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A Survey on Mask Detection and Covid-19 Certificate Validation

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Abstract: **To create a tamper-proof and privacy preserving certification for covid-19 vaccination, we develop Mobile application that facilitates instant verification of tamper proof Certificate. Personally identifiable information is only stored at the user's discretion and the app allows the end-user selectively to present only the specific Certificate result with no other personal information revealed. In this project we are going to validate the COVID-19 vaccine. The vaccination certificate has very common font which can tampered with the help of simple editing software and will look exactly the same. But with the help of QR it can easily validate which is tempered or which is genuine. We are also building a mask detector to help ensure safety of the people, if a person is not wearing mask then we are going to detect face of that individual using face recognition techniques and will take necessary actions against him/her.**

***Keywords*- Face recognition, OpenCV, ZXing library, Data analysis**

1. 1. INTRODUCTION

The novel corona virus covid-19 had brought a new normal life .India is struggling to get out of this virus attack and the government implemented lockdown for the long way. Lockdown placed a pressure on the global economy. So, the government gave relaxations in lockdown. Declared by the WHO that a potential speech by maintaining distance and wearing a mask is necessary. The biggest support that the government needs after relaxation is social distancing and wearing of masks by the people. But many people are getting out without a face mask this may increase the spread of covid-19. Economic Times India has stated that " Survey Shows that 90. percentage Indians are aware, but only 44 percent wearing a mask ". This survey clearly points that people are aware but they are not wearing the mask due to some discomfort in wearing and carelessness. This may result in the easy spreading of covid-19 in public places.

In densely populated regions it is difficult to find the persons not wearing the face mask and warn them. Hence, we are using image processing techniques for identification of persons wearing and not wearing face masks. In real time images are collected from the camera and it is processed in Raspberry Pi embedded development kit. The real time images from the camera are compared with the trained dataset and detection of wearing or not wearing a mask is done.

Verifying the COVID-19 certificate is important for every individual who has taken one or both doses of vaccines, it is important because by verifying the vaccine certificate any individual can assure that the vaccination certificate is valid, having a valid vaccine certificate is a great thing to any individual. Because, in case travelling throughout the country or outside of the country or going for shopping and school, colleges, having a COVID-19 vaccination valid certificate is mandatory.

For this tempered free certificate validation, we are building a software which contains QR generator, for generating QR code for certificate, further this QR code is validate using COWIN API's which is publicly for third party users.

1.2. MOTIVATION

- Covid-19 is not over yet, we need to take maximum precautions, in order to prevent it from spreading ahead. But in order to do that, everyone need to get vaccinated as well as wear mask, and follow proper sanitary methods.
- students/ customers try to edit vaccination certificates to enter the colleges/malls. Also, now-a-day most of the public is not wearing the mask properly anymore, which can help next wave of Corona virus to hit harder.
- to prevent this, certificate validation system is as important as a surveillance system which can help detect individual if they are wearing mask properly or not.

1.3. PROBLEM STATEMENT

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1.4. OBJECTIVES

1. To create a tamper-proof and privacy preserving certification for test results and vaccinations through Desktop application.
2. To develop mask detection using a camera that functions video input and connected to existing system.
3. If people who are not covered their faces with mask are identified through face recognition algorithm, then they will get necessary punishment as this will help to minimize corona virus.

2.1. LITERATURE SURVEY

1. **COVID-19 Monitoring System using Social Distancing and Face Mask Detection on Surveillance video datasets:**
   Sahana Srinivasan, Rutuja Singh et Al[4] have proposed a 24X7 video-monitoring system called “COVID-19 Monitoring System using Social Distancing and Face Mask Detection on Surveillance video datasets” as an effective solution to perform person detection, social distancing violation, face detection, face mask classification using object detection, clustering and Convolution Neural Network (CNN) based binary classifier. The result of concluded system gives an efficient solution to monitor social distancing practices in public areas where it is very difficult to monitor manually.

2. **The Implementation of QR Codes in the Educational Process:**
   M. Filipovic Tretinjak have proposed a paper “The Implementation of QR Codes in the Educational Process” on year May 2015. It states that the use and beneficial attributes of a Quick Response (QR) code. As it can contain information like, URL links, text, Google map location into just a square pattern code consist of black modules on a white background. This paper described various methods for the implementation of QR codes in the educational process. As in conclusion to this paper response of teachers towards QR codes is reflected to be positive.
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3. **Motion Detection and Face Recognition for CCTV Surveillance System:**
   Ade Nurhopipah and AgusHarjoko have proposed Motion Detection and Face Recognition for CCTV Surveillance System research in July 2018 called “Motion Detection and Face Recognition for CCTV Surveillance System”. This research was conducted by designing and testing motion detection and face recognition on a CCTV video. Motion detection using ADI method shows 92.655% success rate. Average time needed to take a decision on motion detection process is 1.115 second. Facial detection using Haar Cascade Classifier produces a 76% success rate. Training data using CPN algorithm results 0.0455 MSE with a 94.286% success rate. Face identification by applying training data value and pattern extraction using SURF and PCA results 60% success rate. The ideal time required for processing was under 0.1 second per frame, while in this research it was clear that in actual it took 0.202 second.

4. **Covid-19 Face Mask Detection Using TensorFlow, Keras and OpenCV**:
   Arjya Das, Mohammad Ansari et Al[3] have proposed a paper on face mask detection system using TensorFlow, Keras and OpenCV.. In paper authors have briefly explained about the motivation for the project to start. While illustrating the learning and performance task of the model. Using basic ML tools and simplified techniques the method has achieved reasonably high accuracy. And authors conclude that it can be used for a variety of applications. As Wearing a mask is mandatory, considering the Covid-19 crisis. Authors were also planning to improve the system in order to identify the type of mask. i.e., the type of the mask is surgical, N95 or not.

5. **PA-GAN: A Patch-Attention Based Aggregation Network for Face Recognition in Surveillance:**
   This Ming Liu, Jinjin Liu, et Al[4] have published a paper on Patch-Attention Based Aggregation Network for Face Recognition in Surveillance. This journal states the investigation for the task of unconstraint surveillance face recognition. In order to recognize face in surveillance efficiently, a novel Patch-Attention based Generative Adversarial Network (PA-GAN)

is proposed in this article. PA-GAN combines patch-attention learning model and unlabelled face training to exactly discard the misleading frames and aggregates the useful information of an input video. One promising potential function of the PA-GAN is for shrinking intra-class distance and enlarging inter-class distance in the feature space. Furthermore, runtime is reduced as we only need to pass a few output images through feature extraction network for recognition. Experimental results on two widely used datasets demonstrate the effectiveness of our framework.

6. **Color quotient-based mask detection:**
IoanBuciu have published a paper named as Color quotient-based mask detection by recognising the issue which can be faced with mask detection algorithm.The paper deals with mask detection in the age of COVID - 19, by proposing a simple and efficient method to detect people not wearing mask. The approach includes a feature extraction step followed by a supervised learning model built with support vector machines.Color information was used to extract meaningful and discriminant features that were next entering a training process to model a suitable SVM. The results were very promising, leading to a high detection accuracy for the test scenario. The approach works for facial images with various resolution (from high to low quality) and also for various facial poses (from frontal to tilted or rotated).

3.1. WORKING OF FACE MASK DETECTION

Fig. 3.4.1 Represents that how face mask detection is works. Initially it train mask detector with almost 2000 without mask faces and 2000 masked faces.

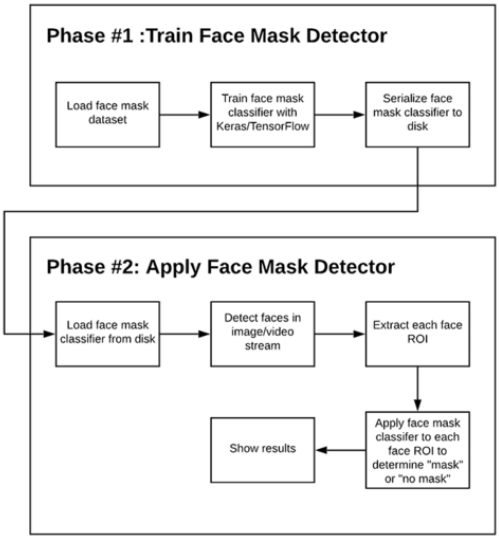

Fig.3.4.1 Mask Detection working

In order to train a custom face mask detector, we need to break our project into two distinct phases, each with its own respective sub-steps:

1. **Training:** Here we'll focus on loading our face mask detection dataset from disk, training a model (using Keras/TensorFlow) on this dataset, and then serializing the face mask detector to disk
2. **Deployment:** Once the face mask detector is trained, we can then move on to loading the mask detector, performing face detection, and then classifying each face as with mask or without mask.

Covid-19 pandemic has rapidly affected our day-to-day life disrupting the world trade and movements. Wearing a protective face mask has become a new normal thing.Therefore, face mask detection has become a crucial task to help global society.The proposed method detects the face from the image correctly and then identifies if it has a mask on it or not. As a surveillance task performer, it can also detect a face along with a mask in motion. The method attains accuracy up to 95.77% and 94.58% respectively on two different datasets.

Our work aims to a develop technique that can accurately detect mask over the face in public areas (such as airports. railway stations, crowded markets, bus stops, etc.) to curtail the spread of Coronavirus and thereby contributing to public healthcare.

A face is detected from an image that has several attributesGiven a solitary image, the challenge is to identify the face from the picture. Face detection is a difficult errand because the faces change in size, shape, color, etc and they are not immutable. It becomes a laborious job for opaque image impeded by some other thing not confronting camera, and so forth. So in order to avoid these difficulties we will be using Open Cv tensor flow using phython and we will be also training mask detection module in order to accurately detect the face mask.

As the numerous surveillance data and video media producing, video face recognition system has many practical applications. Video actually consists of many frames, so video-based face recognition can be treated as set-based recognition. This work was pioneered by Phillips [9] in 1996. However, due to few benchmarks were available, the development of video-based face

recognition was slowed down. Nowadays, there are numerous potential uses of the systems with surveillance FR capability in real-world environments and bringing it back into focus. Existing methods about video FR are simply split into two computation stages.

We detect face area and mark 5 points landmarks by a recent method MTCNN [48], and then use the similarity trans-formation to normalization. Considering the limitations of the training data set, we initialize the input faces of generator less than 20 frames. During training and testing stage, we resize all face images in the methods of bicubic interpolation to the required size 128×128 pixel. Such rescaled images are still of ‘‘low resolution’’ as the underlying resolution is mostly unchanged. We use the stochastic gradient descent with minibatch size 128. We set hyper-parameters, $\lambda 1 = 0.1$, $\lambda 2 = 0.2$. Momentum of 0.9, and weight decay of $1e-4$. In our setting, the learning rate is initialized to $1e-2$, and during fine-tuning, the learning rate is initialized to $1e-3$. We utilize both ResNet26 and ResNet50 [23] as the baselines. The experiment is implemented by Pytorch framework [26] on a machine with four GeForce RTX2080Ti GPUs and 11GB memory for neural network training.

3.2 QR CODE GENERATOR

Quick Response (QR) codes are two-dimensional (2- D) barcodes that can contain all types of data, such as numeric and alphabetic characters, Kanji, Kana, Hiragana, symbols, binary and control codes. Up to 7,089 characters can be encoded in one code. These square pattern codes consist of black modules on a white background. The main features of QR codes are: high capacity data storage, small printout size, Kanji and Kana character set capability, dirt and damage resistant (QR codes have an error correction capability), readable from any direction in 360 degrees and with a structured appending feature. One QR code can be divided into up to 16 smaller QR symbols. Information stored in multiple QR code symbols can be reconstructed as a single data symbol.

The DENSO Wave Incorporated (the inventor of the QR Code and owner of the QR Code trademark) has allowed the patents for the QR code to be freely available to the public there are many websites that feature online QR code generators or downloadable code generating software. Because such software is not certified by the ISO, the created QR codes may not be readable by all devices or the reading quality may be reduced. In order to avoid such problems, only code generating software compliant with ISO Standard 18004 should be used.

Zxing stands for Zebra Crossing, it is one of the most popular open-source API for integrating QR(Quick Response**)** Code processing. It is a barcode image processing library implemented in Java, with ports to other languages. It has support for the 1D product, 1D industrial, and 2D barcodes. Google uses ZXing by web search to obtain millions of barcodes on the web indexable. It also creates the foundation of Android’s Barcode Scanner app and is combined into Google Product and Book Search.

4.1 CONCLUSION

In the context of the Covid-19 pandemic, we have proposed a simple yet efficient approach to detect the presence of facial mask and certificate validation, solution that can be exploited in public spaces. Where vaccine certificate and wearing of the mask is mandatory this system will ensure that people are vaccinated and wear mask, this system will definitely make good impact in this situation.
In this work, a deep CNN based approach for detecting masks over faces in public places to curtail the community spread of Corona virus is presented. The proposed technique efficiently handles occlusions in dense situations by making use of an ensemble of single and two-stage detectors at the pre-processing level. The ensemble approach not only helps in achieving high accuracy but also improves detection speed considerably. Furthermore, the application of transfer learning on pre-trained models with extensive experimentation over an unbiased dataset resulted in a highly robust and low-cost system. The identity detection of faces, violating the mask norms further, increases the utility of the system for public benefits.

4.2. REFERENCES

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