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Face Mask Detection Using Machine Learning Techniques

Akash H R[1], Anirudh PK[2], Mohammed Sadath Hasan[3], Mohammed Shah Faisal Khan[4],

Dr Rajeshwari J[5]

[1,2,3,4]*Students, Department of Information Science and Engineering, Dayanandasagar College of Engineering Bangalore, Karnataka, India*
[5]*Associate Professor, Department of Information Science and Engineering, Dayanandasagar College of Engineering Bangalore, Karnataka, India*

Abstract - *Face Mask Detection system is a Machine Learning-based system recognizes through the usage of biometric data which provides the identification of an individual by securing facial characteristics and classified them. As in the case when one does not wear the Face Mask machine or application generates an alarm and an announcement is made in the location where we applied it for surveillance like in Airport, Railway Station, Bus Terminals, Hospitals, Crowded Marketplaces and in Public Transportation Service.*

Real-time image recognition and video processing are done with the assistance of OpenCV which capture the image of a person who violates the norms and doesn't wear the face mask. Including the utility of Real-time Public Addressing subsystem for alarming and alerting public and authorities to take immediate effect for cases of violation of norms relevant to Face Mask Detection

Key Words: **Mobile Net, Deep Learning, Machine Learning.**

1. INTRODUCTION

A face detection methodology is a technology which is capable of finding or verifying a person from a real time image or a video frame from a video [1]. It is used as access control in security systems and is similar to other biometrics such as fingerprint or eye iris recognition systems.

Here are at least 2 methods involved –

- Detection – Finding the face
- Recognition - the ability to recognize what type of thing it is or whose face it is.

Facial recognition technologies vary, but the basic steps are the following:

Step 1. A picture of your face is captured from a photo or video stream. Face in the image might appear alone or in a crowd.

Step 2. The geometry of the face is read by facial recognition. Key factors include the distance between eyes and the distance from the forehead to chin. The software identifies facial landmarks that distinguish one face from another.

Step 3. Your facial signature (like a mathematical formula) is compared with the model trained from Machine Learning. It is shown in below figure 1

Step 4. As a determination is made. Your faceprint may match that of an image in a facial recognition system database or not.

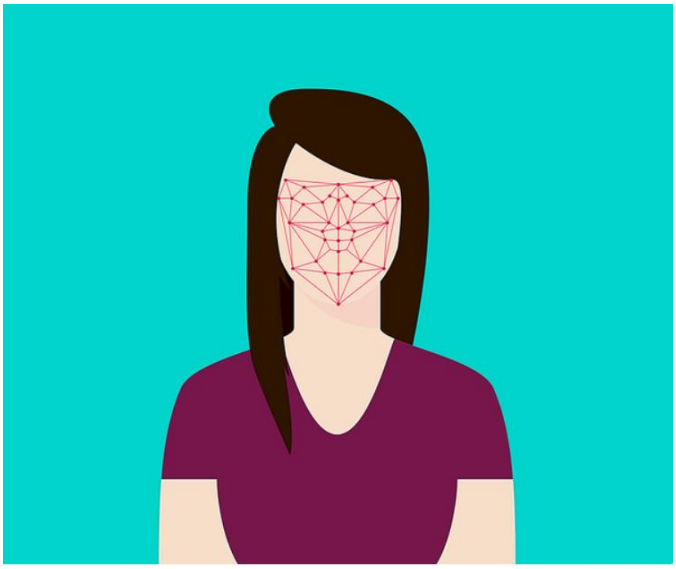

Figure 1 : Facial Signature as a Mathematical Formulae

1.1 Mobile Net

Mobile Net is a CNN architecture model for Image Classification and Mobile Vision. There are many different models also. But what makes Mobile Net special that it very less computation power to run or apply transfer learning to. This makes it a perfect fit for electronics devices, embedded system and the based-on computers without GPU or low computational efficiency with compromising significantly with the accuracy of results. It is also best suited for web browsers as browsers have limitation over computation, graphic processing and storage

1.1.2 Mobile Net Architecture

- Mobile Nets [5] for mobile and embedded vision applications is proposed, which are bon the basis of the streamlined architecture that uses depth wise separable convolutions [3] to build light weight deep neural networks.

- The main layer of Mobile Net is depth wise separable filters, named as Depth wise Separable Convolution [5]. The network structure is another factor to boost the performance. Finally, the width and resolution can be tuned to tradeoff between latency and accuracy.

1.2. Deep Learning

Deep learning is an AI strategy that instructs Computers to do what comes naturally to humans. Deep learning is a vital innovation behind driverless vehicles, empowering them to perceive a stop sign, or to recognize a person on foot from a light post. It is the way to voice control gadgets like telephones, tablets, TVs, and sans hands speakers. Deep learning is getting heaps of consideration in light of current circumstances. It's accomplishing results that were impractical previously

In deep learning, a pc version learns to carry out categorisation from images, text, or sound. Deep learning fashions can gain cutting-edge accuracy, occasionally exceeding human-stage performance. Training of the models are done through the use of massive set of categorized information and many layers is consisted in the neural community architectures.

In 1980's the deep learning was first theorized and there two main reason it became useful recently.:

1 Large amount of labelled data is required for Deep Learning. For Example: Millions of images and hours of videos are required to train a driverless car.
2 Deep learning requires computing power High-performance GPUs have a parallel architecture that is efficient for deep learning.
3 Deep learning combined with clusters or cloud computing, this activates development teams to decrease training time for a deep learning network from weeks to minutes or less.

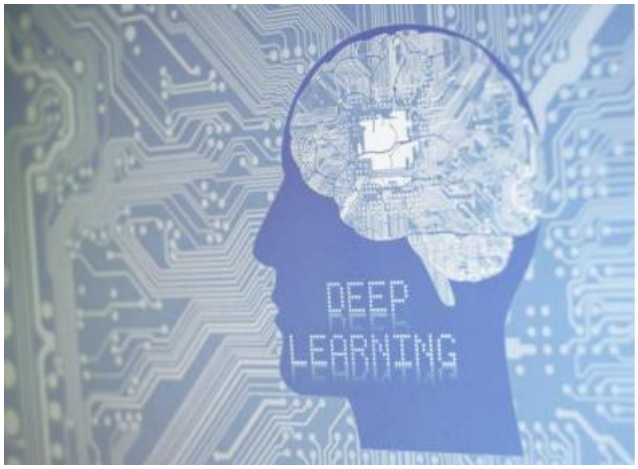

Figure 2: Deep Learning.

2. Proposed System

The proposed system focuses on how to identify the person on image or from a live video stream [2] wearing face mask with the help of computer vision and deep learning algorithm by using the Tensor flow, Kera, OpenCV and PyTorch library.

2.1 Approach

1) Train Deep learning model (Mobile Net Architecture)
2) Apply mask detector on Images or live video stream.

2.2 Flow Chart

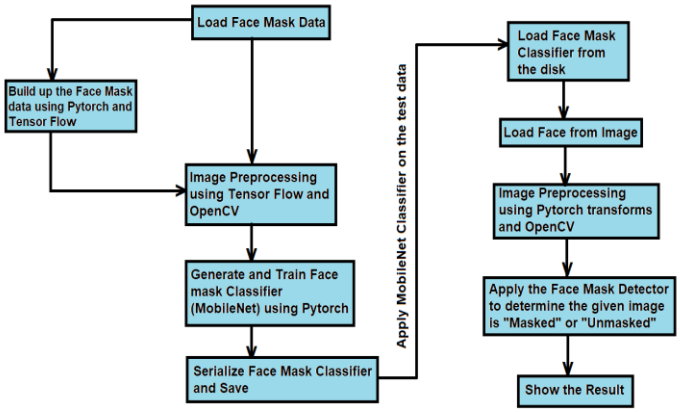

Figure 3: Flow Chart of Face Mask Detector

2.3 Data at the Source

The images in the datasets were augmented by OpenCV. The images in the datasets are also labeled with "Mask" and "No Mask". The images that are present in the datasets are extracted from different sources or from different cameras. The images are also of different sizes and different resolutions.

2.4 Data Preprocessing

The preprocessing steps mentioned below are applied to the raw images to convert them to clean version so that it could be fed to neural network machine learning model.

1) Resizing the input image
2) Applying the color filtering (RGB) over the channels Our model Mobile Net supports 2D 3 channel image)
3) Scaling / Normalizing images using the standard mean of TensorFlow build in weights
4) Center cropping the image
5) Final step is converting them into tensors.

3. Experimental Results

Accuracy of masked face recognition [4] has been measured on these datasets. In this work different combinations of masked and non-masked face images are made to find out the best recognition accuracy. Figure 4 shows train and testing scenarios with different combinations of masked and unmasked images.

Scenario	Train Image	Test Image	Train Accuracy (%)	Test Accuracy (%)
Scenario 1	Non-masked Faces	Masked Faces	100.00	90.40
Scenario 2	Non-masked Faces + Masked Faces	Masked Faces	99.96	98.50
Scenario 3	Non-masked Faces	Masked Faces	100	89.49
Scenario 4	Non-masked Faces + Masked Faces	Masked Faces	99.37	82.21
Scenario 5	Non-masked Faces	Masked Faces	100.00	63.52
Scenario 6	Non-masked Faces + Masked Faces	Masked Faces	99.91	98.10

Figure 4 : Testing Scenario of Masked and Unmasked Images.

4. CONCLUSIONS

We were able to generate accurate face masks for human from RGB channel images containing localized objects. We demonstrated our results on Multi Human Parsing Dataset with mean pixel level accuracy. Also the problem of erroneous predictions has been solved and a proper bounding box has been drawn around the segmented region. Proposed network can detect non frontal faces and multiple faces from single image. The method can find applications in advanced tasks such as facial part detection.

In this system artificial intelligent (AI) and machine learning (ML) are developed various models for face mask detection. Mask detection nowadays is very challenging task today. This Application of Face Mask detector are specially used for prevention of spreading Corona Virus, tracking and anti-spoofing etc. By using a Mobile Net, we can easily detect the facial mask. In the case when one does not wear the Face Mask machine or application generates an alarm in the location where we applied it for surveillance like in Airport, Railway Station, Hospitals and in Public Transport etc.

REFERENCES

[1] Roomi, Mansoor, Beham, M.Parisa, "A Review Of Face Recognition ways in which within which," in International Journal of Pattern Recognition and AI, 2013, 27(04), p.1356005.
[2] A. S.Syed Navaz, t. Dhevi sri, Pratap Mazumder, " Face recognition exploitation principal 0.5 analysis and neural network," in International Journal of microcomputer Networking, Wireless and Mobile Communications (IJCNWMC), vol. 3, pp. 245-256, Mar. 2013.
[3] H. Li, Z. Lin, X. Shen, J. Brandit, and G. Hua, "A convolutional neural network cascade for face detection," in IEEE CVPR, 2015, pp.5325-5334.
[4] Wei Bu, Jiangjian Xiao, Chuanhong Zhou dynasty, Minmin principle, Chengbin Peng, "A Cascade Framework for disguised Face Detection," in IEEE International Conference on CIS & RAM, Ningbo, China, 2017, pp.458-462.
[5] Ge Shiming, Li Jia, Qiting Ye, Zhao Luo, "Detecting disguised Faces within the Wild with LLE-CNNs," in IEEE Conference on laptop Vision and Pattern Recognition, China, 2017, pp. 2682--2690.

BIOGRAPHIES

Akash H R is an undergraduate student from the department of Information Science and Engineering at Dayananda Sagar College of Engineering, Bangalore.

Anirudh P K is an undergraduate student from the department of Information Science and Engineering at Dayananda Sagar College of Engineering, Bangalore.

Mohammed Sadath is an undergraduate student from the department of Information Science and Engineering at Dayananda Sagar College of Engineering, Bangalore.

Mohammed Shah Faisal Khan is an undergraduate student from the department of Information Science and Engineering at Dayanand Sagar College of Engineering, Bangalore.

Rajeshwari J is an Associate Professor from the department of Information Science and Engineering at Dayananda Sagar College of Engineering, Bangalore.