A Project Report

on

Prediction of anonymous identification in video surveillance using Machine Learning in Android App

Submitted in partial fulfillment of

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B.Tech CSE

Under The
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CANDIDATE'S DECLARATION

I/We hereby certify that the work which is being presented in the thesis/project/dissertation, entitled **"Prediction of anonymous identification in video surveillance using Machine Learning"** in partial fulfillment of the requirements for the award of the **BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING** submitted in the **School of Computing Science and Engineering of Galgotias University, Greater Noida,** is an original work carried out during the period of SEPTEMBER 2021, To DECEMBER 2021 under the supervision of **Mr.S.Janarthanan** ,**Assistant Professor, Department of Computer Science and Engineering of School of Computing Science and Engineering** , Galgotias University, Greater Noida .

The matter presented in the thesis/project/dissertation has not been submitted by me/us for the award of any other degree of this or any other places.

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This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

Supervisor

(Mr.S.Janarthanan,Assistant Professor**)**

CERTIFICATE

The Final Thesis/Project/ Dissertation Viva-Voice examination of **SAGAR CHOUDHARY-19SCSE10101282, PRANJAL MAURYA-19SCSE1010486** has been held on _____ and his/her work is recommended for the award of **BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING**

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Signature of Examiner(s) **Signature of Supervisor(s)**

Signature of Project Coordinator **Signature of Dean**

Date:

Place: Greater Noida

Abstract

Prediction of anonymous identification in video surveillance using machine learning is based on facial recognition, it is an innovation based technique for perceiving a human face. Biometric are utilized in face acknowledgment frameworks to plan facial qualities from a picture or video.To find a match, it looks at data to a data set of realized faces. There has been a ton of progress been made in space of face identification and acknowledgment for security, identification, yet at the same time, there are issues that outperform human-level accuracy. These issues are varieties in human facial appearance, for example, fluctuating lightning conditions, different face structures, pose, etc. This programming perceives an approaching image. The significant test is that this task happens in video reconnaissance and genuine-time, which is something that not all bio-measurements face acknowledgment programming organizations offer. This programming is made utilizing various libraries and information bases that make this product feasible for example it involves Open CV and various libraries, for example, Numpy, TensorFlow, Keras, etc. Its establishment depends on AI to run its course offers an extraordinary precision utilizing ongoing recordings

List of Figures

Acronyms

B.Tech.	Bachelor of Technology
SCSE	School of Computing Science and Engineering
	PCA
	MACHINE LEARNING
	EIGENFACESHAARCASCADE
	FACE RECOGNITION

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CHAPTER 1

1.1 Introduction

Due to its continuous uses, face ID has gotten a ton of interest. A great deal of exploration has been done and is right now being done to improve and accelerate the face discovery calculation's execution. For what reason is it so hard for a machine to perceive faces? Because of various contrasts in picture appearance, for example, act variety (front, non-front), impediment, picture direction, lighting changes, and look changes, face recognizable proof isn't quite as straightforward as it shows up.

1.2 Technology Used

Open CV is an open-source PC vision and AI programming library. It is a BSD permit item subsequently free for both business and scholastic purposes. The Library gives over 2500 calculations that incorporate AI devices for order and bunching, picture preparing and vision calculation, fundamental calculations and drawing capacities, GUI and I/O capacities for pictures and recordings. A few uses of these calculations incorporate face discovery, object acknowledgment, removing 3D models, picture preparing, camera alignment, movement examination, and so forth.

Open CV is composted locally in C/C++. Open CV was intended for computational effectiveness and focused on constant applications. Written in advanced C/C++, the library can exploit multi-center preparation.

Open CV contains numerous pre-prepared classifiers for face, eyes, grin and so on The XML documents of pre-prepared classifiers are put away in Open CV/information. For face identification explicitly, there are two pre-prepared classifiers:

1. Haar Cascade Classifier

2.LBP Cascade Classifier
Prediction of anonymous identification in video surveillance using Machine Learning - deals with AI calculations, python, various libraries.

Identify faces with pre-prepared models from Open

CV. It comprises 4 periods of this program :

1. Extract installing from face informational index

2. Train unknown ID model

3. Recognize faces utilizing Open CV

4. Recognize countenances in live video transfers

Different python libraries can be utilized in this product, some of them are:

Imutils

TensorFlow

Keras

Numpy

Pickle

Sci-kit learn

Pandas as pd

3 .ANDROID

The complete project is build on android platform . Android studio has been used to implement the following project . First the model is constructed using different approaches and finally is deployed to the android platform

CHAPTER 2

Literature Review

The aim of the prediction of anonymous identification in video surveillance is picture understanding. It can be said that it essentially analyzes the personality of at least one individual from pictures from recordings to the pictures put away in databases. It's a one to many coordinating with the strategy that decides the recognizable proof of an inquiry face by contrasting it with all of the format pictures in a face data set.The test picture is recognized by imagining that it is in the informational index with the best similarity to the test picture. Face affirmation results depend extraordinarily upon features that are isolated one-of-a-kind picture depiction is incredibly repetitive, and the dimensionality of this depiction could be especially decreased when fundamentally the face plans are of interest. The face picture is reasonably tended to as a segment vector. We can get Eigenfaces by :Component Analysis (PCA).

Karhunen-Loeve changes (KLT).

2.1 Face Analysis

The performance or the ability of the many modern face recognition system decreases due to changes in lighting, present, and different variables. The difficulties in face ID are

Impediment - A couple of appearances are ruined by shades, covers, and various articles this makes a square for the structure as it is inadequate to perceive the image

from the set aside data base.

Time delay - The human face changes over the long haul ,changes such as hairstyle changes, facial hairs,muscle tensiona etc.

Represent Some unavoidable issues appear in the grouping of practical applications, for instance, individuals aren't reliably forward looking to the camera, so the stance trouble is a colossal deterrent for the face reputation machine to be regularity

Gender- Generally females tends to have higher identification rates as compared ot men. There is a reality that ladies put additional time into adjusting their facial appearance than men. Alternatively, PCs might be more touchy to physical varieties in people's face.

2.2 Methods For Face Recognition

Different strategies can be utilized to foster the product. Some of them are as per the following

1.) Open CV contains numerous pre-prepared classifiers for face, eyes, grin and so on The XML documents of pre-prepared classifiers are put away in Open CV information . For face recognition explicitly, there are two pre-prepared classifiers

Haar Cascade Classifier, LBP Cascade Classifier

A short comparison of the haar cascade classifier and LBP cascade classifier is given below :

Algorithm	Advantages	Disadvantages
Haar	High identification exactness Low false positive rate	Computationally intricate and slow Longer training time Less precise on dark appearances Limits in troublesome easing up conditions Less strong to impediment
LBP	Computationally simple fast and quick More limited training time Strong to local brightening changes Strong to impediment	Less accurate High false-positive rate

2) Eigenfaces are a collection of standardized face components derived through statistical analysis of a variety of face pictures. Eigenfaces are a set of faces in mathematics. Eigenvectors are generated from a high-dimensional vector's covariance matrix that portrays many human faces.

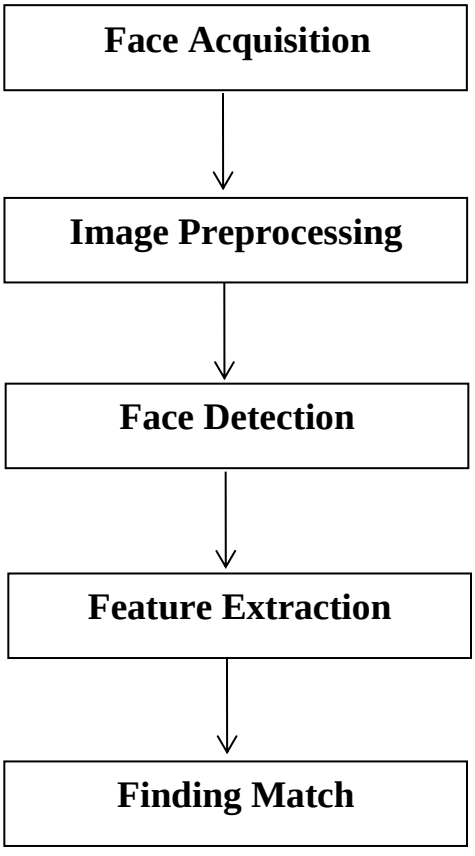
3) PCA is a change gotten from Karhunen-Loeve's change. It computes the s

dimensional vector portrayal of each face in a preparation set of pictures.PCA searches out a t-dimensional subspace whose premise is a bunch of factors.

The most noteworthy difference bearing in the first picture is addressed by vectors. space. Regularly, this new subspace is of lesser measurement (t<<s). On the off chance that the picture isn't clear. The PCA basis vectors are defined as eigenvectors of the scatter matrix if the picture factors are thought about arbitrarily.

2.3 Face Recognition Process

Face recognition is processed by following steps:



2.3.1 Face Acquisition

Creating Images can be finished by either checking a current photo or by taking a live image of a subject with a high goal camera.. Video may be accessed to create face pictures as well. The majority of currently available facial recognition systems only have a single camera. When it comes to image recognition, the accuracy is rather low when various poses and expressions are seen in the photographs. As the posture angle is increased, the accuracy of recognition falls. This happens because when the position angle is more than 30 degrees, the effect is magnified.Different lighting isn't an issue for some face recognition algorithms such as LDA that can still detect faces using changing lighting, although this is not the case with PCA. We can produce facial photographs to solve this problem with modest facial expression, frontal view or minimal rotation.If the PCA algorithm is used, the expression and illumination will be the same.

2.3.2 Image Pre-processing

Face recognition systems must contend with large lighting differences between gallery and probing photos. As a result prior to recognition, an image preprocessing method that accounts for picture illumination changes is applied. Grayscale photographs were utilized in this project. Histogram leveling is utilized to work on the nature of a picture and further develop face acknowledgment by changing the difference of the image, diminishing commotion, and accordingly improving the

nature of a picture. It's frequently done on photographs that are either excessively dim or excessively splendid.The goal of this enhancing techniques is to bring out preciseness that has been concealed, or merely to emphasis key components of a picture that are of interest.Images are enhanced to improve accuracy of the model.

2.3.3 Face Detection

Detection is a procedure for deciding the positions and sizes of human appearances in images.It just perceives faces and overlooks all the other things, including structures, trees, and individuals.The place of any countenances in the gathered picture is recognized utilizing software.To distinguish the appearances, summed up examples of what a face "resembles" are used.Viola and Jones' procedure, which is applied here, utilizes Haar-like properties. In any event, for a little picture, the quantity of Haar-like elements produced is gigantic; for a 2424 pixel outline, in excess of 180000 elements might be generated.Only two or three hundred Haar-like attributes are utilized in the last classifier. Regardless of this, it has an exceptionally high hit rate and a low bogus identification rate.

2.3.4 Feature Extraction

This module utilized is to create a include vector that is adequate to address a facial picture. Its motivation is to extricate significant information from the example that has been taken.The extraction of highlights is isolated into two classes: comprehensive elements and nearby features.Local include based methods endeavor to find individual facial elements like the eyes, nose, and mouth dependent on known

distances between them. The comprehensive element class is worried about the general appearance of the info face picture.To remove a face's recognizable attributes, many methodologies are applied. The frequently utilized methodology is called Principle Components Analysis (PCA), some of the time known as the eigen face strategy. One more methodology utilized here is Linear Discriminant Analysis (LDA), frequently known as the fisher face method.LDA and PCA calculations are both comprehensive element calculations.

2.3.5 Finding a Match

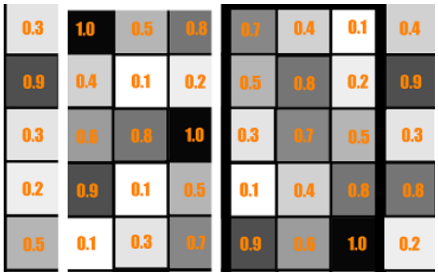
The last advance is to look at the format made in Step 4 to those in an information base of known appearances. In an ID application, the biometric gadget checks an example and analyzes it to each record or format in the data set, returning a match or a competitor rundown of likely matches that are close to the made layouts in the data set. In a confirmation application, the made format is simply contrasted with one layout in the information base, that of the asserted personality, which speeds up the cycle. The Euclidean distance, which recognizes the littlest distinction between the loads of the info picture and the arrangement of loads of all pictures in the data set, is utilized to distinguish the nearest match.

CHAPTER 3

Evaluation of Haar Cascade Approach

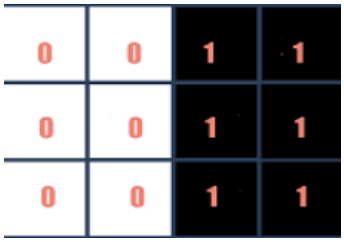
3.1 Haar Cascade Approach For Face Recognition

Cascade is an Object Detection Algorithm that perceives faces in a picture or a constant video.The approach utilizes the edge or line discovery qualities depicted by Viola and Jones in their publication . To train on, the calculation is given countless positive photographs with faces and countless negative pictures without any appearances.



Here is an instance of computing the Haar esteem from a rectangular picture cut. In the haar include, the hazier parts are pixels with values 1, and the more brilliant regions are pixels with values 0. Every one of them is responsible for deciding a specific trademark in the picture. Like a picture's edge, line, or any construction with an unexpected change in force. In the picture above, for instance, the haar component can recognize an upward limit with hazier pixels on the right and more splendid pixels on the left.The objective is to compute the absolute of all picture pixels in the more obscure piece of the haar highlight and the amount of all picture pixels in the more brilliant part of the

haar include. Then, at that point, discover what makes them unique. Assuming the picture contains an edge isolating dim pixels on the right from light pixels on the left, the haar worth will be more like 1. That is, if the haar esteem is close to 1, we guarantee there is an edge recognized. There is no edge in the above case since the haar esteem is far off from 1.



There are further haar highlights that distinguish edges in various ways just as some other picture structures. The haar highlight should navigate the entire picture to identify an edge wherever in it.The haar include moves over an image from left to right.To track down the particular element the haar highlight moves from the upper left of the picture to the base right. This is just a portrayal of the general thought of haar include crossing. The haar component would cross the image pixel by pixel in its genuine activity. Moreover, all possible sizes of haar elements will be used.To track down the particular component the haar highlight moves from the upper left of the picture to the base right. This is just a portrayal of the general thought of haar include crossing. The haar element would navigate the image pixel by pixel in its genuine activity. Likewise, all possible sizes of haar highlights will be utilized.

These are basically assembled into three gatherings dependent on the trademark looked for by each. The main pair of two

rectangular qualities is responsible for deciding whether the edges are horizontal or vertical.The second arrangement of three rectangular qualities is accountable for deciding if a more splendid zone is flanked by more obscure segments on one or the other side or the other way around. The third arrangement of four rectangular highlights is accountable for distinguishing changes in pixel brilliance across diagonals.

To address this, they fostered a groundbreaking thought called as The Integral Image, which permits them to achieve a similar methodology. An Integral Image is figured from the Original Image so that every pixel in it is the complete of the relative multitude of pixels in the Original Image to one side or more. The going with GIF portrays the calculation of a pixel in the Integral Image. The last pixel in the Integral Image's base right corner will rise to the absolute of the multitude of pixels in the Original Image.For each component size, the Integral Image requires only four consistent worth augmentations concerning the 18 increases prior. This step by step diminishes the transient intricacy of every option since the quantity of adds no longer relies upon the quantity of pixels contained.

There is no upward line in the picture above in light of the fact that the haar esteem is -0.02, which is very far off from 1.

Haar Cascade Detection is quite possibly the most essential and strong face discovery algorithm at any point contrived. It has existed for quite a while, well before Deep

Learning became famous. Haar Features were used to perceive don't simply faces, yet in addition eyes, lips, permit number, etc.

CHAPTER 4

EigenFace For Recognition

The term Eigenface determines the important features of a face .Here every feature is called as eigenvector.The term eigenvector does not correlate to actual things on a face. Each face is predicted in the set of eigen features, in this process of recognizing . The Eigen vectors are weighted according to these features.Hence, the sum of the weights depicts a face that is specific to recognize.Basically the these kind of recognition ignores the 3D information and proceed with 2D information for generating models, we can say that Eigenface works with 2D information to construct models.

CHAPTER 5

Working of Eigenface Approach

The system mainly focuses on dividing the input image into into various classes.Lightning conditions cause noise in the input image due to which images are not random and consist of different patterns .In the facial recognition system,these different traits are referred to as Eigenface .They may be derived from raw visual data by using a method called principal components analysis . It can transform the actual input image in the training dataset .The key feature of eigenface is that it uses combination of eigen faces to rebuilt the actual image.Eigen faces are a sort of differentiating aspect for the face.By this we can deduce that combination of all the eigenfaces in the right ratio can result in actual original picture. To rebuild the actual picture we have to use the sum of eigenfaces. So that actual image and eigen faces sum is similar.Their are weights present in the eigenface which determines the corresponding Eigenface in the original image.

CHAPTER 6

Algorithm

The eigen faces-based face recognition method is essentially described as :

To begin with, the preparation set's unique pictures are changed over into an assortment of eigenfaces E. From that point forward, the loads for each picture in the preparation set are processed and saved in the set W When an obscure picture X is noticed, the loads for that picture are registered and put away in the vector WX.Then WX is contrasted with the loads of pictures that are certain beyond a shadow of a doubt to be faces (the loads of the preparation set W). One technique is treat each weight vector as a point in space and compute a normal distance D between the weight vectors from WX and the weight vector of the obscure picture WX (the Euclidean distance expressed in addendum

A may be utilized as a measurement). On the off chance that this normal distance outperforms a specific edge sum Θ the obscure picture W X's weight vector is as well "far separated." from the loads of individuals' faces. In this situation, the obscure X is viewed as non-existent.face. In any case, its weight vector WX is put something aside for ensuing utilization of order (assuming X is a face). The best limit esteem Θ should be found by experimentation.

CHAPTER 7

Eigen Vector

The Eigen vector will result in an integral mutiple if it is mutiplied with thematrix .This integral is the eigen value of the eigen vector .It can be showne by where λ*u=m*u where u (eigenvector) of the given matrix m and λ(eigenvalue).

Eigenvectors consists of the following properties:

• used for matrix having the same number of rows as columns. i.e. square matrix

• n × n matrix consist of n eigenvectors

• Eigen vectors are orthogonal.

CHAPTER 8

Calculating Eigenface

Step 1: Preparing the data

Step 2: Deduct the mean

$$\Psi = \frac{1}{M}\sum_{n-1}^{M}\Gamma_n$$

$$\Phi_i = \Gamma_i - \Psi$$

Step 3: Evaluate covariance of the matrix

$$C = \frac{1}{M}\sum_{n-1}^{M}\Phi_n\Phi_n^T$$

Step 4: Calculate the eigenvectors and eigenvalues of the covariance matrix

In this eigenvector and their eigenvalues are to be calculated such that eigen vectors should be standardized so they have length =1 I.e. are unit vectors.

Step5 : Selecting Principal components

The eigenvectors with higher eigen values should be chosen as high eigen values describes the more characteristic features of a face as compared to the lower eigen values

Covariance matrix contains N2, as dimensionality, hence it contains N2 faces and eigenvalues. That indicates that for a 256 256 picture, one must compute a 65, 536 65, 536 matrix and calculate 65,536 eigenfaces .Now we have to replace the 3rd and 4th

step by the given below step:

The formula used to compute or evaluate covaraince matrix is :

aa^t=C

The course of grouping of a new (unidentified) face Γnew to one of the classes (known faces) continues in two stages.

To begin with, the new picture is changed into its eigenface parts. The subsequent loads structure the weight vector ΩT new. The Euclidean distance between two weight vectors d (I, j) gives a Ω Ω proportion of closeness between the relating pictures I and j. On the off chance that the Euclidean distance among Γ new and different countenances surpasses by and large some edge esteem , one can expect to be that Γ new is no face by any means. d (I, j) additionally permits one to Ω Ω build "groups" of appearances to such an extent that comparative countenances are alloted to one bunch. Then, at that point, calculation of the distance between the face and its reproduction is finished,

ξ2 = ||rrm rs ||2

Later this we need to recognize face and nonface pictures, by

applying these conditions on our determined outcome. The conditions are:

1. On the off chance that

≥ , then, at that point, the picture isn't a face.

ξ Θ

2. Assuming < and ξ Θ εi ≥ ,, it's another face.

Θ3. Assuming < and min { i} < „ it's a known face**.**

CHAPTER 9

Conclusion

After comparing both the method that is Haar cascade(VIOLA JONES) and the Principal Component Analysis we came to the conclusion that eigen face or PCA method gives more accurate results than the actual haar classifier .It is fast , simple and easy to implement compared to other algorithms. The system should be intelligent to adapt to the chanhes over a long run .The Prediction of anonymous identification in video surveillance may not be accurate due to noise in the image which may degrade the accuracy over a period of time nonetheless. There are few faces which are hard to be differentiated for example people with similar face. time .nonetheless.Adaptive Medan filter further removes the noises from images as using eigen face can degrade its efficiency due these noise . Hence it is used to reduce the dimensions from the data

CHAPTER 10

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