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THE LORE OF SPECULATION AND ANALYSIS USING MACHINE LEARNING AND IMAGE MATCHING

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ABSTRACT

Now days the cases of missing kids are increasing. Many of them are left unfound. In this paper we propose an Android application for finding missing kids.This android application will be used by General public for the purpose of finding missing kids. This application contains functionality to add FIR complaint as well as photos of the missing kid. Any anonymous kids photo can be uploaded to the application. By using IMT and neural networks the photo will be traversed with the database. On finding the perfect match with higher precision further actions will be processed.The face recognition model in our system will try to find a match in the database with the help of face encodings. It is performed by comparing the face encodings of the uploaded image to the face encodings of the images in the database. The face recognition model that we have used maintains an accuracy of 99.38% on the Labelled Faces in the Wild Benchmark which comprises of 13,000 images.

Keyword: - Android, Face recognition, Image Labelling, Machine Learning, ML Kit.

I. INTRODUCTION

A missing person can be characterized as the one who can be a child or an adult -- who is lost, voluntarily or involuntarily. There are various categories of missing cases of which only 43% of missing cases' reasons are known, 99% are juvenile runways, 2500 cases are due to family problems and around 500 cases are kidnapped by strangers (which include both teens and adults). Women add about 52% of missing cases and males48%.

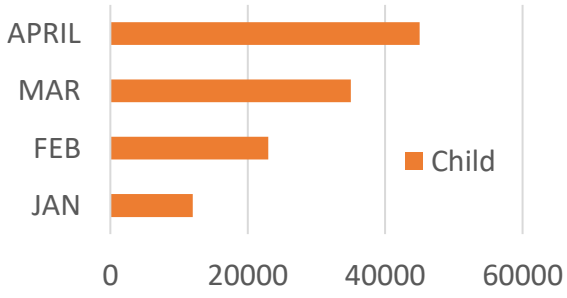
"In India, there are no budgets allocated to finding missing people", claimed by an officialsource.

A missing person faces many obstacles, few are subjected to death (murder), rape or abuse. People concerned with the missing person such as parents, friends, relatives and guardians are exposed to stress and worries from not knowing whether the missing person is alive or dead.

In our system, the image of the person given by the guardian at the time of missing is stored in the database. The public is given authority to upload photographs of any person in uncertain situations. Automatic detection of match for this picture among the already existing images in the database will be done through our application. This helps the police department to spot the missing person in any place in India.

When a suspicious person is found, the picture at that instance of time is compared with the images uploaded by the guardian/police department at the time of missing through the face recognition model. If a match is found, it will be notified to the police and the guardian in the form of an alert message along with the location of where the person is found.

If not found, a new record will be created in the database with the uploaded picture. By this way, it decreases the time taken to search for a person's detail after he is found.



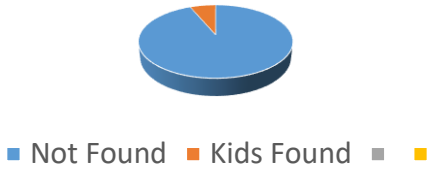


Fig1. Survey of Kid found in Delhi using Face Recognition

Sometimes, the person has been missing for a long period of time. The age gap is reflected in the image as ageing affects the structure of the face, including shape, texture, etc. The appearance of the person can vary due to ageing, filters, pose, lightings etc. All these factors were considered before choosing the face recognitionalgorithm.

II. MACHINE LEARNING

Machine learning (ML) is the scientific study of algorithms and statistical models that computer systems use to perform a specific task without using explicit instructions, relying on patterns and inference instead. It is seen as a subset of artificial intelligence. Machine learning algorithms build a mathematical model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to perform the task Machine learning algorithms are used in a wide variety of applications, such as email filtering and computer vision, where it is difficult or infeasible to develop a conventional algorithm for effectively performing the task.

Machine learning is closely related to computational statistics, which focuses on making predictions using computers. The study of mathematical optimization delivers methods, theory and application domains to the field of machine learning. Data mining is a field of study within machine learning, and focuses on exploratory data analysis through unsupervised learning. In its application across business problems, machine learning is also referred to as predictive analytics.

III. IMAGE MATCHING ALGORITHMS

1. SIFT (Scale-invariant Feature Transform)

It uses interesting key points of image using difference in Gaussian method.The Scale invariance is achieved via scanning key points at different scaleRotation invariance is achieved by obtaining the Orientation Assignment of the key points using image gradient magnitude.

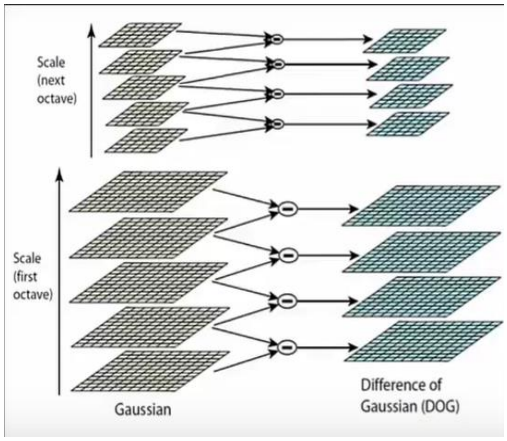


Fig2: Scale invariant transform feature working.

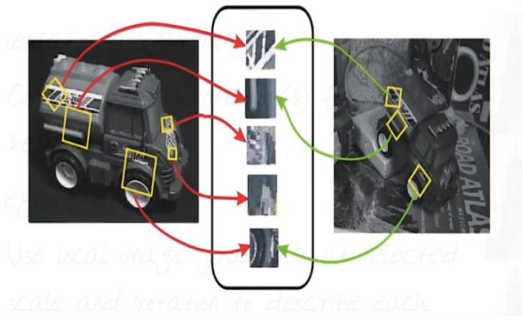


Fig 3: Scale invariant feature transform results.

2. SURF (Speeded Up Robust Features)

SIFT is quite effective but computationally expensive, so the SURF was developed to improve the speed of the scale invariant feature detector. It uses Hessian Matrix approximation to detect

interesting points and use the sum of Haar wavelet responses for orientation assignment.

3. BRIEF (Binary Robust Independent Elementary Features)

Computes descriptor quickly (instead of using SIFT and SURF). Faster as compared to SIFT and SURF but fails in Orientation invariance.

4. ORB (Oriented Fast and BRIEF)

Developed out of OpenCV labs (not patent so free to use). Provide faster orientation invariance with BRIEF

IV. METHODOLOGY

The proposed system makes use of Face Recognition for missing peoples' identification. The architecture of our framework is presented in figure 4.

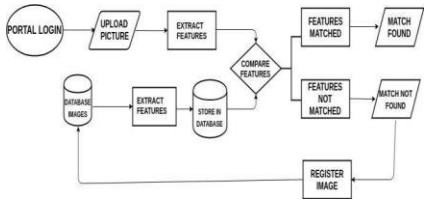
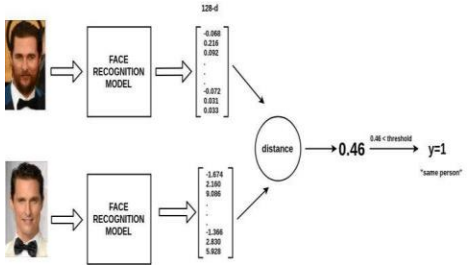


Fig 4: The Architecture of the proposed People Identification



System

Here the public or police who finds a suspicious person (child, mentally challenged person, etc.) on the road uploads a picture of that person into the portal. Our algorithm extracts the face encodings of the image as shown inFigure 5 and compare with that of the face encodings of the previously existing images in the database. If a match is found, an alert message will be sent to both the concerned police officer and the parent/guardian of that person in the image. If a match is not found, then the person will be provided with the option of registering that face asa new entry to our database with the location they found and remarks.

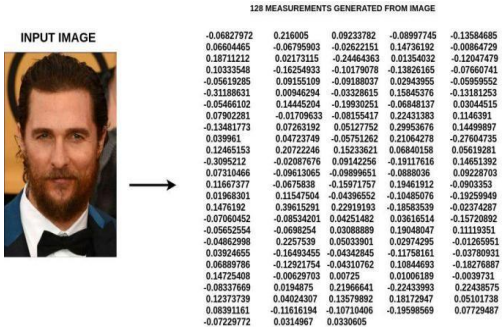


Fig 5: Face Encodings generated from an input image

Whenever public or police upload an image, the face encodings of the image are extracted and then compared to the face encodings of the images stored in the database. If the distance between the encoding of the uploaded image and the encoding of the image in the database is less than or equal to the threshold, then the face in both the images is of the same person as shown in Figure 3 and Figure 4. If that is the case, the user is notified that a match is found along with the picture from the database that matched with the uploaded picture. If the distance between the encodings is more than the threshold, it means that the faces in the images are not of the same person's. By this way, our proposed system will help in identifying the missingpeople.

Fig 6: Comparing Face encodings of two images

The model we have used involves three main steps to perform face recognition.

STEP 1: Face detection – Firstly, face patterns are generated using Histogram of Oriented Gradients (HOG) algorithm. The images are made black and white. Here, the part of the images that looks more like the original HOG face pattern is found. Finally, the detected face is bounded by a bounding box.

STEP 2: Sixty-eight specific points (landmarks) that are existing on every face are figured out by using the face landmark estimation algorithm. From the landmarks found, image transformations like scaling, shearing and rotation are used by the OpenCV's affine transformation to make the lips

and eyes appear in the same location on every image.

STEP 3: The face images are then passed through deep convolutional neural network. By doing this, we obtain 128 measurements which are 128-dimension hyper sphere. And no one knows which parts of the face the 128 measurements representing. All we know is that the network outputs the same 128 numbers for two different images of the same person.

STEP 4: Finally, a linear SVM classifier is used to recognize the face. The classifier has been trained in such a way that it can take the measurements from a test image and gives the closest match as output.

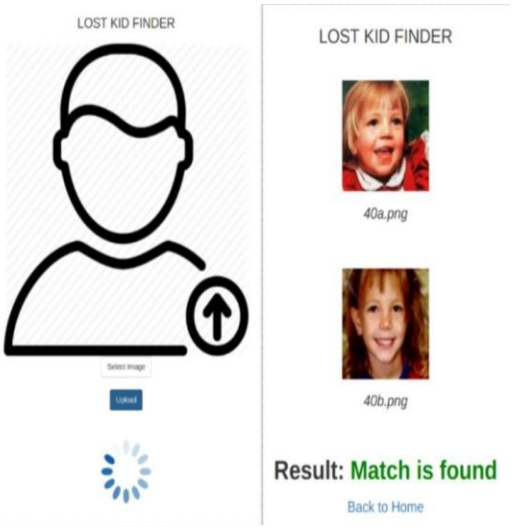


Fig 7: Interface for the system built using the Flask framework

A Flask API interface accompanies our model to give the user a better user experience as shown in Figure 7. When the user opens our application they will be asked to upload an image of the missing person. If a match is found, they will have provided with the image and details about the match. If match is not found, they will be asked if they want to register that image as a new entry into our database. If they wish to register, they will be asked to enter the details about the image as shown in figure8.

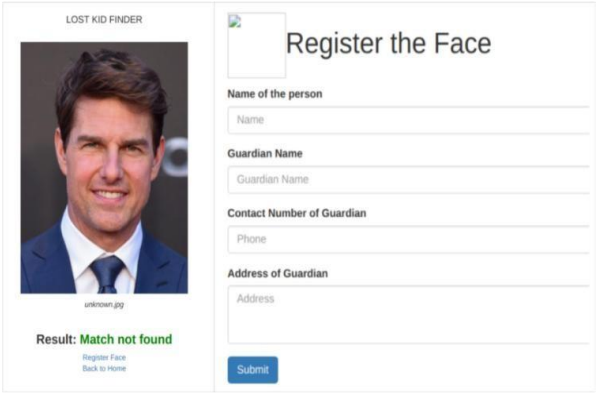


Fig 8: Face Registration form

V. RESULTS

The Face Recognition model we used has an accuracy of 99.38% on the Labelled Faces in the Wild Benchmark which comprises of 13,000 images The testing conducted by us yielded an accuracy of 97.5% where the dataset included 82 images – 41 pairs which included images of kids, teens, adults (male and female) with age gap, different hairstyles, filters etc. The dataset we used is taken from ML kit.

VI. CONCLUSION AND FUTURE SCOPE

By this way, the process of identifying the missing people is fastened. Our system replaces the manual method of scanning through the databases for each picture to check the match, by an efficient face recognition method which finishes the work in notime.

Though our system has a small limitation i.e. when the age of the person is between the age 0 and 10 the accuracy drops. This is due to the incomplete growth of facial features at that age. We look forward to overcome this limitation in the future.

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