AUTHENTICATION SYSTEM BASED ON FACE MASK AND TEMPERATURE DETECTION USING HAAR FEATURES

Saritha Haridas A [1], Kesavan Namboothiri T[2]

[1] *Mtech student, Department of ECE, KMCT College of Engineering, Kerala,India*
[2] *Assistant Professor, Department of ECE, KMCT College of Engineering, Kerala, India*

ABSTRACT: *As we all know after the breakout of the world-wide pandemic the coronavirus disease 2019 (covid-19), there arise a sever need for protection mechanism. The face mask being the primary one. Masks are primarily intended to prevent the wearer from spreading the viral droplets (source control). Covid-19 and other respiratory infections spread primarily through inhalation of respiratory aerosols produced by coughing, sneezing, talking, or breathing. The virus propagates and migrates down the respiratory tract and may lead to pneumonia, acute respiratory distress syndrome (ARDS) and even death. The ongoing pandemic and the rapidly emerging variants have made this respiratory illness, a daily headline. To prevent the spread of infection, it is recommended that people use face masks as part of their personal safety gear and as a public health measure. For employing more security, the body temperature is also considering. When a person is onboarded, the body temperature is detected by the non-contact temperature sensor. If it is in between the range of normal body temperature,then the camera module gets opened and captures the required number of image, then the haar features are considered by the neural networks and processes the data for face mask detection. If the mask is detected, then the access will be permitted, otherwise restricted.*

Key words— *Ear biometrics, Artificial Intelligence, Identification, sample reputation, Convolutional neural networks.*

1.INTRODUCTION

COVID-19 is a highly contagious disease, and the WHO and other health agencies have recommended that people use face masks to prevent its transmission. All governments are attempting to guarantee that face masks are worn in public places, but it is difficult to manually identify those who are not wearing face masks in crowded places. Scientists are working on developing automatic methods to identify and enforce the use of face masks in public locations. The problem may be summarized as follows: given a face picture as an input, the classification model must categorize the facial image in a mask detection task using the classification model. Using Depthwise Separable Convolutions with MobileNet data, we provide a method for mask detection-driven face picture classification that is both fast and accurate, as demonstrated in this work. We employed Depthwise separable convolution layers instead of traditional convolutional layers to successfully develop the model with a smaller number of learnable parameters and a smaller number of learnable parameters. Face mask detection is a subset of object recognition that uses image processing algorithms. Digital image processing may be divided into two broad categories: classical image processing and deep learning-based image analysis. As opposed to classical image analysis, which uses complex formulas to recognize and interpret pictures, deep learning-based approaches utilize models that mimic the workings of the human brain. Deep Learning models have been used in the majority of past research

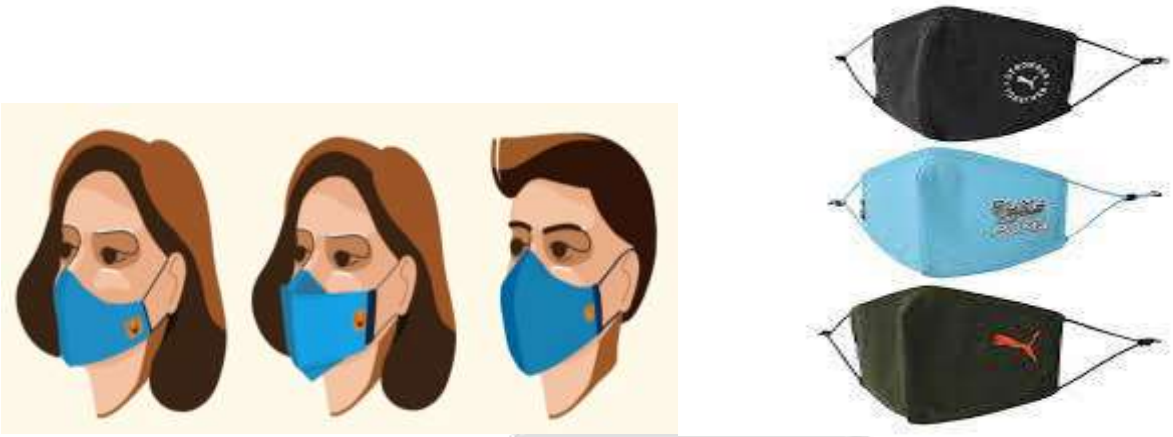

Fig 1.1:Mask

2.LITERATURE REVIEW

(2) evaluates if the face has been disguised. It is also capable of identifying a moving face and a mask in a video as a surveillance job performance. Accuracy is great with this method. An algorithm called YOLO-v3 was developed by Bhuiyan et al. (11) to identify face masks in public spaces. They trained the YOLO-v3 model on their own custom dataset of photos with people labeled as "mask and no-mask." The model's performance was enhanced by Mata (12) via data augmentation. It is necessary to create a CNN model that can distinguish between ROIs with and those without a face mask in order to extract the facial area as a ROI. With the use of Mobile NetV2, Toppo et al. (1) developed a method for detecting face masks that incorporates three distinct face detector models in order to test the model's correctness and evaluate its performance. The trained model's outcome allows for implementation on low-power devices, making the mask detection method's inclusion faster than previous strategies. To recognize people who were not wearing face masks in government workplaces, Balaji et al. (13) utilized a VGG-16 CNN model developed in Keras/TensorFlow and Open-CV to detect people who were not wearing face masks. To compensate for the model's light weight, Fan et al. (3) offered two additional methods. A unique residual contextual awareness module for crucial face mask regions Two-stage synthetic Gaussian heat map regression is used to identify better mask discrimination features. Ablation research has found that these strategies can improve feature engineering and, as a result, the effectiveness of numeric identification. For AIZOO and Moxa3K, the suggested model outperforms prior models. Conventional deep learning algorithms for lightweight facial image classification alone do not give a good discriminating feature space, as shown by the research covered above, and they complicate the model and greatly increase the number of parameters and necessary computational resources.

In this study, a Depthwise Separable Convolution Neural Network-based MobileNet for the detection of face masks by classifying facial images is developed in this study in an effort to answer the shortfalls of previous research in this area (2). Our technique improves the work performed by (2) by replacing the conventional convolution with a depth-wise separable convolution in the neural network (14). Table 2 shows a tabular summary of selected earlier works.

Tian Ying[7] proposed an set of rules the usage of deep convolutional neural community for enhancing the popularity of human ear. Dropout generation is used withinside the remaining related layer for stopping the community over-fitting.Mary Ann F. Harrison [8] proposed an ear detection device the usage of Haar capabilities in a Adaboost classifier with accuracy 95%. A. Abaza [9] proposed an ear detection device the usage of quicker CNN in which Alex internet version is used for segmenting the layers of ear and checking out accuracy is round 98%. M. Saranya[10] proposed a totally computerized ear reputation device in which the function extraction is carried out primarily based totally on the 'Adaptive blocks' method and performance is improved. Thirimachos Bourlai[11] proposed a CNN primarily based totally ear detection technique via way of means of thinking about manyimage degradations factors, in which the versions blanketed are brightness, contrast, additive noise etc.

Aman Chhabra [12] proposed ear function extraction method primarily based totally on picture processing techniques like segmentation, function extraction via way of means of the usage of the MATLAB tool. Karim Faez [13] designed a biometric device (ear, face, gait) the usage of Gabor and PCA (important factor evaluation) technique and done an accuracy of 97.5%. M. Usman Akram [14] proposed a biometric device the usage of Haar wavelets and go correlation method and picture dataset from USTB and were given an accuracy of 97.2%.MiguelLopez [15] proposed a modular structure primarily based totally on 2D wavelet evaluation and Global

Thresholding Method and the outcomes are correct to 97%.

Liang Tian [16, 20] recommend an set of rules the usage of deep CNN with 3 layers of convolution and the classifier used for type is Soft Max. Junbin Gao[18] proposed an ear reputation technique the usage ofnearby capabilities of ear and part detection is carried out and subsequently a neural community is used for function extraction. Erhardt Barth[17, 19] proposed a deep CNN set of rules for ear detection the usage of Resnext101 version and t-SNE set of rules is used to examine the capabilities. N.Hamdy [21] proposed a low-price ear reputation device via way of means of lowering the fake rejection prices and discrete cosine ameliorations are carried out for function getting to know and won an accuracy of 96.67%.

A neural community and Adaboost done nearly as desirable type prices because the assist vector system and will be utilized in programs in which type pace is taken into consideration greater crucial than the most type accuracycome to shape and has many benefits over the already existed biometrics withinside the coming days. The Fig.3.1 describes diverse biometrics which can be gift. The method we've got long gone thru is figuring out and detecting the person through the usage of the strategies of Image Processing and Convolutional Neural Networks.

3.EXISTING SYSTEM

Till date there are numerous biometric strategies existed like fingerprint recognition (with theassist of styles which can be gift at the top layer of palm), hand geometry (thinking about duration of hands and width of hand), face recognition, iris recognition, retinal identification, voice verification, Handwritten signature, gait (strolling style), DNA matching etc.

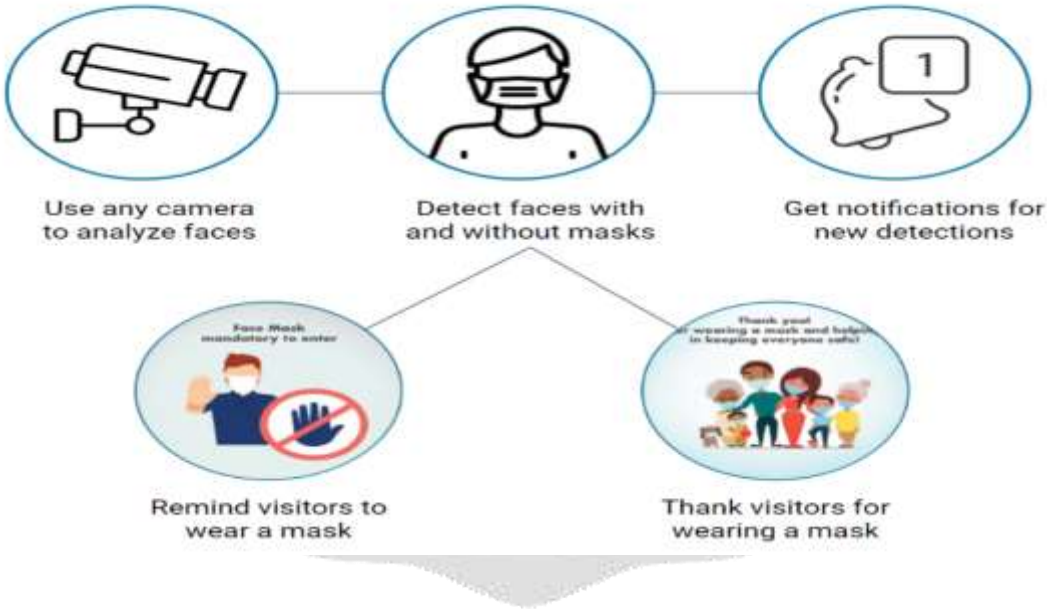

Fig. 3.1. facemask detection

As we all know after the break out of world wide pandemic situation there arises a severe need for protection mechanism. Face mask being the primary one. So to confirm the hygiene and security of the public the body temperature is verified before the entry. Then the facemask is detected manually.

4.PROPOSED SYSTEM

In the proposed method, I am aiming to develop a system for checking automatically the body temperature when the customer or person is onboarded and then the presence of face mask too .

A. Block Diagram

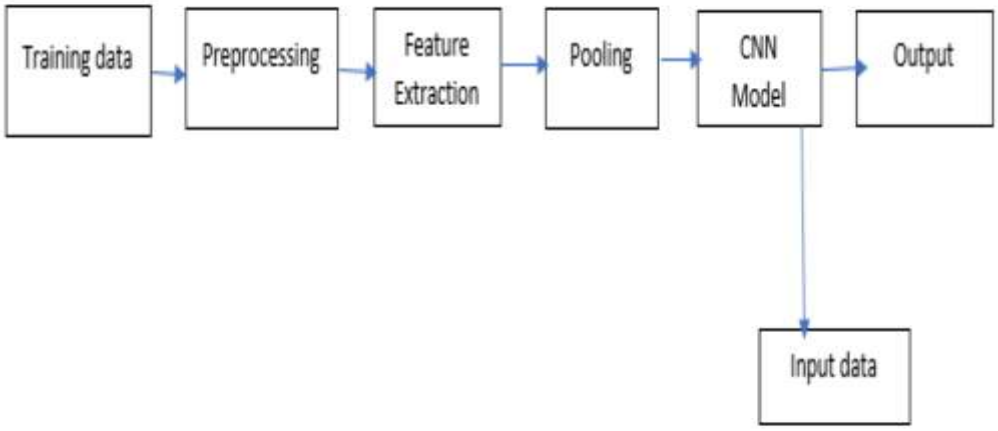

Fig4.1: Block diagram for facemask detection

Here the images with mask are captured by the camera and is taken as training data, which is then pre-processed. The features are then extracted and the pooling is applied to enhance the features. This is then given to the CNN model. Where it gets trained and the CNN will give the response. Now if we take a test data directly to the CNN model it will give the required response.

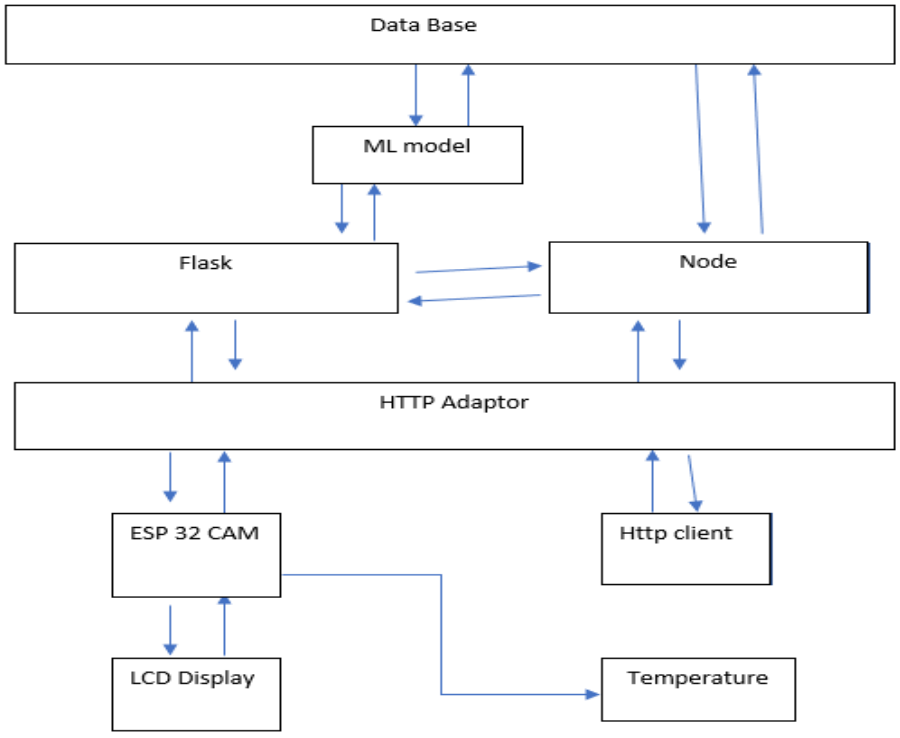

Fig4.2: Block diagram for facemask detection and temperature

B. *Viola Jones Algorithm*

The **Viola–Jones object detection framework** is an object detection framework which was proposed in 2001 by Paul Viola and Michael Jones. Although it can be trained to detect a variety of object classes, it was motivated primarily by the problem of face detection.The algorithm has four stages:

1. Haar Feature Selection
2. Creating an Integral Image
3. Adaboost Training
4. Cascading Classifiers

The features sought by the detection framework universally involve the sums of image pixels within rectangular areas. As such, they bear some resemblance to Haar basis functions, which have been used previously in the realm of image-based object detection. However, since the features used by Viola and Jones all rely on more than one rectangular area, they are generally more complex. The figure on the right illustrates the four different types of features used in the framework. The value of any given feature is the sum of the pixels within clear rectangles subtracted from the sum of the pixels within shaded rectangles. Rectangular features of this sort are primitive when compared to alternatives such as steerable filters. Although they are sensitive to vertical and horizontal features, their feedback is considerably coarser.

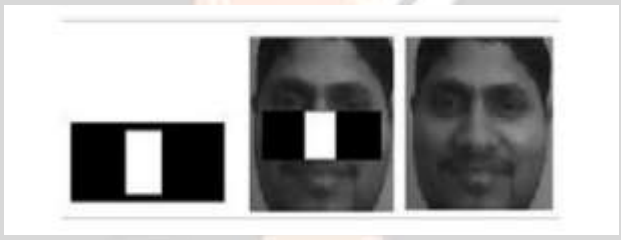

Fig 4.3: Haar features similar to the bridge of nose is applied on to the face

Fig 4.4: Haar Feature that looks similar to the eye region which is darker than the upper cheeks is applied onto a face

5.NETWORK ARCHITECTURE

A. *Convolutional Neural Network (CNN)*

In deep learning, a convolutional neural community (CNN or ConvNet) is a category of deep neural networks, maximum normally implemented to analysing visible imagery [20]. CNNs are regularized variations of multilayer perceptron's. Multilayer perceptron's normally consult with completely related networks, this is, every neuron in a single layer is hooked up to all neurons withinside the subsequent layer. The completely-connectedness of those networks makes them susceptible to over becoming facts. Typical approaches of regularization consists ofincluding a few shape of value dimension of weights to the loss feature. However, CNNs take a exceptionaltechnique toward regularization: they take gain of the hierarchical sample in facts and gather extra complicated styles the use of smaller and less complicated styles. Therefore, on the size of connectedness and complexity, CNNs are at the decrease extreme. A convolutional neural community includes an enter and an output layer, in addition to a couple of hidden layers. The hidden layers of a CNN commonly include convolutional layers, RELU layer i.e. activation

feature, pooling layers, completely related layers and normalization layers.

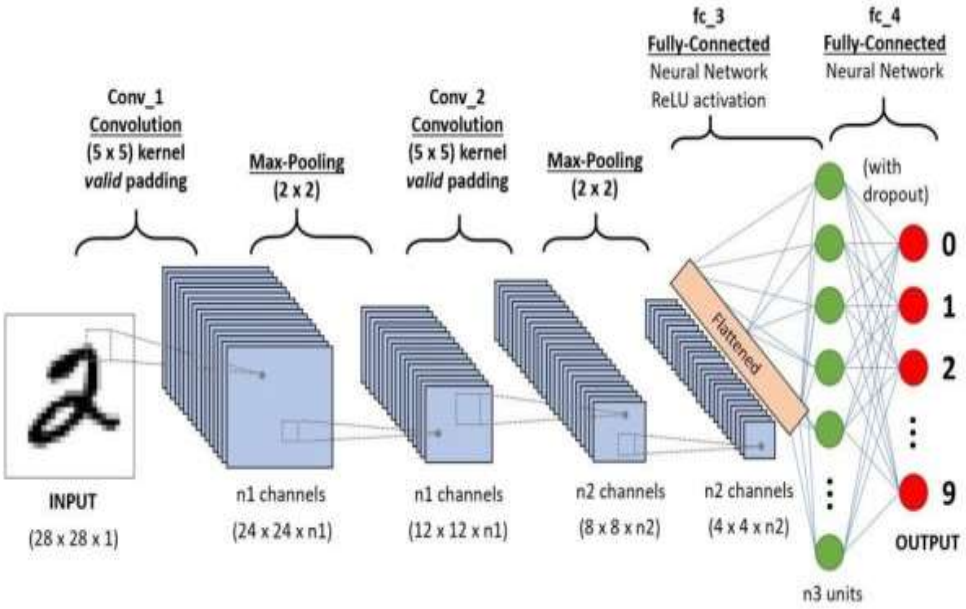

Fig 5.1: Network architecture of convolutional neuralnetwork

6. SOFTWARE

A. Python

Python is an incredible and effective programming language it is smooth to use (smooth to study and write) and with Raspberry Pi helps you to join your venture to the actual world. Python syntax could be very clean, with an emphasis on clarity and makes use of Standard English keywords. Start via way of means of commencing IDLE from the desktop. IDLE offers you a REPL (Read-Evaluate-Print-Loop), that's a set off you could input Python instructions into. Because it is a REPL, you even get the output of instructions revealed to the display with out the usage of print. Python is an interpreter, high-level, general- motive programming language. Created via way of means of Guido van Rossum and primary launched in 1991, Python's layout philosophy emphasizes code clarity with its excellent use of big whitespace. Its language constructs and object-orientated technique pursuits to assist programmers write clear, logical code for small and large-scale projects.

B. Data Set

In this segment for facemask dataset I had organized the dataset with the aid of using amassing a 500 photos of face with and without mask of myself, my buddies and my relatives. detection in addition to popularity is wanted wherein withinside the case of facemask. And I even have carried out this detection on the premise of Viola Jones algorithm.Masks play a crucial role in protecting the health of individuals against respiratory diseases, as is one of the few precautions available for COVID-19 in the absence of immunization. With this dataset, it is possible to create a model to detect people wearing masks, not wearing them, orwearingmasksimproperly.

This dataset contains 853 images belonging to the 3 classes, as well as their bounding boxes in the PASCALVOC format.

The classes are:

- With mask;
- Without mask;

- Mask worn incorrectly.

Face mask detection refers to **detect whether a person is wearing a mask or not**. In fact, the problem is reverse engineering of face detection where the face is detected using different machine learning algorithms for the purpose of security, authentication and surveillance.

Fig 6.1 Sample data set of with mask and without mask

Fig 6.2 Data set

7. RESULTS AND DISCUSSION

The customer is firstly subjected for the detection of facemask, then to temperature checking. Only after the verification of facemask and the normal temperature, the person is allowed for entry. For a person without mask the system displays as 'no mask' and his entry will be restricted. In the same way, a person with mask is displayed as 'mask', and he will be subjected to enter and if he is recognised by the system displays as person1 is matched and authenticated , otherwise not matched and rejected.

8.CONCLUSION

The purpose of this studies is to create a biometric machine that used photographs of human face with mask and without mask. It seems to be a correct technique to an ever increasing call for safety within inside spaces. Then the strong characteristic extraction approach is regularly accustomed decide character of a few individuals, for example terrorist on the airport terminals. Other feasible programs consist of get entry to manage to numerous homes and spectators monitoring. Ear as biometrics is regularly utilized in multimodal structures to enhance the overall performance of a few different acknowledged biometrics. For example, airports utilise a combination of iris and face biometrics to confirm a passenger's identity; nevertheless, one ear biometric machine is regularly used to confirm a passenger's authenticity with the identical precision. Person's behaviour the usage of written textual content is used to decide if someone is lying, amongst different things.

REFERENCES

[1] Miguel Lopez; Patricia Melin; Lizette Gitierrez," Modular neural network integrator for human recognition from ear images" in The 2010 International Joint Conference on Neural Networks (IJCNN), 2010.

[2] Zhichun Mu; Liang Tian,"Ear recognition based on deep convolutional anetwork" in 9th International Congress on Image and Signal Processing, Biomedical Engineering and Informatic (CISPBMEI), China, 2016.

[3] M Adhyarua; Ankit K.Sharma; TanishH.Zaveri,"A survey of automated biometric authentication techniques" in Nirma University International Conference on Engineering (NUiCONE), India, 2013.

[4] Rafiqul Islam; Mozammel Chowdhury; JunbinGao,"Robust ear biometric recognition using neural network: in 12th IEEE Cong=ference on Industrial Electronics and Applications (ICIEA), Cambodia, 2017.

[5] Christoph Linse; Erhardt Barth; Hamman Alshazly," Deep Convolutional Neural Networks for Unconstrained Ear Recognition" in IEEE Access (Vi=olume:8), pg: 170295-170310, September-2020.

[6] Angelica Gonzalez Arrieta; Miguel Ramon Ramon; Pedro Luis Galdamez," Ear recognition using a hybrid approach based on neural networks" in 17th International Conference on Information Fusion (FUSION), Spain, 2014.

[7] N.Hamdy; H.Ibrahim; M.El- Habrouk,"Personal Identification Using Combined Biometrics Techniques", in 16th International Conference on Systems, Signals and Image Processing, Greece, 2009.

[8] Dheeraj DilipMor; Aman Chhabra; Shubhangi Khobragade," A method of ear feature extraction for ear biometrics usingMATLAB" in Annual IEEE India Conference (INDICON), New Delhi, 2016.

[9] Karim Faez; RasoulAmirfattahi; Ali Pour Yazdanpanah," Multimodal biometric system using ear, face and gait biometrics" in International Conference on Information Science, Signal Processing and their Applications (ISSPA 2010), Malaysia, 2010.

[10] Almas Anjum; AnamTariq,"Personal identification using computerized human ear recognition system" in Proceedings of 2011 Interntional Conference on Computer Science and Network Technology, China, 2011