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AUTOMATED CRIMINAL IDENTIFICATION USING MACHINE LEARNING

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Abstract- *With advances in computing and telecommunications technologies, digital images and video are playing key roles in the present information era. Human face is an important biometric object in image and video databases of surveillance systems. Detecting and locating human faces and facial features in an image or image sequence are important tasks in dynamic environments, such as videos, where noise conditions, illuminations, locations of subjects and pose can vary significantly from frame to frame.*

I.INTRODUCTION

Facial recognition is a way of identifying or confirming an individual's identity using their face. Facial recognition systems can be used to identify people in photos, videos, or in real time. Facial recognition is a category of biometric security. Other forms of biometric software include voice recognition, fingerprint recognition, and eye retina or iris recognition. The technology is mostly used for security and law enforcement, though there is increasing interest in other areas of use.

Many people are familiar with face recognition technology through the FaceID used to unlock iPhones (however, this is only one application of face recognition). Typically, facial recognition does not rely on a massive database of photos to determine an individual's identity it simply identifies and recognizes one person as the sole owner of the device, while limiting access to others. Beyond unlocking phones, facial recognition works by matching the faces of people walking past special cameras, to images of people on a watch list. The watch lists can contain pictures of anyone, including people who are not suspected of any wrongdoing, and the images can come from anywhere even from our social media accounts. Facial technology systems can vary, but in general, they tend to operate as follows:

II.LITERATURE REVIEW

Title: Towards on-farm pig face recognition using convolutional neural networks. Author: Hansen, M. F., Smith, M. L., Smith, L.N.,Salter, M. G., Baxter, E. M., Farish, M., & Grieve, B., Dated On: June 2018

Current best practice involves the use of RFID tags which are time-consuming for the farmer and distressing for the animal to fit. To overcome this, non-invasive biometrics are proposed by using the face of the animal. We test this in a farm environment, on 10 individual pigs using three techniques adopted from the human face recognition literature: Fisherfaces, the VGG-Face pre-trained face convolutional neural network (CNN) model and our own CNN model that we train using an artificially augmented data set. Our results show that accurate individual pig recognition is possible with accuracy rates of 96.7% on 1553 images. Class Activated Mapping using Grad CAM is used to show the regions that our network uses to discriminate between pigs.

III.EXISTING SYSTEM

Finger print based automation

Automated fingerprint identification is the process of using a computer to
match fingerprints against a database of known and unknown prints in the fingerprint

identification system. Automated fingerprint identification systems (AFIS) are primarily used by law enforcement agencies for criminal identification purposes, the most important of which is the identification of a person suspected of committing a crime or linking a suspect to other unsolved crimes.

Automated fingerprint verification is a closely related technique used in applications such as attendance and access control systems. On a technical level, verification systems verify a claimed identity (a user might claim to be John by presenting his PIN or ID card and verify his identity using his fingerprint), whereas identification systems determine identity based solely on fingerprints.

DRAWBACKS

- **System failures:**

scanners are subject to the same technical failures and limitations as all other electronic identification systems such as power outages, errors and environmental factors.

- **Cost:**

It is true that fingerprint recognition systems are more cost effective than ever, but for smaller organisations the cost of implementation and maintenance can still be a barrier to implementation. This disadvantage is lessening as devices become more cost effective and affordable.

- **Exclusions:**

Fingerprints remain relatively stable over a person's lifetime there are sections of the population that will be excluded from using the system. For example, older people with a history of manual work may struggle to register worn prints into a system or people who have suffered the loss of fingers or hands would be excluded.

IV.PROPOSED SYSTEM

Multiple Face Detection and Recognition in Real Time

The facial recognition has been a problem worked on around the world for many persons; this problem has emerged in multiple fields and sciences, especially in computer science, other fields that are very interested in this technology are: Mechatronic, Robotic, criminalistics, etc. In this article, I work on this interesting topic using EmguCV cross platform .NET wrapper to the Intel OpenCV image processing library and C# .NET, these libraries allow me to capture and process image of a capture device in real time. The main goal of this article is to show and explain the easiest way in which to implement a face detector and recognizer in real time for multiple persons using Principal Component Analysis (PCA) with eigenface for implementing it in multiple fields.

ADVANTAGES

- **Time-saving**

Beginning with the most effective and important benefit i.e. saving time. As successful people say 'saving time = saving money, it's true since saving time at a workplace can boost productivity. Let us explain how: Imagine one of your employees arrives at the office in the morning, what's the first thing that he does Mark his attendance right And when he goes to enter his attendance, he sees a queue of people waiting for their turns. Don't you think it will cost him a few important minutes The same time he could have invested in work. Well, if you have a facial recognition system this entire hassle can be avoided and your employees can head straight to work in no time.

- **High security**

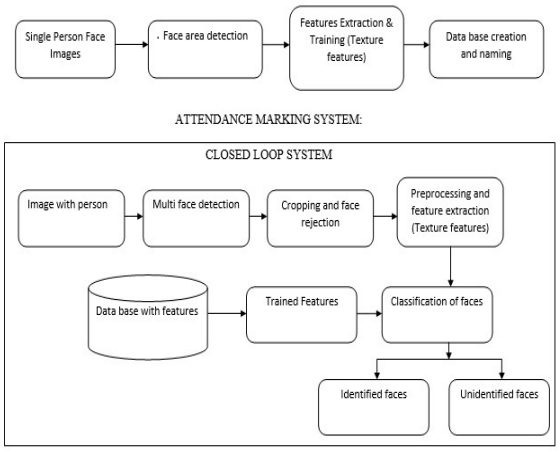
Not only these systems are quick, but they are also highly advanced when it comes to security. The face recognition camera

attendance system comes with numerous features such as Imposter violation, location tagging, and facial suspicion.

- **Easy time tracking**

Entering attendance manually is not always accurate. People don't remember the exact minute they arrived or left so having precise numbers is a challenge. However, if you switch to a face recognition attendance system then it records the exact time and location of your entry and exit. All you have to do is ask your employees to click a selfie from their attendance app.

V.METHODOLOGY



MODULE DESIGN AND ORGANIZATION

- Class room automation with multi face feature comparison and recognition system.
- The distance between the face parts is first calculated and then to be stored in the system. The facial characters stored are to be compared with the real time image of the students.
- Neural Networks
- Here multiple user faces are detected and recognized with the data base trained multiple texture based features.

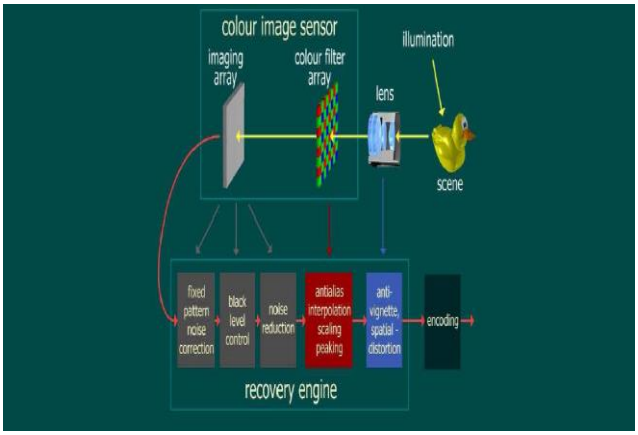
CAMERA MODULE

The camera module, also known as CCM (compact Camera Module), has been widely used in video conferencing, Security System and real-time monitoring as a video input device. With the development of Internet technology, the continuous improvement of network speed, coupled with the maturity of photographic imaging device technology and the large amount of use in the manufacture of cameras, has made its price drop to a level that ordinary people can bear.

DSP (Digital Signal Processing): The digital image signal parameters are optimized (RGB/YUV→JPEG) through a series of complex mathematical algorithm operations, and the processed signals are transmitted to the storage. DSP structure framework:

- ISP (image signal processor)
- JPEG encoder

Image sensor working:



DATA COLLECTION MODULE

Data used in this paper is a set of product reviews collected from web Attacks records. This step is concerned with selecting the subset of all available data that you will be working with. ML problems start with data preferably, lots of data (examples or observations) for which you already know the target answer. Data for which you

already know the target answer is called labelled data.

DATA PREPROCESSING MODULE

The data you have selected may not be in a format that is suitable for you to work with. The data may be in a relational database and you would like it in a flat file, or the data may be in a proprietary file format and you would like it in a relational database or a text file.

Cleaning data is the removal or fixing of missing data. There may be data instances that are incomplete and do not carry the data you believe you need to address the problem. These instances may need to be removed. Additionally, there may be sensitive information in some of the attributes and these attributes may need to be removed from the data entirely. Sample of the selected data that may be much faster for exploring and prototyping solutions before considering the whole dataset.

FEATURE EXTRACTION MODULE

Next thing is to do Feature extraction is an attribute reduction process. Unlike feature selection, which ranks the existing attributes according to their predictive significance, feature extraction actually transforms the attributes. The transformed attributes, or features, are linear combinations of the original attributes. Finally, our models are trained using Classifier algorithm. We use classify module on Natural Language Toolkit library on Python. We use the labelled dataset gathered. The rest of our labelled data will be used to evaluate the models. Some machine learning algorithms were used to classify pre-processed data.

EVALUATION MODEL MODULE

Model Evaluation is an integral part of the model development process. It helps to find the best model that represents our data and how well the chosen model will work in the future. Evaluating model performance with the data used for training is not acceptable in data science because it can easily generate overoptimistic and over fitted models.

HAAR CASCADE

It is an Object Detection Algorithm used to identify faces in an image or a real time video. The algorithm uses edge or line detection features proposed by Viola and Jones in their research paper "Rapid Object Detection using a Boosted Cascade of Simple Features" published in 2001. The algorithm is given a lot of positive images consisting of faces, and a lot of negative images not consisting of any face to train on them.

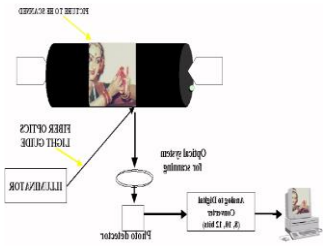
VI.EXPERIMENTAL IMPLEMENTATION AND DISCUSSION

IMAGE PROCESSING

Image Processing is a technique to enhance raw images received from cameras/sensors placed on satellites, space probes and aircrafts or pictures taken in normal day-to-day life for various applications.

Various techniques have been developed in Image Processing during the last four to five decades. Most of the techniques are developed for enhancing images obtained from unmanned spacecrafts, space probes and military reconnaissance flights. Image Processing systems are becoming popular due to easy availability of powerful personnel computers, large size memory devices, graphics software etc.

The common steps in image processing are image scanning, storing, enhancing and interpretation. The schematic diagram of image scanner-digitizer diagram.



Methods of Image Processing

There are two methods available in Image Processing.

Analog Image Processing

Analog Image Processing refers to the alteration of image through electrical means. The most common example is the television image.

The television signal is a voltage level which varies in amplitude to represent brightness through the image. By electrically varying the signal, the displayed image appearance is altered. The brightness and contrast controls on a TV set serve to adjust the amplitude and reference of the video signal, resulting in the brightening, darkening and alteration of the brightness range of the displayed image.

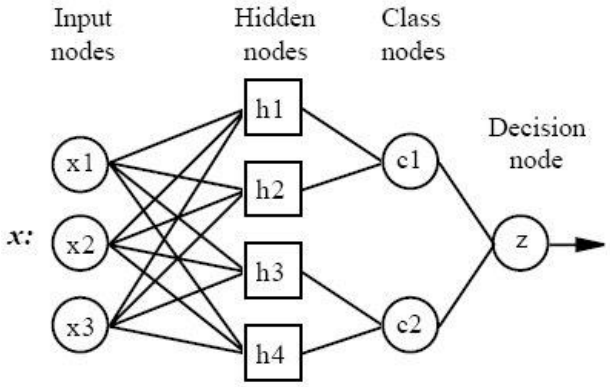
Digital Image Processing

In this case, digital computers are used to process the image. The image will be converted to digital form using a scanner digitizer (as shown in Figure 1) and then process it. It is defined as the subjecting numerical representations of objects to a series of operations in order to obtain a desired result. It starts with one image and produces a modified version of the same. It is therefore a process that takes an image into another. The term digital image processing generally refers to processing of a two dimensional picture by a digital computer. In a broader context, it implies digital processing of any two-dimensional data. A digital image is an array of real numbers represented by a finite number of bits. The principle advantage of Digital Image Processing methods is its versatility, repeatability and the preservation of original data precision.

Back propagation networks (BPN):

Back Propagation (BPN) and General Regression Neural Networks (GRNN) have similar architectures, but there is a fundamental difference: Probabilistic networks perform classification where the target variable is categorical, whereas general regression neural networks perform regression where the target variable is continuous. If you select a BPN/GRNN network, DTREG will automatically select the correct type of network based on the type of target variable.

Architecture of a BPN:



Contour Detection

It includes a variety of mathematical methods that aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities. The points at which image brightness changes sharply are typically organized into a set of curved line segments termed edges. The same problem of finding discontinuities in 1D signals is known as step detection and the problem of finding signal discontinuities over time is known as change detection.

In the ideal case, the result of applying an edge detector to an image may lead to a set of connected curves that indicate the boundaries of objects, the boundaries of surface markings as well as curves that correspond to discontinuities in surface orientation. Thus, applying an edge detection algorithm to an image may significantly reduce the amount of data to be processed and may therefore filter out information that may be regarded as less relevant, while preserving the important structural properties of an image. If the edge detection step is successful, the subsequent task of interpreting the information contents in the original image may therefore be substantially simplified. A typical edge might for instance be the border between a block of red color and a block of yellow. In contrast a **line** (as can be extracted by a ridge detector) can be a small

number of pixels of a different color on an otherwise unchanging background.

VII. CONCLUSION

This system helps to avoid the fail proof of attendance system and this system works as the substitute for the all existing systems i.e. Radio Frequency Identification and all other bio metric systems. It saves the time and energy in the aspect of taking attendance. Automated Attendance Systems based on face recognition techniques thus proved to be time saving and secured. This system can also be used to identify an unknown person whether he is related to the organization or not.

VIII. FUTURE ENHANCEMENT

Further extensions can be made, to achieve the real time detection of specific student in the surveillance premises. Instead of taking images, we can also work with recorded videos. But some time period is maintained to record the images, because if continuous recording is done then load on database increases. The future work is to improve the recognition rate of algorithms when there are unintentional changes in a person like tonsuring head, using scarf and beard. The system developed only recognizes face up to 30 degrees angle variations which has to be improved further. Gait recognition can be fused with face recognition systems in order to achieve better performance of the system.

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