

## FINGERPRINT IMAGE IDENTIFICATION FOR CRIME DETECTION

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**ABSTRACT** Fingerprint images in crime scene are important clues to solve serial cases. In this paper we present a complete crime scene fingerprint identification system using deep machine learning with Convolutional Neural Network (CNN). Images are acquired from crime scene using methods ranging from precision photography to complex physical and chemical processing techniques and saved as the database. The images collected from the crime scene are usually incomplete and hence difficult to categorize. Suitable enhancement methods are required for pre-processing the fingerprint images. Minutiae are extracted from the fingerprint images. The features of preprocessed data are fed into the CNN as input to train and test the network. The experimental results demonstrated on database using Open CVPython shows high accuracy of 80% recognition a partial or full fingerprints in the criminal database.

**Key Words:** Convolutional Neural Network, Image acquisition, Image pre-processing, Open CV,

**I. Introduction** FINGERPRINTS in the crime scene plays an important role to identify the criminal involved in the crime. Crime scene images (CSI) are images taken from the crime spot. When crime is occurred, the investigator takes both latent and patent sample of fingerprints left behind. The patent fingerprints are visible by naked eye, so they are simply photographed. But latent fingerprints are invisible and these samples are more difficult to perceptible. These samples can be lifted through different techniques. The use of cyanoacrylate vapors which sticks to prints and make them visible in the present of normal light. This method is much difficult, so normally in crime scene, the investigators apply a fine dusting powder (aluminium dust or black granular) to the surface in which fingerprints to be extracted. The dust actually sticks to the fingerprint then they use clear tape to lift the fingerprint. After the lifting the fingerprints, the prints are scanned and saved in the digital image form. The fingerprints taken from the crime scene is unintentionally made and these images are

noisy or partial prints and difficult to identify. To moderate this problem, the fingerprint images are subjected to image pre-processing, image feature extraction and identification analysis. Here we use image preprocessing techniques to improve image quality with the aim of enhancing local level features called minutiae. After minutiae extraction the fingerprint data will proceed to training using CNN network. For training, training-set will take if dataset has 2000 images, the 1500 fingerprint images are used for training and remaining 500 fingerprint images are used for testing. An investigator takes the fingerprints at the crime scene and compares it with database of old criminals. After the image pre-processing techniques, the CNN system will extract the feature and then, the criminals identified are ranked according to their similarity features to the fingerprint images and gives the accuracy of identification. With the introduction of biometrics technology which is an advanced computer techniques now widely adopted as a front-line security measure for both identity verification and crime detection, and also others an effective crime deterrent. In an increasingly digital world, reliable personal authentication has become an important human computer

interface activity. Fingerprint recognition could be very complex pattern recognition problem. It is difficult to design accurate algorithms that are capable of extracting prolific features and comparing them in a robust way, especially in poor quality fingerprint images and when low-cost acquisition devices with small area are adopted. There is a greatest misconception that the fingerprint recognition is a fully solved problem considering it was one of the first applications of all amongst machine pattern recognition. **Biometrics** Biometrics is an automated method that recognizes people based on their physical and action characteristics, and is a field that used to authenticate a certain individuals characteristic, recognize a person's character, or study a person's measurable characteristics. Among the different biometrics, like face, hand, iris, voice and many others, fingerprints is the most dominant biometric technology in commercial applications due to their distinctiveness, persistence, accuracy, throughput, size and cost of readers.

**II. Literature Survey** Pavithra [1] proposed an algorithm for crime scene fingerprint image detection by using Convolutional Neural Network (CNN). Images acquire from crime scene is complex in physical appearance. So, image

pre-processing and feature extraction is used are fed into the CNN and accuracy of 80% is achieved. B. Wenxuan [2] proposed an algorithm which is focused on feature extraction by the edges of the fingerprint obtained. For this purpose clustering with neighboring points. O. I. Abiodun [3] focused using artificial neural network (ANN) for feature extraction from the fingerprint images and identification purpose. The experimental result of the proposed algorithm with some existing algorithms such as GAN, SAE, DBN, RBM, RNN, RBFN, PNN, CNN, SLP, MLP, MLNN.

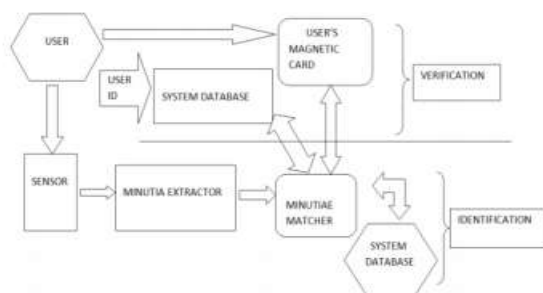
**III. EXISTING SYSTEM** Fingerprints in the crime scene plays an important role to identify the criminal involved in the crime. Crime scene images (CSI) are images taken from the crime spot. When crime is occurred, the investigator takes both latent and patent sample of fingerprints left behind. The patent fingerprints are visible by naked eye, so they are simply photographed. But latent fingerprints are invisible and these samples are more difficult to perceptible. These samples can be lifted through different techniques. The use of cyanoacrylate vapours which sticks to prints and make them visible in the present of normal light. This method is much difficult, so normally in crime scene,

the investigators apply a fine dusting powder (aluminium dust or black granular) to the surface in which fingerprints to be extracted. The dust actually sticks to the fingerprint then they use clear tape to lift the fingerprint. After the lifting the fingerprints, the prints are scanned and saved in the digital image form. The fingerprints taken from the crime scene is unintentionally made and these images are noisy or partial prints and difficult to identify

**IV. PROPOSED SYSTEM** The CNN uses successive convolutional layers with a non-linear ReLu function for storing the features of an image having a specific dimension. Maxpooling layers are used for down sampling. The fully connected layer multiplies the input by a matrix with sigmoid activation function and adds to a bias vector which contains the feature map. The images obtained from the crime scene are called crime scene images (CSI). These images play important role and used as evidence in criminal cases. The fingerprint information contained in the images collected directly from the crime scene may be partial or tough to identify. This can lead to fingerprint images of bad or low quality. Due to the low quality of fingerprint image to another systematic image feature, the early fingerprint image

quality may be of exterior value of identification. To moderate this problem, the fingerprint allows to perform image pre-processing, to feature mark up and identification analysis. Segmentation is a first step in image enhancement which converting low-level image processing transforming a gray scale image into high-level image description in terms of features, objects and scenes. It partitions an image into distinct region containing each pixel with similar characteristics. Fingerprint skeletonization is used to reduce ridges until one pixel wide. The fingerprint features like minutiae are extracted from the skeleton images. The ROI is extracted using open and close operation by discarding the image areas without effective ridges and terminates. The remaining effective area is divided into two areas, to determine bound the white area used and to represents the inner area the gray area used

## V.SYSTEM ARCHITECTURE:



### 5.1 Modules Description

**I. Data Collection** Firstly, Dataset can be collected from various sources of any organization. The right dataset helps for the prediction and it can be manipulated as per our requirement. Our data is in the form of images it may be based on night, fog, and rainy. The data can be collected from the organization based on the areas where the weather can be seen unusual. By collecting these it makes accurate in prediction.

**II. Data Processing** All the data was collected, the data is in the form of the images. Images are collected by the use of driving recorder and the image set is established for training in the first step the matching values for all pixels and all disparities are calculated. In the second step the disparity values are interpolated to sub-pixel accuracy by fitting a quadratic curve to the matching values in the neighborhood of the best matching value.

**III. Training the Data** Deploying the Model After the data has been prepared and transformed, the next step was to build the classification model using the support vector classifier technique. This technique was selected because the construction of support vector classifiers does not require any domain knowledge. By using the attribute, we have considered in the dataset

we train the model by using the algorithm. The training sets are used to tune and fit the models.

**IV. Deploying** the model the classification rules are generated from the support vector. The trained data can be used for the Testing the data. It helps to give the output or accurate prediction of weather using this model.

**Feature Extraction** Feature extraction is a process of dimensionality reduction by which an initial set of raw data is reduced to more manageable groups for processing. A characteristic of these large data sets is a large number of variables that require a lot of computing resources to process. Feature extraction is the name for methods that select and /or combine variables into features, effectively reducing the amount of data that must be processed, while still accurately and completely describing the original data set

**CONCLUSION** Fingerprint identification system used for identifies the criminal who involved in the crime helps to automate fingerprint identification process. Pre-processing was performed with Otsu thresholding, fingerprint thinning and minutiae extraction with Cross-Number method. Feature extraction will be done by the CNN classifier. The performance of

SVM and CNN based classifiers are analyzed. It is observed CNN gives better performance compared to SVM because of its deep learning ability to learn relevant features from the image. Using CNN classifier, improved fingerprint identification accuracy of 80% is achieved.

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