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Innovative Approaches to Criminal Identification: ML and Face Recognition Technologies

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ABSTRACT_ Identifying criminals is becoming a very difficult assignment for cybercrime investigators these days because there are so many elements to consider.A criminal record typically includes personal information about a specific person, as well as a photograph. To identify any criminal, we need some identification about the person, which is provided by witnesses. In most situations, the captured image segments have poor clarity and resolution, making it difficult to recognize a face. To address this issue, we are building numerous software applications that use current patterns to identify criminals, however no method is 100% accurate in recognizing criminal information.

1.INTRODUCTION

Face identification is primarily used to distinguish criminals from bystanders based on their facial expressions. Based on the hints, we construct a picture by utilizing the image in our data set, and then we compare it to the images we already have. Given that still or video images require the distinguishing proof of at least one separated and removed from the scene, whereon it tends to be recognized and coordinated, the primary task that needs to be done is. given still or video images require the distinguishing proof of the at least one separated and removed from the scene, whereon it tends to be recognized and coordinated "an accurate or similar portrayal of a being or thing" is the definition of a picture. The two-dimensional light force work f (x, y), where x and y represent spatial coordinates, is referred to as the picture or monochrome picture, for instance, or the highly contrasting passage. A picture of f (x, y) that has been digitized in both spatial coordinate and splendor is called an advanced picture. Picture components, picture components, and pixels, or pixels, are the names given to the parts of a particularly computerized display. A person's criminal record includes a photo and personal information about them. We need the individual's ID, which the

observer provides, to identify any criminal. Face ID is one application for which unique fingerprint, eye, DNA, and other biometrics should be available. In friendly interactions, our primary focus is on the face, which plays a significant role in transmitting personality and emotion. The human capacity to recall and perceive faces is amazing, despite the fact that it is difficult to deduce knowledge or character from facial appearance. A framework for face recognition makes use of a picture database and compares one more picture to those to find a match, if one exists. Using the RGB values for the eye tone, the width and height of the face, and various proportions, as proposed by Kovashka and Martonosi [1], it should be possible to distinguish each facial image. This structure is designed to identify criminals in any examination division. In this way, we are storing the images of criminals in our database along with their details. After that, these images are divided into four sections: the brow, the eyes, the nose, and the lips. To facilitate the distinguishing proof cycle, these images are once more stored in a different information base record. This task is intended to identify criminals in any examination division. The strategy here is that, in addition to his details, we currently store a few images of criminals in our data base. These images are divided into a variety of categories, such as eyes, hair, lips, nose, and so on. These images are then stored in another data set in order to identify any criminals; By using it, we promote the face, which may be coordinated with our pictures, so that viewers will be able to see the images or cuts that appear on the screen. We anticipate that he is only the thief if any image is coordinated to close to 100 percent. As a result, this project creates a conducive environment for both administrators and viewers to easily configure any face and quickly identify criminals. Using the most recent photographs, this task is expected to identify a person. The distinguishing evidence will be completed by confirming previous photographs of various individuals. The undertaking is limited to storing the image and storing it in the data set. When a person needs to be identified, the pictures in the data set and the current subtleties are compared. This task can be used in the examination office to identify a criminal. The project keeps up with the photos of the nefarious individuals. Each photo is divided into several pieces.

2.LITERATURE SURVEY

The first step in creating a facial recognition system is face detection. The process by which the system identifies the face and determines whether or not it is a human face takes place here. Additionally,

it determines whether the system is able to distinguish the subject from the background, making it easier for the system to identify faces. Probably one of the earliest and most successful algorithms developed by [7] is Eigen face, which employs an information theory approach to search for the best matching or possible face information encoded in a collection of faces that will best distinguish them. The algorithm finds the average face vector, also known as the mean, and then subtracts the mean face from each sample face to make it work. This is how it works: first, it takes several images from the database and puts them into a vector. This is useful for locating the distinguishable features in each image, locating the covariance matrix, and selecting the best images that match. It makes the images of faces into a set of basis faces, which are basically the main part of the face itself [8]. A major objective of computer vision researchers is to develop automated face recognition systems that can match or even exceed human performance. The principal components determine which directions are more efficient for representing the data. In light of this, it is absolutely necessary for computational researchers to be aware of the most important results from experimental studies of face recognition [1]. The building blocks for attempts to artificially replicate these abilities are these findings, which shed light on the nature of the cues the human visual system uses to achieve its impressive performance. Over the past two decades, the face recognition issue has been the subject of research. There are primarily two types of strategies that have been proposed in the literature thus far: model- and appearance-based, as Fu Jie Huang and Zhihua Zhou [5] explain. The appearance-based approach uses intensity or intensity-derived parameters, such as eigen faces coefficients, to identify faces, whereas the model-based method attempts to extract geometrical parameters measuring the facial parts. The expression, occlusion, rotation, and other changes in lighting, The appearance of the human face may change significantly.

In the early years of the 21st century, we found that physical human interaction was becoming less and less important in the majority of everyday tasks. We interact more frequently with mechanical agents, anonymous users, and the electronic information sources of the World Wide Web than with our human counterparts as we move ever closer to an automated society. Therefore, it may be ironic that identity has grown to be such a significant issue in the twenty-first century. In a time when fraud costs the public billions of

pounds annually and even the most powerful nations are powerless against a few extremists with a flight ticket, it would appear that what matters is not who we are but rather who we claim to be. Because of these factors, biometric authentication has already begun to expand rapidly in a variety of market sectors, and it will undoubtedly continue to do so until biometric scans become as common as swiping a credit card or writing a signature [4].

3.PROPOSED SYSTEM

In this study, the author uses a pre-trained model to recognize and identify criminal faces. MTCNN pre-trained model will be used to detect faces, followed by the FACENET model to extract features (embedding) from detected faces, which will then be trained with the SVM algorithm to determine whether the individual in the image is a criminal or a regular person.

3.1 IMPLEMENTATION

1) Upload Criminals Dataset: using this module we will upload dataset to application and then load both MTCNN and FACENET models

2) Preprocess Dataset: using this module we will read each image and then detect face and then extract features using FACENET and then normalize all face values and then split dataset into train and test where SVM will be using 80% dataset images for training and 20% for testing

3) Train SVM using MTCNN & FaceNet Features: using this module we will train SVM using faces and extracted features from FACENET and then train SVM using 80% dataset and then apply trained model on 20% images to calculate prediction accuracy

4) Comparison Graph: using this module we will plot accuracy, precision graph of SVM

5) Criminal Identification: using this module we will upload test image and then SVM will predict criminal and calculate matching % and if not matched then display alert messages and if any image matched with existing criminal then it will display matching %.

3.2 SVM

Support vector machines (SVMs) are powerful and versatile supervised machine learning algorithms that may be utilized for both classification and regression. However, they are mostly utilized in classification difficulties. SVMs were first developed in the 1960s before being enhanced in 1990. SVMs differ from other machine learning algorithms in terms of

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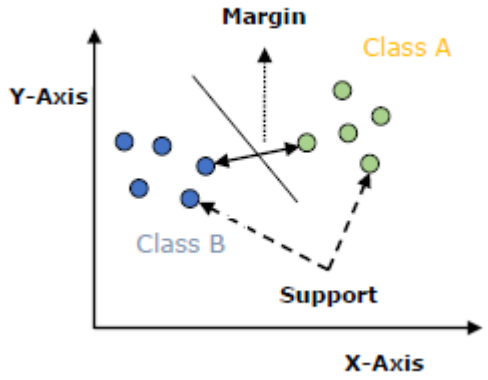
implementation. They have recently gained popularity due to their ability to handle several continuous and categorical variables.

Working of SVM

An SVM model is essentially a representation of various classes in a hyperplane in multidimensional space. SVM will generate the hyperplane iteratively to reduce the error. The purpose of SVM is to partition datasets into classes and identify the largest marginal hyperplane.



4.RESULTS AND DISCUSSION

The following are key principles in SVM:
• Support vectors are the data points nearest to the hyperplane. Using these data points, a separating line will be defined.
• The hyperplane is a decision plane that divides a set of objects into classes, as seen in the diagram above.
• Margin refers to the space between two lines on data points from distinct classes. It can be calculated as the perpendicular distance between the line and the support vectors. A large margin is considered excellent, whereas a small margin is considered poor.

The main goal of SVM is to divide the datasets into classes to find a maximum marginal Creating a hyperplane (MMH) involves two steps:
• SVM iteratively generates hyperplanes to best distinguish classes. • It then selects the optimal hyperplane.
To implement SVM in Python, first import the standard libraries as shown below.

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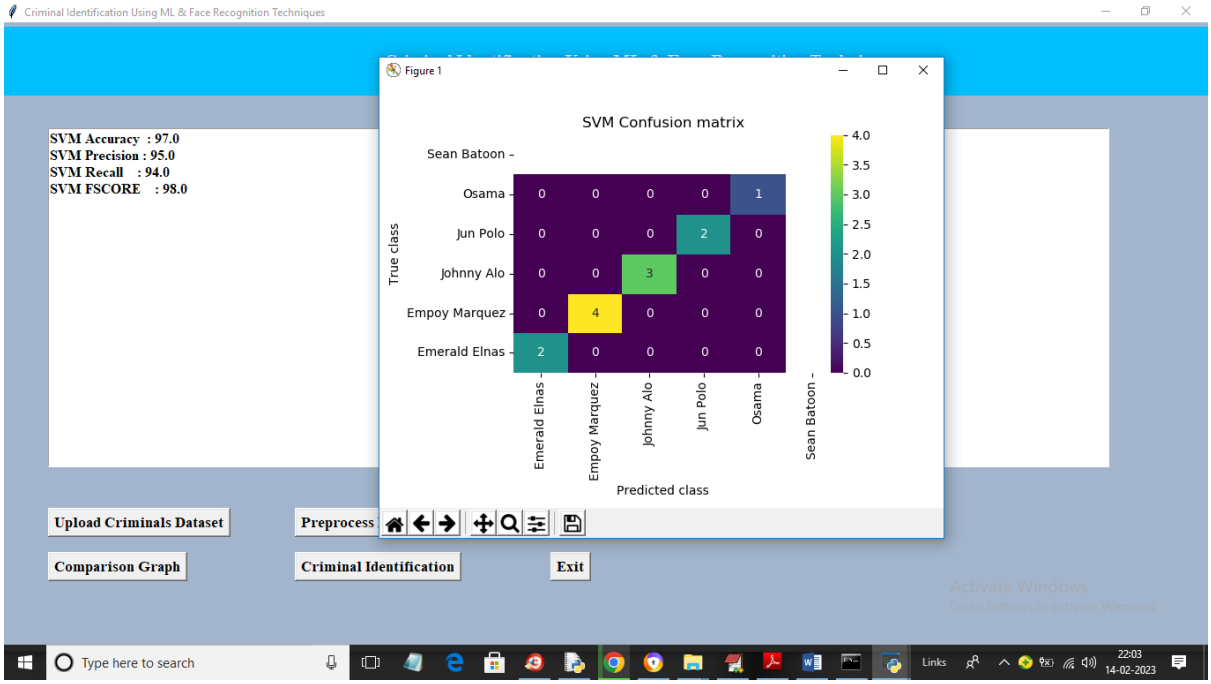
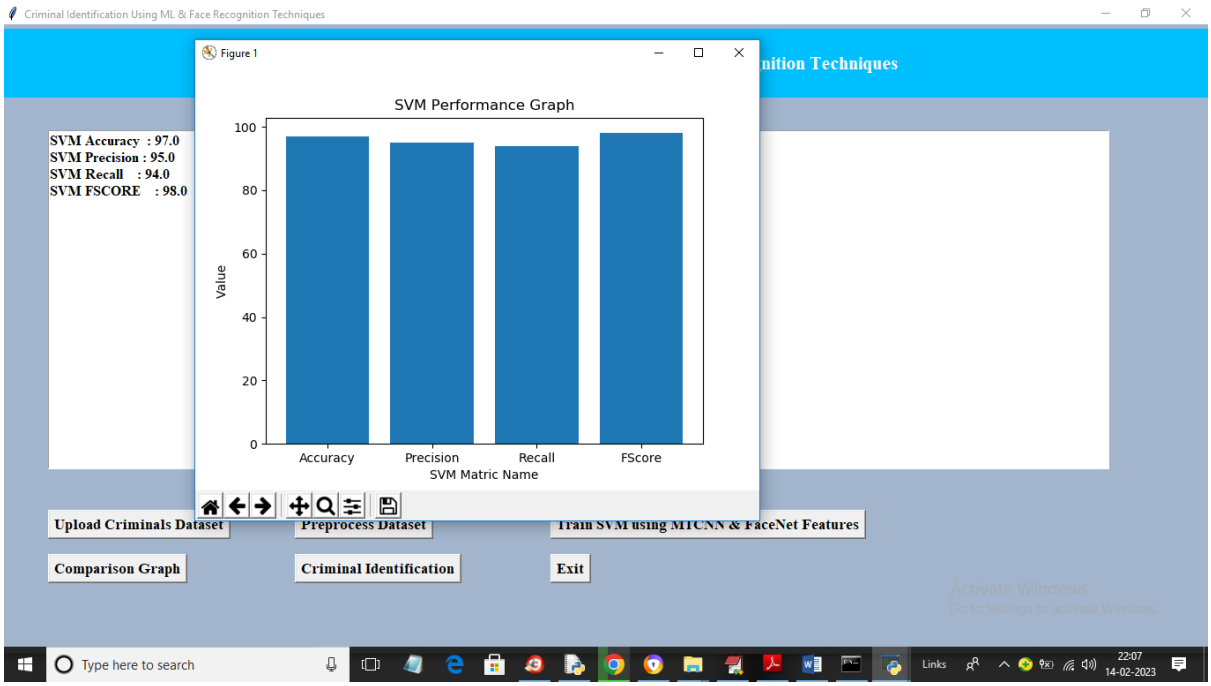


In above screen with SVM we got 97% accuracy and we can see other metrics output like precision, recall and FSCORE and in confusion matrix graph x-axis represents Predicted Labels and y-axis represents True Labels and all different colour boxes in diagnol represents Correct Prediction count and blue colour boxes contains incorrect prediction count which is 0 so SVM is accurate in criminal classification. Now close above graph and then click on 'Comparison Graph' button to get below output



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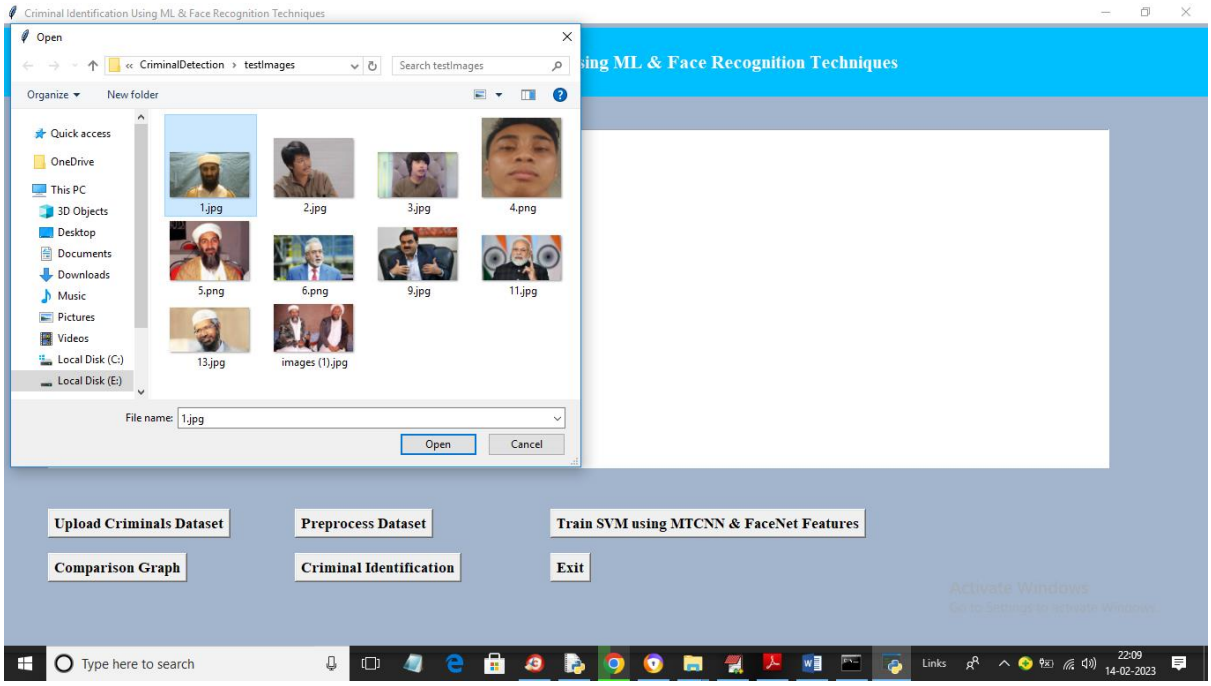
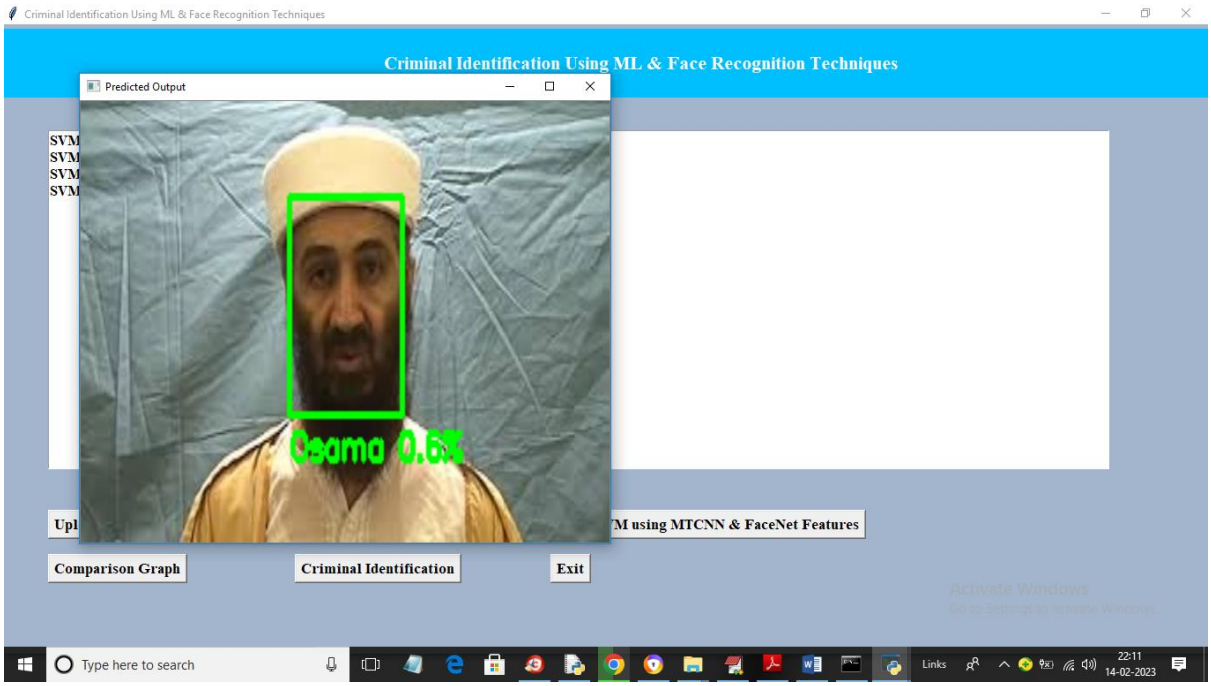
In above graph x-axis represents SVM metrics and y-axis represents performance values which is closer to 1. Now close above graph and then click on 'Criminal Identification' button to upload test image and get below output



In above screen selecting and uploading 1.jpg file and then click on 'Open' button to get below output



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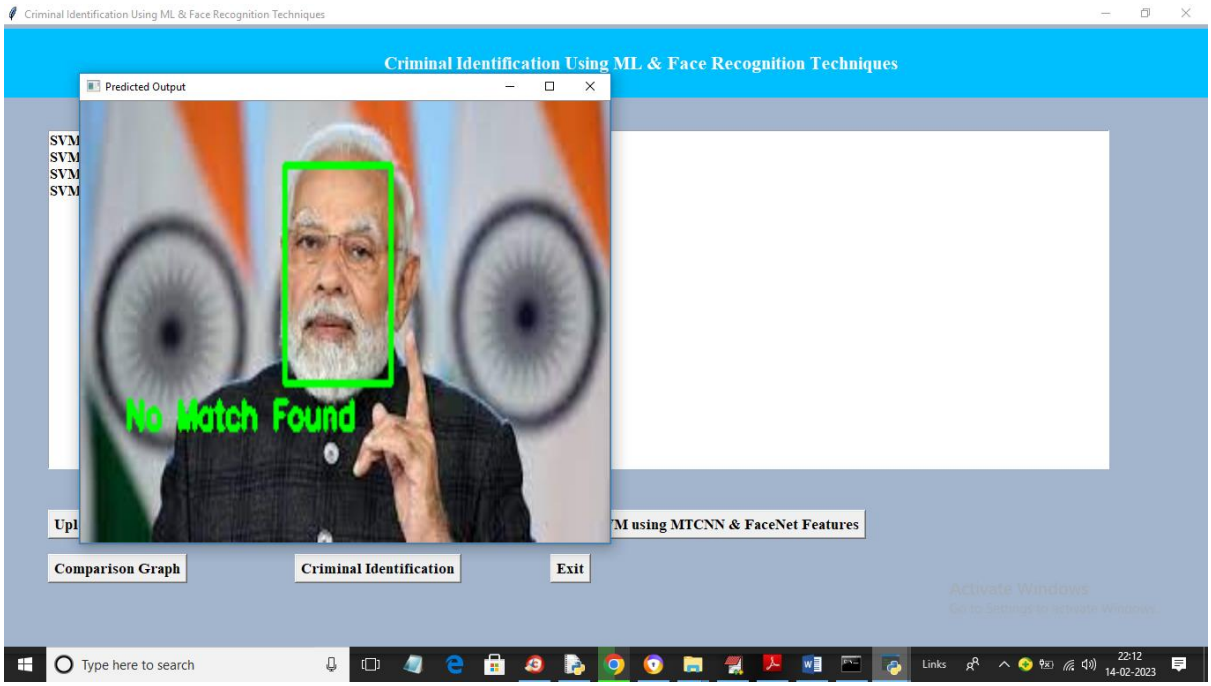
In above screen person is identified as Osama with matching percentage as 60% and similarly you can upload and test other images



5.CONCLUSION

The goal of a facial recognition system is to identify criminals. In previous years, this process was carried out by humans. This approach provides a precise image of the criminal, but it is extremely difficult to identify the criminal details and needs a significant amount of human effort. The major goal of our study is to overcome the disadvantages of the human-based system by adopting a machine-based facial recognition technology.

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