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Missing Child Identification System using Convolutional Neural Network

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ABSTRACT

This paper proposes a new way of using deep learning to use face recognition to find a missing child from photos of other children. People can take pictures of children they think might be up to no good and upload them to a website with landmarks and comments. This picture will match the pictures of children who have been reported missing. The image of the child entered is matched with a photo that is the best match, and that photo is chosen from a database of missing children. With the help of pictures uploaded by the public, a deep learning model is trained to find the right missing child from a database of missing child cases. The Convolutional Neural Network (CNN) is a deep learning method that is very good for image-based applications. This project uses it to recognize faces. With the help of a CNN model with VGG-Face deep architecture that has already been trained, face descriptors are taken from these images. Our algorithm uses a convolution network, which, compared to normal feature extractors, is a high-level feature extractor. Deep learning applications. Child recognition is done based on the trained KNN classifier. Choosing the best performing CNN model for face recognition, VGG-Face, and proper training results in a deep learning model invariant to noise, illumination, contrast, occlusion, image pose, and the age of the child that outperforms earlier methods in face recognition based on missing child identification.

Keywords: Missing Child, Convolutional Neural Network, high-level feature extractor, VGG-Face deep architecture, Deep learning

I. INTRODUCTION

Children are the greatest asset of each nation. The future of any country depends upon the right upbringing of its children. India is the second populous country in the world and children represent a significant percentage of total population. But unfortunately a large number of children go missing every year in India due to various reasons including abduction or kidnapping, run-away children, trafficked children and lost children. A deeply disturbing fact about India's missing children is that

while on an average 174 children go missing every day, half of them remain untraced. Children who go missing may be exploited and abused for various purposes. As per the National Crime Records Bureau report which was cited by the Ministry of Home Affairs in the Parliament (LS Q no. 3928, 20-03- 2018), more than one lakh children (1,11,569 in actual numbers) were reported to have gone missing till 2016, and 55,625 of them remained untraced till the end of the year. Many NGOs claim that estimates of missing children are much higher than reported [1].

Mostly missing child cases are reported to the police. The child missing from one region may be found in another region or another state, for various reasons. So even if a child is found, it is difficult to identify him/her from the reported missing cases. A framework and methodology for developing an assistive tool for tracing missing child is described in this paper. An idea for maintaining a virtual space is proposed, such that the recent photographs of children given by parents at the time of reporting missing cases is saved in a repository. The public is given provision to voluntarily take photographs of children in suspected situations and uploaded in that portal. Automatic searching of this photo among the missing child case images will be provided in the application. This supports the police officials to locate the child anywhere in India. When a child is found, the photograph at that time is matched against the images uploaded by the Police/guardian at the time of missing. A deep learning architecture, considering all these constrain is designed here [2]

To help authorities and parents in missing child investigation. There is no system to identify the photographs of children with different lighting conditions, noises and images at different ages of children. Proposing a methodology for missing child identification which combines facial feature extraction based on deep learning and matching based on KNN[3]. A countless number of children go missing every year. The category of missing children includes a number of problems including abduction or kidnapping of children by family members and by nonfamily members, run-away children or those forced to run away by family and surrounding circumstances, children who are in a difficult or aggressive environment, trafficked children, and lost children. The convention way of finding a missing person is to broadcast picture, from poster to News Channel. The proposed system utilizes face recognition for missing child identification. This is to help authorities and parents in missing child investigation.

Sometimes the child has been missing for a long time. This age gap reflects in the images since aging affects the shape of the face and texture of the skin. The feature discriminator invariant to aging effects has to be derived. This is the challenge in missing child identification compared to the other face recognition systems.

Also, facial appearance of child can vary due to changes in pose, orientation, illumination, occlusions, noise in background etc.[4]. The image taken by public may not be of good quality, as some of them may be captured

from a distance without the knowledge of the child.

A New ML Framework which provides Search of Missing Children. The framework provides the adoption of children to needy persons. The framework provides interaction between parents and missing children.

The main contribution of the research paper is as follows

- Comparatively an easy, inexpensive, and reliable method compared to other offline systems.
- Methods for recognition and adoption with ML Features.
- Missing child identification is proposed, which employs principal component analysis.

The remaining paper is organized as follows: Section 2 represents a literature review; Section 3 presents a proposed model; Section 4 presents a result analysis; and Section 5 presents concussion.

II. Literature Review

In [5] they described about the computer vision features such as HOG, LBP ,SIFT, or SURF and also described about how we can describe the problem of face recognition as a supervised predictive modeling task trained on samples with inputs and outputs.

In [6] provides a comprehensive account of face recognition research and technology, spanning the full range of topics needed for designing operational face recognition systems .It also gives information about coverage of face detection, tracking, alignment, feature extraction, and recognition technologies, and issues in evaluation, systems, security, and applications.

In [7] presents a novel use of deep learning methodology for identifying the reported missing child from the photos of multitude of children available, with the help of face recognition. The public can upload photographs of suspicious child into a common portal with landmarks and remarks. The photo will be automatically compared with the registered photos of the missing child from the repository.

In [8] Missing child identification is proposed which employees principal component analysis using Eigen vectors is used for face recognition system. Find Face is a website that lets users search for members of the social network VK by uploading a photograph [9] . Find Face employs a facial recognition neural network algorithm developed by N-Tech Lab to match faces in the photographs uploaded by its users against faces in photographs published on VK, with a reported accuracy of 70 percent. The “Tuanyuan”, or “reunion” in Chinese, app developed by Alibaba Group Holding Ltd. helped Chinese authorities recover hundreds of missing children .

III. System Study

Mostly missing child cases are reported to the police. The child missing from one region may be found in another region or another state, for various reasons. Even if a child is found, it is difficult to identify him/her from the reported missing cases. A deeply disturbing fact about India’s missing children is that while on an average 174 children go missing every day, half of them remain untraced. There is so system to identify the photographs of children with different lighting conditions, noises and also images at different ages of children.

3.1 Proposed Model

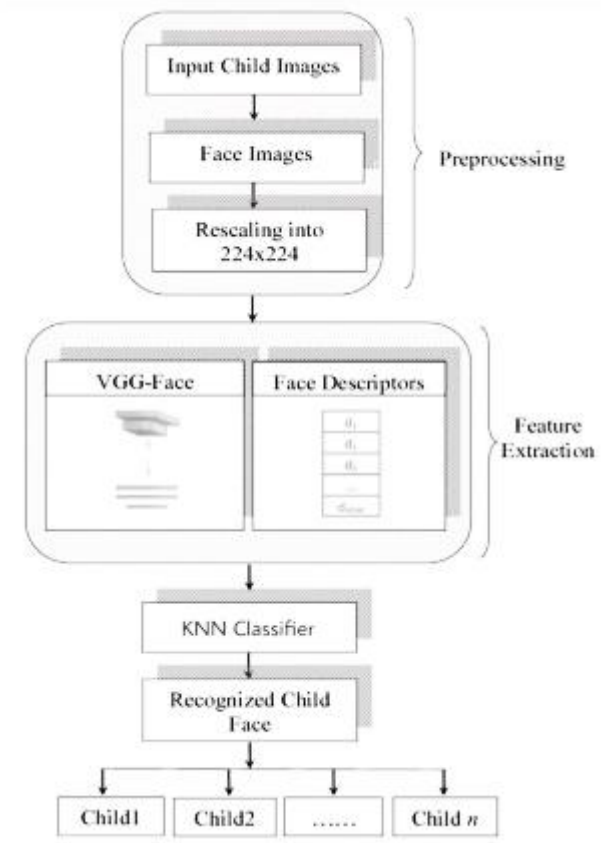

Figure 1. System Architecture

There are three modules in this application. They are Upload photo, Preprocessing and Search i.e

Upload Photo:

The public can upload photo of any suspicious child at any time into the portal with details like place, time, landmarks and remarks. The software reads the geometry of your face. The aim is to identify the facial landmarks that are key to distinguishing your face. The face capture process transforms analog information (a face) into a set of digital information (data)[10] based on the person's facial features. Your face's analysis is essentially turned into a mathematical formula. The numerical code is called a face print. In the same way

that
thumbprints are unique, each person has their own face print.

Preprocessing:

Before being used for model training and inference, pictures must first undergo image preprocessing. This includes, but is not limited to, adjustments to the size[11], orientation, and color. The purpose of preprocessing is to raise the image's quality so that we can analyze it more effectively. Preprocessing allows us to eliminate unwanted distortions and improve specific qualities that are essential for the application we are working on. Those characteristics could change depending on the application. An image must be preprocessed in order for software to function correctly and produce the desired results.

Search:

The face images are then passed through deep convolutional neural network. By doing this, we obtain 128 measurements which are 128 dimension hypersphere. And no one knows which parts of the face the 128 measurements representing[12]. All we know is that the network outputs the same 128 numbers for two different images of the same person. Finally, KNN Algorithm 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.

IV. Result and Analysis

3.2 System Specifications

User constraints:

User Constraints for the project are analyzed in this phase, and the business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis, the feasibility study of the proposed system is to be carried out[13].

a) Hardware Requirements Processor : I3 or higher Speed : 2.9 GHz RAM : 4 GB (min) Hard Disk : 160 GB

b) Software Requirements Operating system : Windows 7 Ultimate Coding Language: Python Back-End : Django-ORM Designing : Html, CSS, javascript Data Base : MySQL (WAMP Server)

3.3 Homepage of the application

This is what the homepage looks like. There are two types of users. Parent user and guest user. Anyone can check the status of the child[14].

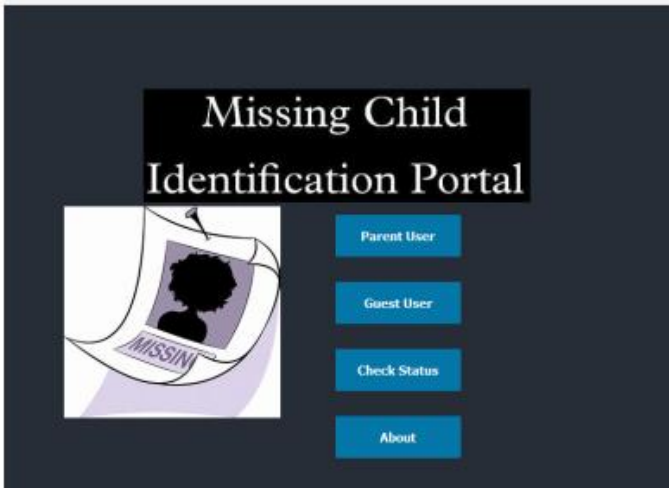

Figure 2. Home page

In this window a photo, the user has to upload and enter all the details

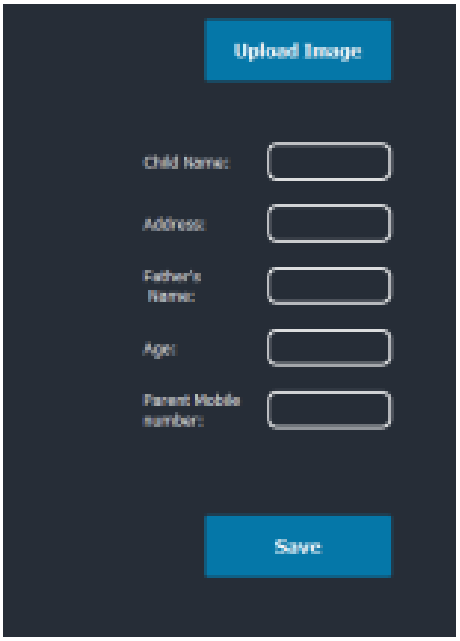

Figure 3. Parent user window

Image is uploaded and the entries are also filled then user can save the details and it will be as shown in fig 4.

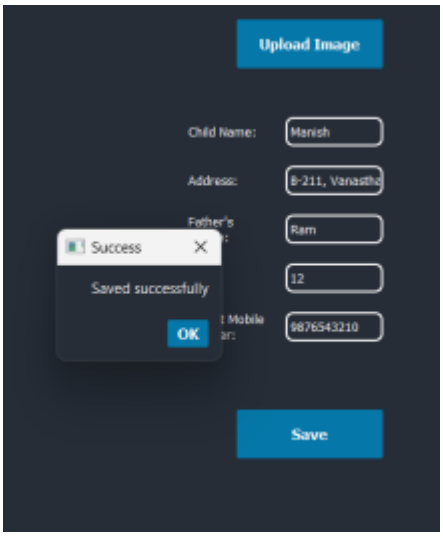

Figure 4 : Message for saving successfully

After saving the photo and details, if there are any matches to the photo then the matched results and uploaded details are displayed as figure 5.

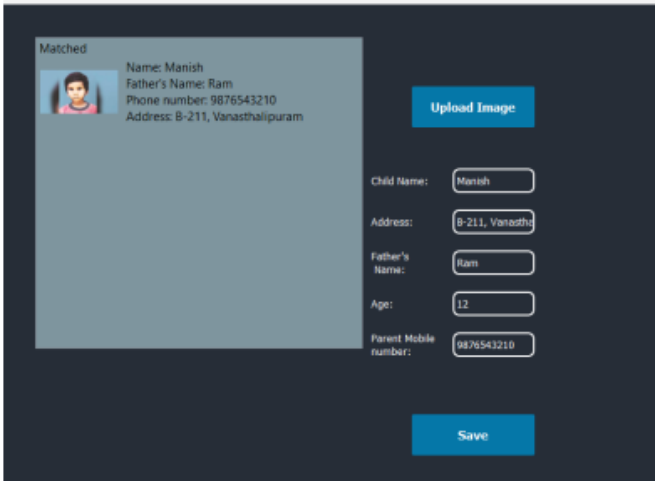

Figure 5 : Details of the Uploaded and matched child

If no face is detected in the photo output will be as shown in figure 6.

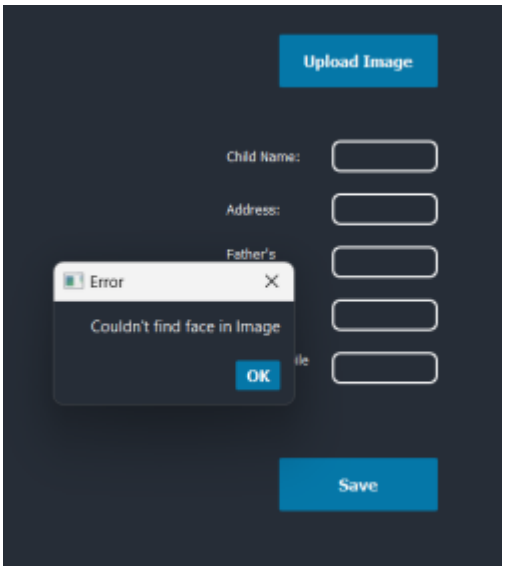

Figure 6. Message for detection of no face

3.4 Guest User

This is for guest user. In this window the user has to upload the photo of the child and enter the details.

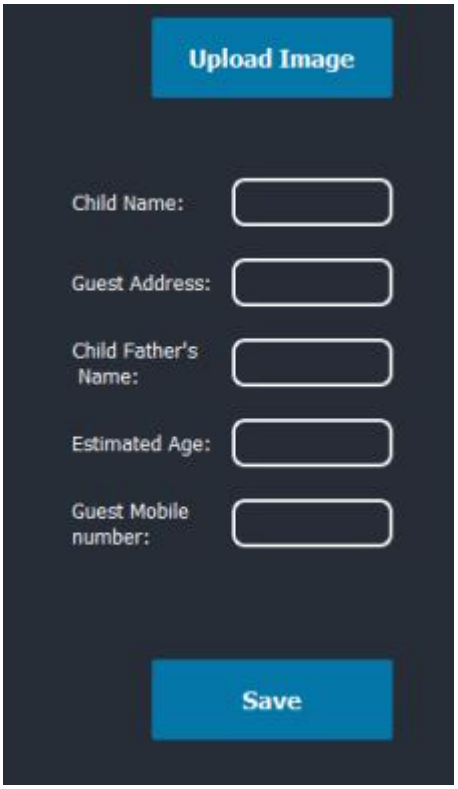

Figure 7: Guest User Window

If the uploaded image is matched with the image in the database then the child details will be displayed.

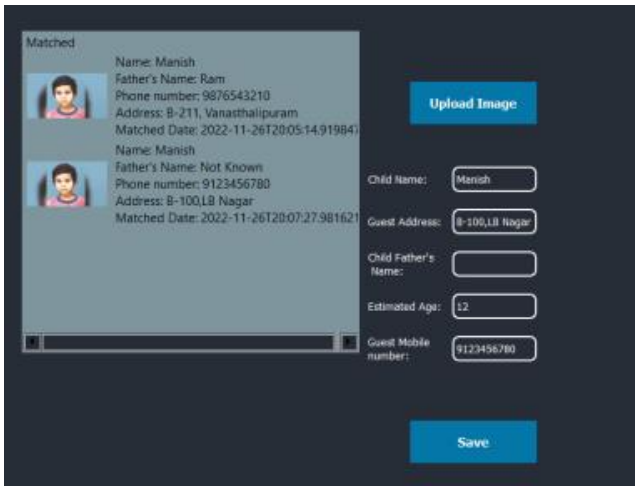

Figure 8: Matched

If the details about child are not known then the user can leave it and can be saved and display the message as shown in the figure 9. and the missing details will be saved as "Not Known".

Figure 9. Message showing saved successfully without entering all details

3.5 Check User

In this window any user can check status of child. The user has to upload the photo and click on check.

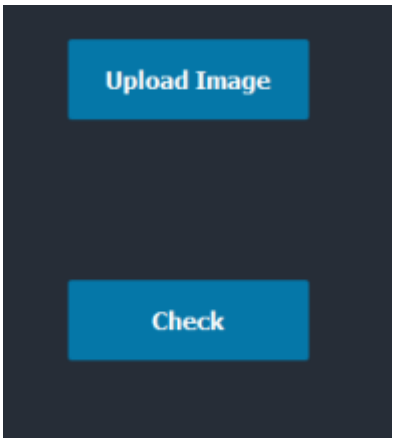

Figure 10. Check Status Window

After clicking on check if there are any matched results then it will show the matched child details

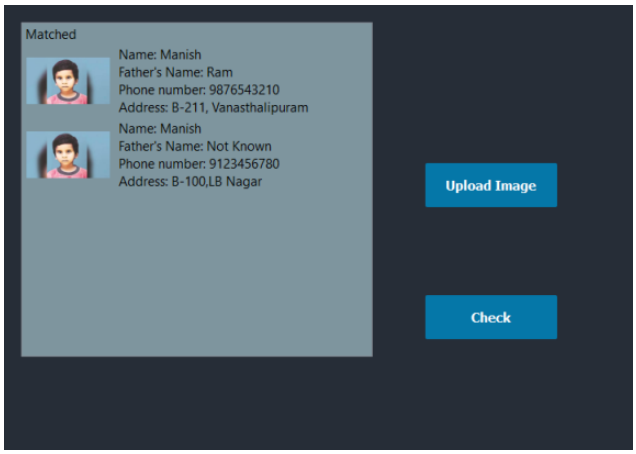

Figure 11. Status of the child

V. Conclusion

A missing child identification system is proposed that combines a powerful CNN-based deep learning approach for feature extraction with a support vector machine classifier to classify different child categories. This system is evaluated using a deep learning model trained on feature representations of children's faces. Better performance was achieved by taking out the softmax from the VGG-Face model and using CNN image features to train a multi-class SVM. The proposed system's performance is evaluated using photographs of children taken under various lighting conditions, noises, and ages. The classification achieved a higher accuracy of 99.41%, indicating that the proposed face recognition methodology could be used for the reliable identification of missing children.

This paper describes the framework and methodology for creating an assistive tool for locating missing children.

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