Biometric Based Recognition for Vaccinated Surveillance Finder and Alert System

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Abstract*— Now a days vaccinations are an important and effective cornerstone of preventive medical care with significant health benefits. authorities has commenced vaccination to save you the non-stop unfold of corona contamination in India.Address ubiquitous problem: the widespread hesitancy toward or downright rejection of vaccination. Proposed an Aadhar -based facial recognition system is used to find non vaccine citizen and alert them using Artificial Intelligence. Finally its provides COVID-19 vaccination status using their face and attest that an individual has received a vaccine or not and alert them to get vaccinated. Deep getting to know withinside the shape of Convolutional Neural Networks (CNNs) to carry out the face popularity and appears to be an ok technique to perform face popularity because of its excessive accuracy. A CNN is a sort of Deep Neural Network (DNN) this is optimized for complicated duties which includes photograph processing, that is required for facial popularity. CNNs include more than one layers of related neurons: there's an enter layer, an output layer, and more than one layers among those two. In the context of the coronavirus disease (COVID-19) pandemic, A face popularity-primarily based totally person's modern-day vaccination reputation to guard towards COVID-19 can then be used for continuity of care or as evidence of vaccination for functions aside from fitness care. Facial popularity technology (FRT) at the side of the Aadhaar to authenticate humans earlier than moving into any styles of service.

I. INTRODUCTION

COVID-19 vaccines in India and someplace else are often shot vaccines. High performance calls for each doses of COVID-19 vaccines to be administered which can offer safety in opposition to deadly contamination. As the second one wave of COVID-19 contamination picked up, India noticed a excessive charge of COVID contamination and deaths most of the aged human beings and those with comorbidities. Elderly and the human beings with comorbidities had been those who had been at excessive threat of COVID-19 contamination, and consequently they had been prioritized to get hold of COVID-19 vaccine pictures relative to others withinside the section smart vaccine rollout. Many amongst them who had been vaccinated with the primary dose gotten smaller COVID-19 contamination and a number of them died because the first dose on my own become now no longer supposed to construct enough immunity to combat excessive COVID contamination. However, the parable advanced mainly withinside the rural regions that covid vaccines had been inflicting deaths and illness. This too possibly contributed to vaccine hesitancy all through the 0.33 and the fourth section of the vaccination drive. India is looking at adding Aadhar-based facial recognition in an effort to make its COVID-19 vaccination procedure contactless. To test the efficacy of the facial recognition system, which is based on data obtained from the Aadhaar database. Aadhar is already the "preferred" mode of identity verification and for vaccination certificates. Using facial recognition at vaccine centers risks further marginalizing vulnerable people who may be misidentified and refused the vaccine, and raises fears the controversial technology could become the norm at all centers. The main objective of the project is to develop an "Aadhaar-based facial recognition system could soon replace biometric fingerprint or iris scan machines at COVID-19 vaccination finder across the country in order to avoid non-vaccination".

II. PROPOSED SYSTEM

This project provides COVID-19 vaccination status using their face and attest that an individual has received a vaccine or not and alert them to get vaccinated. Proposed an Aadhaar-based facial recognition system is used to find non-vaccination citizen and alert them using Artificial Intelligence.

Deep learning in the form of Convolutional Neural Networks (CNNs) to perform the face recognition.

2.1 Face Recognition – DCNN

CNNs are a category of Neural Networks that have proven very effective in areas such as image recognition and classification. CNNs are a type of feed-forward neural networks made up of many layers. CNNs consist of filters or kernels or neurons that have learnable weights or parameters and biases. Each filter takes some inputs, performs convolution and optionally follows it with a non-linearity. A typical CNN architecture can be seen as shown in Fig.3.3. The structure of CNN contains Convolutional, pooling, Rectified Linear Unit (ReLU), and Fully Connected layers.

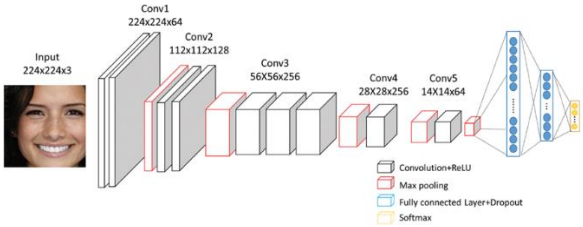


Figure 3.3. DCNN

2.1.1 Convolutional Layer: Convolutional layer performs the core building block of a Convolutional Network that does most of the computational heavy lifting. The primary purpose of Convolution layer is to extract features from the input data which is an image. Convolution preserves the spatial relationship between pixels by learning image features using small squares of input image. The input image is convoluted by employing a set of learnable neurons. This produces a feature map or activation map in the output image and after that the feature maps are fed as input data to the next convolutional layer.

2.1.2 Pooling Layer: Pooling layer reduces the dimensionality of each activation map but continues to have the most important information. The input images are divided into a set of non-overlapping rectangles. Each region is down-sampled by a non-linear operation such as average or maximum. This layer achieves better generalization, faster convergence, robust to translation and distortion and is usually placed between convolutional layers.

2.1.3 ReLU Layer: ReLU is a non-linear operation and includes units employing the rectifier. It is an element wise operation that means it is applied per pixel and reconstitutes all negative values in the feature map by zero. In order to understand how the ReLU operates, we assume that there is a neuron input given as x and from that the rectifier is defined as $f(x)= \max(0, x)$ in the literature for neural networks.

2.1.4 Fully Connected Layer: Fully Connected Layer (FCL) term refers to that every filter in the previous layer is connected to every filter in the next layer. The output from the convolutional, pooling, and ReLU layers are embodiments of high-level features of the input image. The goal of employing the FCL is to employ these features for classifying the input image into various classes based on the training dataset. FCL is regarded as final pooling layer feeding the features to a classifier that uses Softmax activation function. The sum of output probabilities from the Fully Connected Layer is 1. This is ensured by using the Softmax as the activation function. The Softmax function takes a vector of arbitrary real-valued scores and squashes it to a vector of values between zero and one that sum to one.

III. METHODOLOGY

1. Covid 19 Vaccination Finder Web App.
2. Face Recognition Module
3. Face Detection
4. Training of RPN
5. Face Identification
6. Prediction
7. Non-Vaccination
8. FinderNotification
9. Performance Analysis

1. Covid 19 Vaccination Finder Web App

Covid Vaccine Intelligence Network (Co-WIN), a portal set up to aid India's Covid immunisation drive. In this portal an Aadhaar-based facial recognition system is developed to find Covid-19 vaccination finder across the country in order find to Non-Vaccinated Population. "Facial recognition authentication is used as one of the methods for Aadhaar Authentication for online verification of beneficiary prior to COVID-19 vaccination wherein facial template is captured and send to UIDAI for verification of image of beneficiary."

2. Face Recognition Module

- Face Enrollment

This module begins by registering a few frontal face of Bank Beneficiary templates. These templates then become the reference for evaluating and registering the templates for the other poses: tilting up/down, moving closer/further, and turning left/right.

- Face Image Acquisition

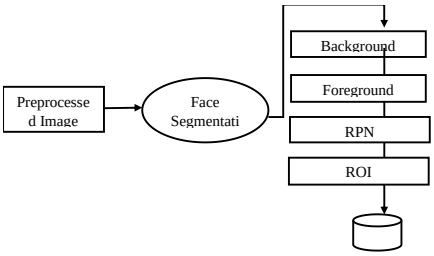
Cameras should be deployed in ATM to capture relevant video. Computer and camera are interfaced and here webcam is used.

- Frame Extraction

Frames are extracted from video input. The video must be divided into sequence of images which are further processed. The speed at which a video must be divided into images depends on the implementation of individuals. From we can say that, mostly 20-30 frames are taken per second which are sent to the next phases.

3. Face Detection

Face detection and segmentation method based on improved RPN. RPN is used to generate RoIs, and RoI Align faithfully preserves the exact spatial locations. These are responsible for providing a predefined set of bounding boxes of different sizes and ratios that are going to be used for reference when first predicting object locations for the RPN.



4. Training of RPN.

To know that for each location of the feature map we have 9 anchor boxes, so the total number is very big, but not all of them are relevant. If an anchor box having an object or part of the object within it then can refer it as a foreground, and if the anchor box doesn't have an object within it then we can refer it as background.

5. Face Features

- Forehead Height: distance between the top edge of eyebrows and the top edge of forehead.
- Middle Face Height: distance between the top edge of eyebrows and nose tip.
- Lower Face Height: distance between nose tip and the baseline of chin.
- Jaw Shape: A number to differentiate between jaw shapes. this number can be replaced if you use Face Shape Recognition, see (this) notebook.
- Left Eye Area
- Right Eye Area
- Eye to Eye Distance: distance between eyes (closest edges)
- Eye to Eyebrow Distance: distance between eye and eyebrow (left or right is determined by whice side of the face is more directed to the -screen-)
- Eyebrows Distance: horizontal distance between eyebrows
- Eyebrow Shape Detector 1: The angle between 3 points (eyebrow left edge, eyebrow center, eyebrow right edge), to differentiate between (Straight | non-straight) eyebrow shapes
- Eyebrow Shape Detector 2: A number to differentiate between (Curved | Angled) eyebrow shapes.
- Eyebrow Slope
- Eye Slope Detector 1: A method to calculate the slope of the eye. it's the slope of the line between eye's center point and eye's edge point. this

detector is used to represent 3 types of eye slope (Upward, Downward, Straight).

- Eye Slope Detector 2: Another method to calculate the slope of the eye. it's the difference on Y-axis between eye's center point and eye's edge point. this detector isn't a 'mathematical' slope, but a number that can be clustered into 3 types of eye slope (Upward, Downward, Straight).
- Nose Length
- Nose Width: width of the lower part of the nose
- Nose Arch: Angle of the curve of the lower edge of the nose (longer nose = larger curve = smaller angle)
- Upper Lip Height
- Lower Lip Height

6. Prediction

In this module the matching process is done with trained classified result and test Live Camera Captured Classified file. Hamming Distance is used to calculate the difference according to the result the prediction accuracy will be displayed.

7. Non-Vaccination Finder

This module is capable of identifying or verifying a non-Vaccination person by comparing and analysing patterns, shapes and proportions of their facial features and contours from the trained classified file. When a facial image (probe image) is entered into the system it is automatically encoded by an algorithm and compared to the profiles already stored in the Aadhar database system.

8. Notification

This information is then passed on to the countries that provided the images, and to those that would be concerned by the profile or a match. The results are returned quickly to enable immediate follow-up action.

9. Performance Analysis

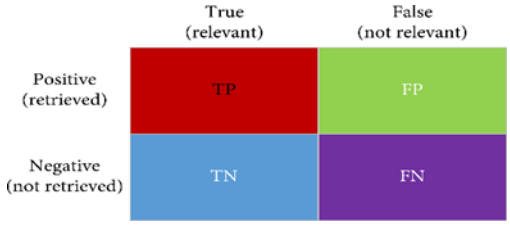
The important points involved with the performance metrics are discussed based on the context of this project:

True Positive (TP): There is a Face, and the algorithms detect Card Holder.

False Positive (FP): There is no Face, but the algorithms detect as Card Holder and display Card Holder name.

False Negative (FN): There is a Face, but the algorithms do not detect Card Holder and name.

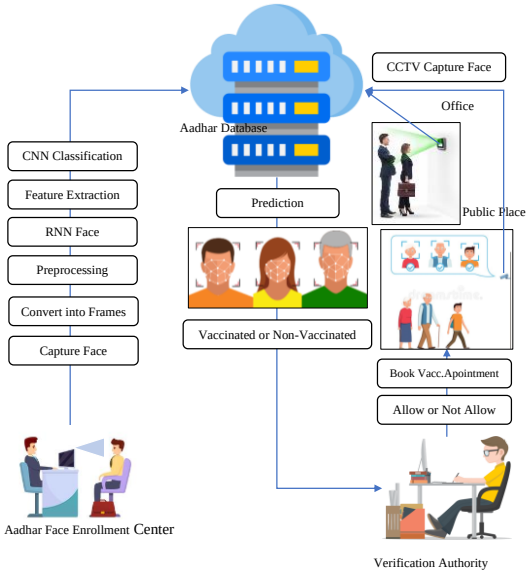
True Negative (TN): There is no Face, and nothing is being detected.



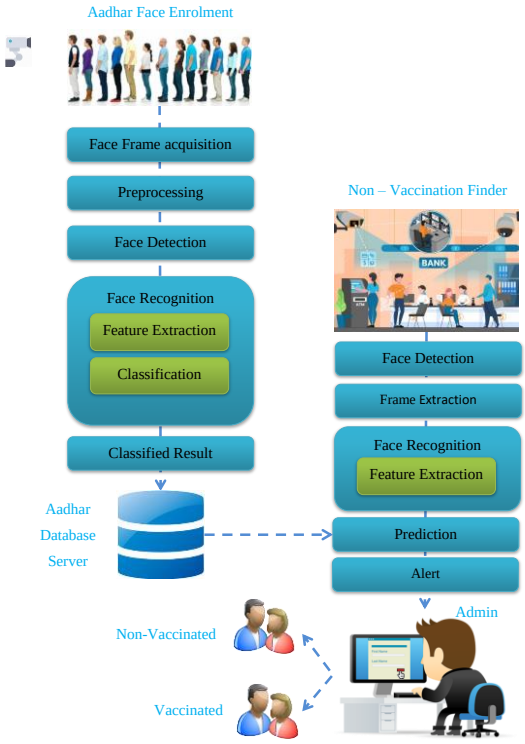
Parameter Definition

IV. SYSTEM DESIGN

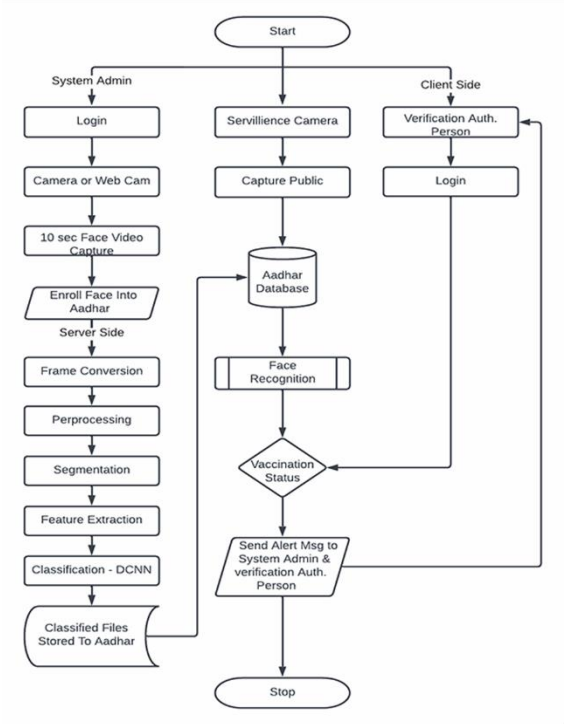
4.1 System Architecture



4.2 System Flow



4.3 Flow Chart



V. BENEFITS OF PROPOSED SYSTEM

- The system stores the faces that are detected and automatically marks vaccinated or not or Dose 1.
- Provide authorized access.
- Multiple face detection.
- Provide methods to maximize the number of extracted faces from an image.
- Ease of use.
- Manipulate and recognize the faces in real time using live video data.
- Multipurpose software.
- Can be used in different places.
- Vaccination Alert
- Vaccination Certificate with Face and QR

CONCLUSION

A facial recognition system is a technology capable of matching a human face from a digital image or a video frame against a database of faces, typically employed to authenticate users through ID verification services, works by pinpointing and measuring facial features from a given image. In the context of the coronavirus disease (COVID-19) pandemic, A face recognition-based person's current vaccination status to protect against COVID-19 can then be used for continuity of care or as proof of vaccination for purposes other than health care. Facial recognition technology (FRT) along with the Aadhaar to authenticate people before entering into any kinds of service. This project provides COVID-19 vaccination status using their face and attest that an individual has received a vaccine or not and alert them to get vaccinated. The proposed classifier performance evaluation was presented as a confusion matrix, in terms of sensitivity, specificity, precision, accuracy, and F1score. Results indicated that the proposed classifier has achieved higher recognition accuracy than ten other classifiers of the state of art.

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