect the gender of a person and keep a count on the number of visitors in the shopping Centre. To be more precise ,If the Persons face does not Matches with the values listed in dataset then the name returned will be automatically designated as "Unknown" and send a message containing "unknown" to the Android application (MQTT APP). The app will respond to a message and count that "unknown" value and also differentiate male and female based on different features and keep a count of it.

1.4 Thesis Objectives:

1) To build a human facial recognition and gender detection system .
2) To identifies the known(employees) and gives the count of unknown(customers) visited in the shop.
3) To differentiate male and female based on different features and keep a count of it.
4) The major goal of this system is to give the accurate number of customers visiting the shop per day.
5) To analyze the growth of the shop.

1.5 Thesis Organization:-

The thesis is organized as follows:

- Chapter 1 is about the formal introduction of the thesis which includes our motivation for starting this thesis and our aims and objectives for it.

- Chapter 2 is the Review of Literature which consists of current knowledge and work done on

  this topic. Also, it includes all theoretical and methodological contributions for this thesis.

- Chapter 3 focuses on our proposed model for this thesis which the work flow we maintained throughout thoroughly.

- Chapter 4 shows the end results of our experiments and analysis of the data we acquired as a

  result.

- Chapter 5 is the Summary and conclusion which includes the summary of our thesis along with current limitations, future plans and further insight.

CHAPTER:2
REVIEW OF LITERATURE

CHAPTER:2

REVIEW OF LITERATURE

- Review on " Face Detection and Recognition using Viola-Jones algorithm and fusion of PCA and ANN BY W. Y. .Lu and M. Yang[1]
1. PCA is used to extract features from an image of human face.
2. It is used as a tool in predictive analysis and in explanatory data analysis and is used to transform higher dimensional data into lower dimensional data .
3. The neural networks learn through the back propagation technique and determine the connection weights between the inputs, outputs and hidden cells.

- Review on " The technique based on image processing " by Albiol et al.[2] and Chen et al.[3]
  1. It capture the moving object such as setting the camera perpendicular to the top of the specific gateway through the selected region of the image sequence to attain real-time crowd counting.

  2. This paper presents the unknown person counting using face detection.

- Review on "Face detection using Haar Based Cascade classifier and recognition using Principle Component analysis." BY Sarala A. Dabhade & Mrunal S. Bewoor
  It implement the system (model) for a particular face and distinguish it from a large number of stored faces with some realtime variations as well.

- Review on "Facial expression recognition and gender classification using facial patches" BY Anusha et al
  Facial expression recognition and gender classification based on the two expressions anger and joy along with geometric and appearance based method.

- Review on " Facial parts detection using Viola Jones algorithm" by V. K and Dr.S.Padmavath
1. Numerous feature extraction algorithms in detecting the face detection.
2. However inadequate consideration has been given to the detection precision.

- Review on "Face Recognition and Counting using Raspberry Pi with IOT" By H. Monalisa & Veerbhadra Bale
  It count the number of people in a selected area and recognition of faces to avoid duplicates is the main feature of the presented work.
- Review on " Human gender detection from facial images using Convolution neural network"
1. The pre-processed image is passed through the Convolution, RELU and Pooling layer for feature extraction
2. A fully connected layer and a classifier is applied in the classification part of the image.

- Review on "Gender classification with decision trees" By Khan MNA, Qureshi SA, Riaz N.[9]

1. The architecture consists of fused convolutional and subsampling layers, and cross-correlation is applied in the processing layers instead of convolution.
2. the first experiments to study the effect of weight flipping on the performance of a CNN in terms of classification rate and processing speed .

- Review on " A Neural network Based Gender Detection Algorithm on Full- face photograph" By Elham Arianasab [10]
1. presented his work using Neural Network-based classification algorithm for gender diagnosis and reliability is mainly based on pixel value and geometric facial features.
2. For the robustness of this system, training and testing on whole dataset is presented to classify them into male and female using Neural Network.

- Review on " An experimental comparison of gender classification methods" By Mäkinen, E., Raisamo [11]
1. In the technical background section they introduce the cascaded face detector by Viola and Jones since to fully understand the gender classification results.
2. They discuss face detection, cover existing gender classification methods and describe face recognition research.

- Review on " Human Gender Detection from Facial Images Using Convolution Neural Network " By Tahmina A. S , Mohammad S.H [12]
1. As part of image processing, a pre-processing technique has been applied first. After pre-processing, feature extraction and classification are implemented in this system.
2. A sigmoid function has been used as classifier in this model.

CHAPTER:3
WORK DONE AND DETAIL

3.1 Methodology:

The method implements an effective Face Detection technology that is independent on the number of in features like color, hairstyle, tone, eyebrows and different facial expressions using the Viola-Jones algorithm.

A) Proposed method for face recognition

1) Face Detection

A face detection technique is categorized into two parts that is feature-based approache and image-based approaches. The feature-based approach is used for feature analysis. While the image-based approach detects facial objects. It is the first step towards face recognition. First of all the input image is converted into a grayscale image and then finds its location on the coloured image. In the Pre-processing stage white pixels are made whiter and black pixels are darker using contrast stretching.

2) Viola-Jones Algorithm

After pre-processing to detect a face in the image Viola-Jones Algorithm is used. Viola-Jones method was chosen because it faster than other methods, high detection rate which is very high true-positive rate and a very low false-positive rate and it always runs real time.

Viola-Jones method is efficient on Frontal facial images and it sets the image with 45° face rotation in both vertical and horizontal axis.

2.1 Haar-Like Feature:

Haar-like features are virtual image features used in real-time face detectors. The Haar-like features are adaptable, four-sided rectangular frames that are used to compare white pixels with grey one. Edge features, Line features, and Four-rectangle features are three types of Haar features. Edge and Line features are useful for the determination of edges and lines in the image. For the detection of diagonal features, four-sided features are used.

The Haar-like features are calculated when the summation of all the feature values of a white pixel is subtracted from the sum of features in the dark pixels. If the calculated value is more in any that of the region, the region is classified as eyes, nose, cheek etc.

$F(Haar) = \sum Fwhite - \sum Fblack$
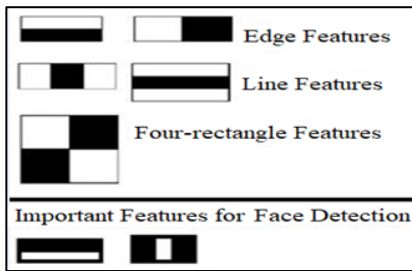
Fig 3.1.1 First 4 forms of Haar-like features   Fig 3.1.2 Detected Face Feature

2.2 Integral Image:

Since it is clear that huge number of these rectangular haar features have to be evaluated each time Viola Jones have come up with a neat technique to reduce the computation rather than summing up all pixel values under the black and white rectangles every time. They have introduced the concept of integral image to find the sum of all pixels under a rectangle with just 4 corner values of the integral image. In an integral image the value at pixel (x,y) is the sum of pixels above and to the left of (x,y).
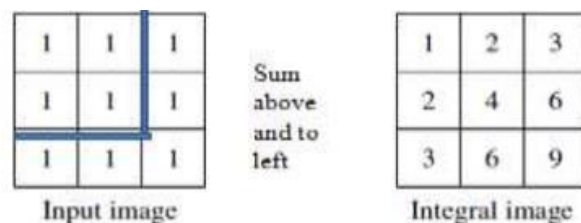
Fig 3.1.3 Integral Image

Integral image allows for the calculation of sum of all pixels inside any given rectangle using only four values at the corners of the rectangle.

Image integral formula :

$$\sum ii(x, y) = i(x', y' x' \leq x, y' \leq y)$$

2.3 Adaptive Boosting Algorithm

Adaboost algorithm integrates numerous "weak classifiers" into a single "strong classifier".It checks the performance of each classifier and used to avoid the complexity of calculation.

It is a machine-learning algorithm used to detect faces. The main purpose of face detection is to determine the facial area and non-facial area. After identification Adaboost allocates a weight to all of them.
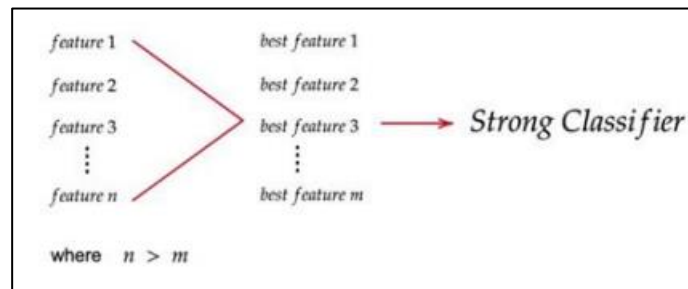
Fig. 3.1.4 Extraction of best feature using Adaboost Algorithm

2.4 Cascade Classifier

The cascade classifier eliminates non-faces, and provides accurate results. In cascading system identification of face is completed into multiple stages for the classification of the best feature. If all features are approved the image, is eventually it classified as a human face.
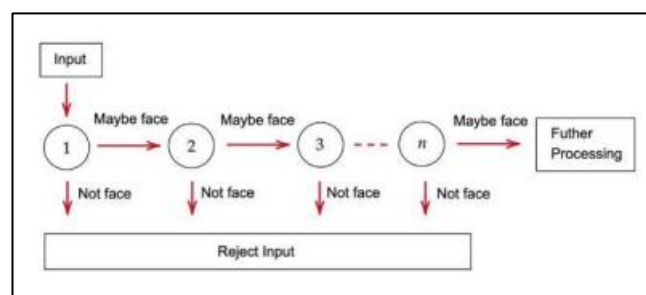
Fig.3.1.5 Cascade Classifier

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B) Face tracking and counting

Step 1: live Images are captured by camera module .

Step 2: Camera continuously examine and outputting the image if a human face is found in the video frame .

Step 3: Captured Image is then compared with Known Dataset present in the System.

Step 4: If the Persons face does not Matches with the values listed in dataset then the name returned will be automatically designated as "Unknown" and send a message containing "unknown" to the Android application (MQTT APP). The app will respond to a message and count that "unknown" value.

MQTT Setup

- Open **MQTT** app and create new group
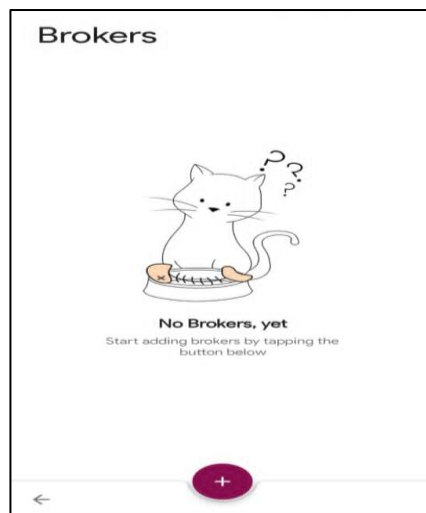
- Tap on **'+'** button to add new **broker**
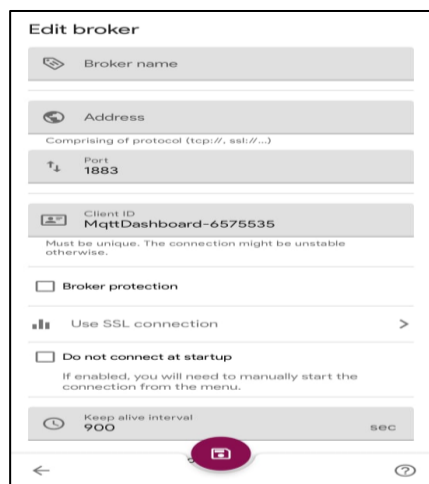
- **Add** a new tiles and change the **setting** as per shown below
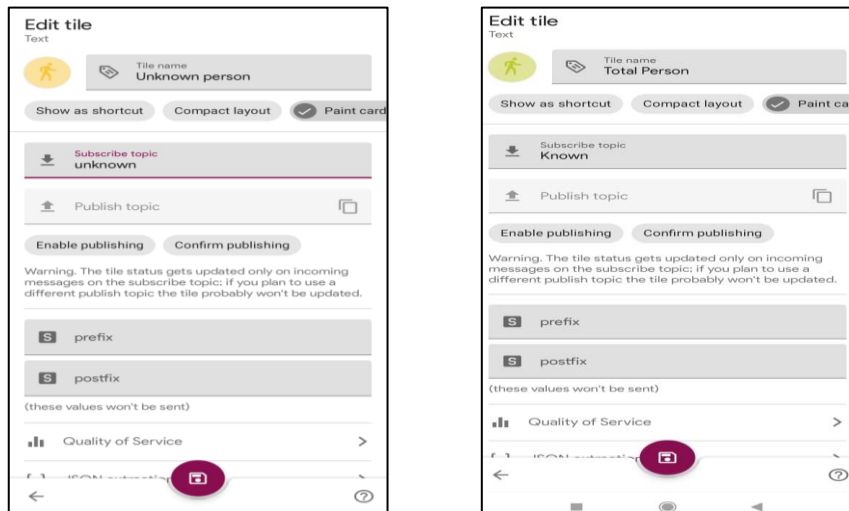
- Finally the complete setup
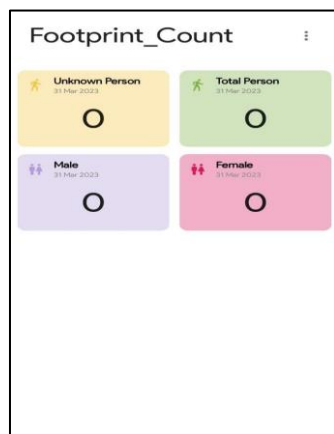
C) Proposed method for Gender Detection :-

For Classification CNN has been proven to perform as the best algorithm compared with other machine learning algorithms.

CNN Architecture has been decomposed into three parts –

1) Pre-processing:

Pre-processing of image generally removes low frequency background noise, normalizes the intensification of the individual practical image, removes reflection of light to get rid of the image noise, and prepares the face image to better feature extraction. In our system, we have first resized the images into 96×96 dimension. Then We have converted the image to an array of pixel value. Each pixel value of the array is converted to float and divided by 255.0 so that all the pixel values comes to a range between 0 to 1.
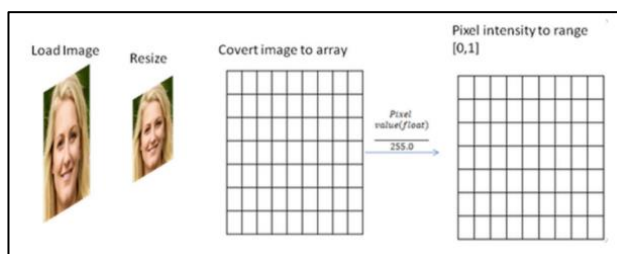
Fig. 3.1.6 Pre-processing steps

2) Feature Extraction:

In Convolutional Neural Network (CNN), the feature extraction is performed by the Convolution and the Pooling layer. The convolution layer contains 32 filters with a 3×3 kernel. Here RELU is used as the activation function followed by batch normalization. The POOL layer uses a 3×3 pool size to reduce spatial dimension from 96×96 to 32×32. A dropout is used in our network architecture which disconnects nodes arbitrarily from layer to layer.

Next the convolution and ReLU layers are applied twice before applying another POOL layer. This operation of multiple convolutional and ReLU layers allow to learn a richer set of features. then filter size is being increased from 32 to 64. As we go deep into the network, we will learn the filters more.

– The max pooling size is decreased from 3×3 to 2×2 so that spatial dimensions don't get reduced too quickly. Dropout is again performed at this stage. Again the convolution and ReLU layers is applied twice before applying another POOL layer. The filter size is increased to 128. And 25% dropout of the nodes is executed in this step for the reduction of over fitting.

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3) Classification:

Fully Connected and RELU operation is performed and a sigmoid classifier is used for classification. Here RELU and batch normalization with dense (1024) defines the fully connected layer where dropout is executed for the last time. This time 50% of the node is being dropped during training.

Figure 3.1.5 : Network Architecture

3.2. Experimental Setup and working procedure:
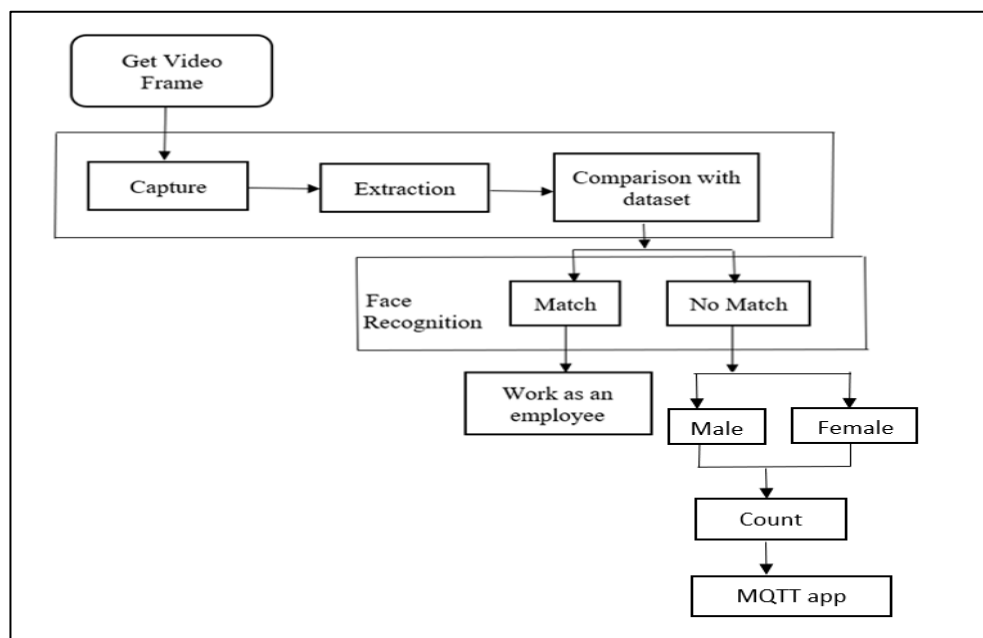
Figure 3.2.1: Methodology for proposed work

The block diagram represented below mainly contains function modules, including a Capture module, an extraction module, a face detection module, and a people counting module.

3.2.1 Input using Camera:-

- The input images are captured from the Camera module which is connected through the Raspberry Pi Board .

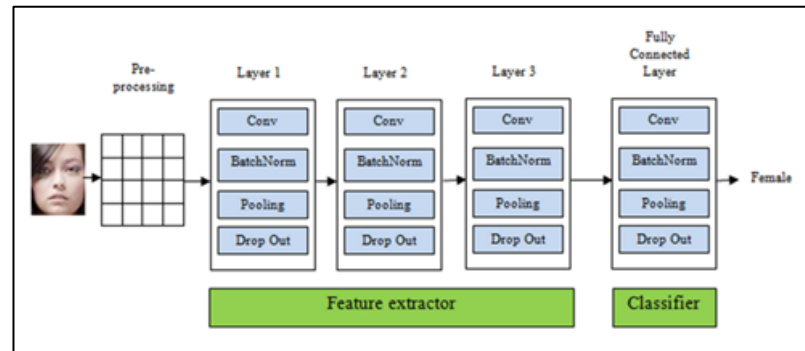### 3.2.2 Face detection:-

- The captured images are converted into gray scale by using the RGB to gray scale conversion then finds its location on the coloured image.

- Then the images in binary format are applied to the face detector .

- The main purpose of face detection is to determine the facial area and non-facial area.

- In the Pre-processing stage white pixels are made whiter and black pixels are darker using contrast stretching.

- After pre-processing to detect a face in the image Viola-Jones Algorithm is used.

3.2.3 Feature Extraction:-

- Facial feature extraction locates important features like eyes, mouth, nose and eyebrows are in different positions within a detected Face.
- The Haar-like features are used for the calculation of different facial features.It is calculated when the summation of all the feature values of a white pixel is subtracted from the sum of features in the dark pixels.
- If the calculated value is more in any that of the region, the region is classified as eyes, nose, cheek etc.

3.2.4 Face Matching:-

- Captured Image of a person compared with Known Dataset present in the System.

3.2.5 Face tracking, counting and gender classification:-

- If the Persons face does not match with the values listed in dataset then the system will thereby determine the recognized face as "unknown" and detect the gender of a person and send a message containing "unknown" to the Android application (MQTT APP). The app will respond to a message and count that "unknown" value and classify gender as male or female.

3.2.6 Gender Detection :-

One of the best methods for gender classification used a neural network trained on a small set of near-frontal face images.

CNN Architecture it has been decomposed into two parts:

–Feature Extraction

– Classification

The convolution and the pooling layers performs the feature extraction of the image which actually extract information from input for decision-making.

Pre-processing of image generally removes low-frequency background noise, normalises the intensification of the individual practical image, removes reflection of light to get rid of the image noise, and prepares the face image to better feature extraction.

1. Feature Extraction

Pre-processing of image generally removes low-frequency background noise, normalises the intensification of the individual practical image, removes reflection of light to get rid of the image noise, and prepares the face image to better feature extraction.

In Convolutional Neural Network (CNN), feature extraction is performed by the Convolution and the Pooling layer.

2. Classification

Fully Connected and RELU operation is performed and a sigmoid classifier is used for classification.

RELU and batch normalization with dense (1024) defines the fully connected layer where dropout is executed for the last time. This time 50% of the node is being dropped during training.

3.3 Material Used

3.3.1 Raspberry Pi and Pi Camera

Raspberry Pi is a compact, efficient, economical, customizable, and computer - based learning board that was announced in 2012. It behaves similarly to a regular computer, needing a keyboard for command entry, a display unit, and a source of energy.

Specification of Raspberry PI:

CPU: Pi 3 A+: 1.4 GHz quad-core A53 64-bit Pi 4 B: 1.5 GHz quad-core A72 64-bit Zero W: 1
GHz ARM11 32-bit CM 3+: 1.2 GHz quad-core A53 64-bit

Memory: Pi 3 A+: 512 MB LPDDR2 SDRAM Pi 4 B: 2GB LPDDR4-3200 SDRAM Zero W: 512 MB LPDDR2 SDRAM CM 3+: 1 GB LPDDR2 SDRAM

The ML and CV processing is done in the Raspberry Pi and the GPIO pins of the Raspberry pi provide the output to the relay driver to operate the gate.

Fig 3.3.1 Raspberry Pi and Pi Camera

CHAPTER 4
RESULT AND DISCUSSION

CHAPTER 4

RESULT AND DISCUSSION

4.1 Result :-

In the proposed system, facial recognition and face detection is done where the image is matched with the predefined database. If the person's face does not match the dataset then it is interpreted as an unknown person with their gender specification. And the data is observed on the online platform app which is created from the MQTT app.

The formula for Accuracy is :

$$Accuracy = \frac{Unknown\ Person\ Count}{Total\ no.of\ unknown\ Person\ in\ video}$$
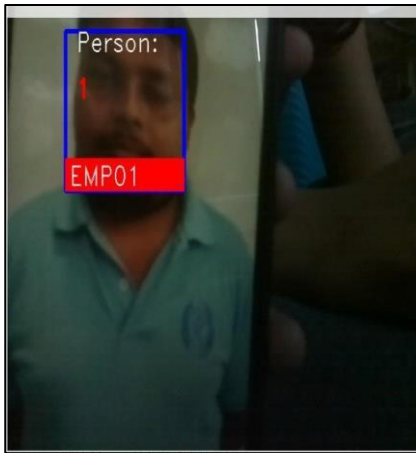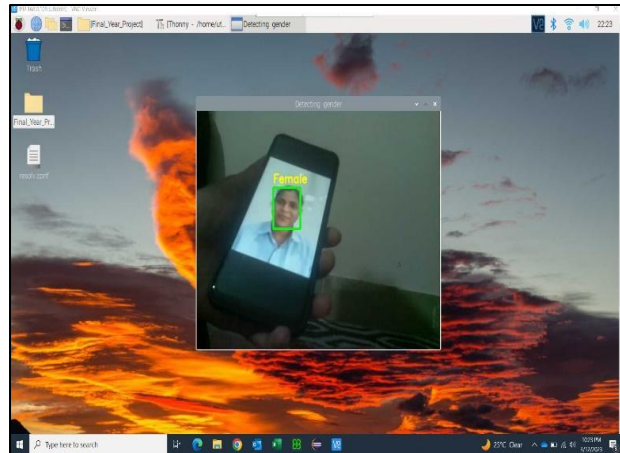
Fig 4.1.1(a)   Fig 4.1.1(b)

Fig 4.1.1(a) The System Recognizing Known Face correctly as a Employee
Fig 4.1.1(b) The System Recognizing Unknown Face Correctly as a Customer

The value of Footprint count will be displayed as shown in the below Fig 4.1.3
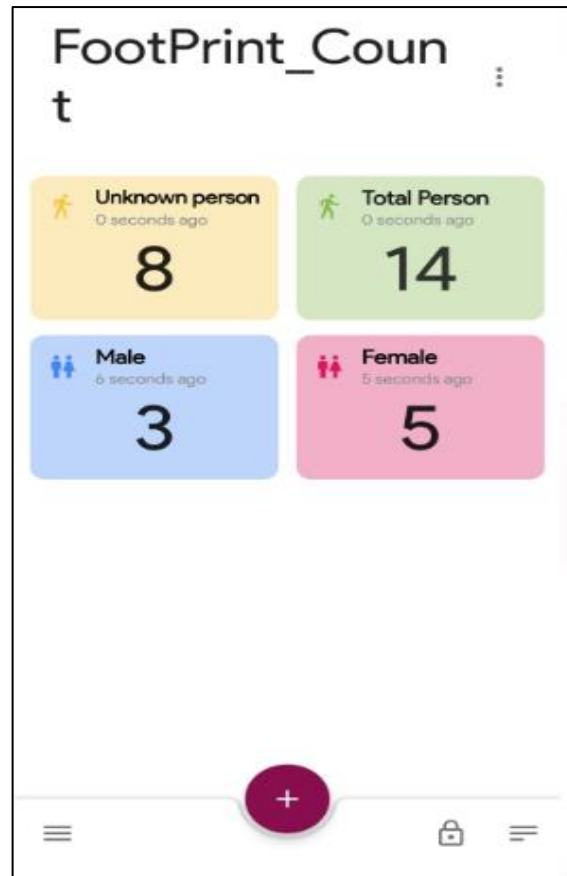
Fig 4.1.3 Final Footprint count with male & Female

Fig 4.1.4(a)   Fig.4.1.5(b)

Fig 4.1.4(a) & Fig 4.1.5(b) Setup of Face recognition

The accuracy of the system is -

Table 4.1.6: Accuracy of System

Video	Unknown person in video	Unknown person count	Accuracy
Video1	10	9	90%
Video2	6	6	100%
Video3	7	6	85.71%

CHAPTER 5

SUMMARY AND CONCLUSION

CHAPTER 5

SUMMARY AND CONCLUSION

5.1 Summary :

Face detection algorithms can be feature-based, knowledge-based, template matching, appearance- based, or a combination of methods. Face tracking follows the presence of a face within a video frame.

The system was designed on the given problem statement received from "Ajmera tyre". We have provided a modular approach to the solution. The system provide us the data of unknown person visited in the shopping center on the basis of Face recognition. The system gives the 100% accuracy for detecting the number of customer visited in the shopping centre .

5.2 Conclusion:

Face recognition and gender detection plays a vital role in wide range of applications. Today can check identity information automatically with regard to safe transactions, tracking, security purposes and buildings access control. In most of the applications, a high rate of accuracy in identifying a person is desired. This paper presents an efficient approach for face detection and recognition using the Viola-Jones algorithm. The objective of this project to recognize the face and keep a count on the number of visitors in the shopping Centre using Raspberry Pi is implemented with good accuracy results. For the future scope, the identification of gender is definitely one. The performance of the proposed method is compared with other existing face recognition methods and it is observed that better accuracy in recognition is achieved with the proposed method. The proposed system can be used at various places. we have proposed a gender detection system after detecting all the faces from a scene and have achieved decent accuracy. As we have used Viola and Jones algorithm for the face detection part, we attained some advantages. Face detection part is achieved by using CNN .It is extremely fast for feature computation and selects the features efficiently. For gender detection of facial image part, we have used CNN algorithm which shows grate accuracy.

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Yeshwantrao Chavan College of Engineering

Project Preliminary Investigation Report

Name of Department:

Electronics and Telecommunication

Name of Project Guide:

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Title of the Project:

Footprint Count Using Face Recognition

Area of Project Work:

Machine Learning

Problem Statement:

Every Shopping Centre wants to keep record of their customers to analyze its growth. So by considering this we are designing "Footprint Count using Face Recognition".It will help us to recognize the face and to detect the gender of a person and keep a count on the number of visitors in the shopping Centre. By that we will get the accurate number of customers visiting the shop per day. To be more precise, if a person's face does not matches with the dataset present in the system, then it will show that the person is unknown and keep count of it.

Face recognition has many challenges due to illumination variations, large dimensionality, uncontrolled environments, aging and pose variations. In the recent years, Face recognition get remarkable improvement and accuracy to overcome these challenges. Face recognition get remarkable improvement and accuracy to overcome these challenges.

Prior Art (Patent Search):

Patent Application No.	Title of Patent	Existing Solutions (Abstract of Patent)
US9639740B2	Face detection and recognition	The present invention provides, in at least one aspect, methods and systems that detect at least one face in at least one digital image, determine and store area co-ordinates of a location of the at least one detected face in the at least one digital image, apply at least one transformation to the at least one detected face to create at least one portrait of the at least one detected face, rotate the at least one portrait at least until the at least one portrait is shown in a vertical orientation and a pair of eyes of the at least one face shown in the at least one portrait are positioned on a horizontal plane; and store the rotated at least one portrait

U0190213395A1	Human facial detection and recognition system	Aspects of the present disclosure provide an image-based face detection and recognition system that processes and/or analyzes portions of an image using "image strips" and cascading classifiers to detect faces and/or various facial features, such an eye, nose, mouth, cheekbone, jaw line, etc.
WO2011119117 A1	Facial gender recognition	A method and system for building a classifier for use in facial gender recognition, and a method and system for facial image gender recognition. The methods of building a classifier for use in facial image gender recognition and of facial image gender recognition are based on both LBP features and Gabor features.
CN104598888B	A kind of recognition methods of face gender	The present invention relates to technical field of face recognition, more particularly to a kind of recognition methods of face gender, it comprises the following steps successively : Obtain facial image ; Detect whether the facial image includes face ; The facial image is converted into the grey level histogram on pixel ; Calculate appropriate feature ; Convert thereof into close to basic function kernel ; The object gender discriminant value of the facial image is calculated by utility function.The recognition methods of the present invention assign the other ability of objectivity in computer discriminant facial image, realizes automatic intelligent management.

Literature Survey

Title of Paper	Details of Publication with Date and Year	Literature Identified for Project
"Real Time Face Detection and Recognition using Haar - based Cascade Classifier and Principal Component Analysis"	Vol 1, No. 1.(2012)	International Journal of Computer Science and Management Research
"Facial expression recognition and gender classification using facial patches"	21-23 July 2016.	International Conference on Communication System and Networks
"Facial Parts detection using Viola Jones algorithm"	06-07 January 2017	4th International Conference on Advanced Computing and Communication Systems (ICACCS)
"Face Recognition and Counting using Raspberry Pi with IOT"	Vol 11, No. 1, Jan 2020	
"Human gender detection from facial images using Convolution neural	pp. 188–203, 2021	

network"		

Current Limitations

1. The effectiveness of facial-recognition algorithm is influenced by the image quality.

2. The relative angle of the target's face has a significant impact on the recognition score.

3. The high-definition video takes up a lot of disc space despite having a resolution that is much lower than that of the digital camera images.

Proposed Solution

Face detection, recognition, and gender classification plays a vital role in wide range of applications. Today can check identity information automatically with regard to safe transactions, tracking, security purposes and building access control. In most of the applications a high rate of accuracy in identifying a person is desired. This paper presents an efficient approach for face detection and recognition using Viola-Jones algorithm and classifying gender based on facial feature detection and recognition. The objective of this project to recognize the face also detect the gender of a person and keep a count on the number of visitors in the shopping centre using Raspberry Pi is implemented with good accuracy results..The performance of the proposed method is compared with other existing face recognition and gender detection methods and it is observed that better accuracy in recognition and detection is achieved with the proposed method. The proposed system can be used at various places.

Objectives and Scope of Work

Objectives:

1. – Inducing technology for a real life application
2. – Implement a real-time face recognition system
3. –Detect the unique faces with the help of camera module
4. –Identify and Verify gender of person using their faces
5. –propose a framework to integrate different algorithms for better performance

Scope of Work:

Facial Recognition is a category of biometric software that maps an individual's facial features and stores the data as a face print. The software uses deep learning algorithms to compare a live captured image to the stored face print to verify one's identity. Image processing and machine learning are the backbones of this technology.

The scope of Machine Learning is not limited to the investment sector. Rather, it is expanding across all fields such as banking and finance, information technology, media & entertainment, gaming, and the automotive industry. This system recognizes the live capture image from the shop and compares it with the known data set present in the system and holds the count of customers with their gender specification.This helps the shopkeeper to track the count of daily customers .

Feasibility Assessment:

I. Expected Outcomes of the Project

Facial recognition and gender detection is performed when the image is not matched with the predefined database. The system will label the recognised face as "unknown" and send a message with the word "unknown" to the Android application (MQTT APP) if the person's face does not match the values specified in the dataset.In response to a notification, the app will count the "unknown" figure, determine whether it is male or female, and continue counting.

II. Innovation Potential

Facial recognition and gender detection play a vital role in a wide range of applications. This is the efficient approach for face detection and recognition using the Viola-Jones algorithm. The main objective is to recognize the face detect the gender and keep a count of it.

The performance of the proposed method is compared with other existing face recognition methods and it is observed that better accuracy in recognition is achieved with the proposed method.

III. Task Involved

1. Development of a prototype of the project using pvc sheet, Raspberry pi 3 B+, Pi cam with ribbon strip, internet, 5v 2A power supply for the Raspberry pi.
2. Initial steps include developing code for human facial detection i.e the person is known or unknown..
3. Next we develop code for gender detection of the person, then develop code

to send the data on MQTT Dashboard App.

4. Next we integrate all the code to one code.

5. Then test the code with live Images captured by the camera module.

6. Making hardware using PVC sheets, Installing entire hardware components in the PVC box and finally checking for proper and expected output of the project to be done.

IV. Expertise Required

1. Inhouse Expertise- for development of interface hardware and software both.
2. External Expertise- MQTT App environment development.

V. Facilities Required

1. In-house and External facilities both relating to project hardware includes pvc sheet, Raspberry pi 3 B+, Pi cam with ribbon strip, internet, 5v 2A power supply for the Raspberry pi.

Milestones and Time Plan

	Task	JULY 2022	AUG 2022	SEP 2022	OCT 2022	NOV 2022	DEC 2022	JAN 2023	FEB 2023	MAR 2023	APR 2023
Design	Conceptual Design	✓									
	Detailed design		✓								
	Design Modifications			✓							
	Final Design			✓							
Develop	Procurement (If any)			✓	✓						
	Prototyping				✓	✓					
	Modifications						✓				
Deliver	Testing and Validation						✓				
	Final Modifications							✓			
	Research Paper								✓		
	Thesis and Poster								✓		

Societal Relevance :

To provide connected and engaging in-store experience, Shopping centres continuously integrate innovative technologies. This System helps to analyse the number of customers visited in the shop. By this data we can also examine the customer's satisfaction. It also depicts the gender of customers visiting in the shop. The shop owner can do the analyses of daily records of visitors and can predict the growth of their Business.

On the other hand shop owner can also get the number of present employees in the shop on daily basis since it differentiates the recognised face into customer and employee. This system helps the shopping centres to grow and run smoothly.

Co-Po mapping table

				PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
VIII	ET2451: Major Project	1	Design and analyze application based electronic systems.	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		2	Implement core/multidisciplinary/ industrybased electronic projects in cost effective manner.	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		3	Communicate technical details effectively.	3				3		3	3	3	3	3	3	3	3

Appendix

List of Publications

Sr. No.	Authors	Title of Paper	Name of International Journals / International Conference	Place and date of Publication with **Citation** Index
1.	Yogita Chitriv(Dubey) Yashaswi Rewatkar Samruddhi Uplapwar Nikita Parate Saloni Giratkar	Footprint Counting Using Face Recognition	International Conference on Advanced Computing and Communication Systems (ICACCS).	Conference date : 17-18, March 2023