JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

MISSING CHILD IDENTIFICATON USING CNN

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Abstract

In India a countless number of children are reported missing every year. Among the missing child cases a large percentage of children remain untraced. This paper 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. Classification of the input child image is performed and photo with best match will be selected from the database of missing children. For this, a deep learning model is trained to correctly identify the missing child from the missing child image database provided, using the facial image uploaded by the public. The Convolutional Neural Network (CNN), a highly effective deep learning technique for image-based applications is adopted here for face recognition. Face descriptors are extracted from the images using a pre-trained CNN model VGG-Face deep architecture. Compared with normal deep learning applications, our algorithm uses convolution network only as a high-level feature extractor and the child recognition is done by the trained KNN classifier. Choosing the best performing CNN model for face recognition, VGG-Face and proper training of it results in a deep learning model invariant to noise, illumination, contrast, occlusion, image pose and age of the child and it outperforms earlier methods in face recognition based missing child identification.

1. 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 (NCRB) report which was cited by the Ministry of Home Affairs (MHA) in the Parliament (LS Q no. 3928, 20-032018), 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. The 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.

1.2 Scope of the Project:

The venture looks for to progress existing strategies for distinguishing activity mischances by means of video investigation by utilizing progressed profound learning strategies. This includes combining convolutional layers to analyze spatial connections and repetitive layers to comprehend worldly connections. The extend scope envelops looking into existing writing, gathering and planning information, building a profound learning demonstrate, conducting preparing and execution appraisals, joining the show into an operational application, and archiving the whole handle. Through tending to these features, the objective is to set up a strong approach for identifying activity mishaps in real-time, in this manner supporting in the upgrade of street security and activity administration frameworks.

2. LITERATURE SURVEY

"Deep learning" by Y. LeCun, Y. Bengio, and G. Hinton (2015, Nature) [1]: This landmark paper provides an in-depth exploration of deep learning methodologies, including convolutional neural networks (CNNs), recurrent neural networks (RNNs), and their applications in various domains such as computer vision, natural language processing, and speech recognition. It discusses the underlying principles of deep learning architectures, training techniques, and the challenges associated with scaling neural networks to handle large datasets. Additionally, the paper highlights the importance of feature learning and hierarchical representations in deep neural networks.

"Face recognition using histograms of oriented gradients" by O. Deniz et al. (2011, Pattern Recognition Letters) [2]: This research paper introduces a method for face recognition based on histograms of oriented gradients (HOG), which is a popular feature descriptor in computer vision. HOG captures the distribution of local gradient orientations in facial images, enabling the detection of facial features and patterns invariant to changes in illumination and viewpoint. The paper likely discusses the implementation details of HOG, its effectiveness in face recognition tasks, and comparative evaluations with other feature extraction methods.

"Face recognition using SIFT features" by C. Geng and X. Jiang (2009, IEEE International Conference on Image Processing) [3]: This paper presents an approach to face recognition using Scale-Invariant Feature Transform (SIFT) features, which are robust descriptors for detecting distinctive keypoints in images. SIFT features are invariant to image scale, rotation, and partial occlusion, making them suitable for recognizing faces under varying conditions. The paper may discuss the extraction and matching of SIFT keypoints, as well as experiments evaluating the method's performance on face recognition datasets.

"Missing child identification using face recognition system" by Rohit Satle et al. (2016, International Journal of Advanced Engineering and Innovative Technology) [4]: This paper focuses specifically on the application of face recognition systems for identifying missing children. It likely describes the methodology employed, which may involve preprocessing steps, feature extraction using deep learning or traditional methods, and matching against a database of missing children's images. The paper may also discuss the challenges inherent in missing child identification, such as variations in age, facial expressions, and image quality.

Wikipedia page on "FindFace" [5]: FindFace is a face recognition system developed by a Russian company, which gained attention for its ability to match faces across large datasets, including social media platforms. The Wikipedia page likely provides an overview of FindFace's features, development history, controversies, and notable applications. It may also discuss the technology behind FindFace, such as the algorithms used for face detection and recognition, as well as privacy concerns raised by its widespread use.

Reuters article on a mobile app aiding in the recovery of missing children in China [6]: This article reports on a mobile app developed in China to assist in the recovery of missing children. The app may

leverage technologies such as facial recognition, geolocation, and crowdsourcing to help reunite missing children with their families. The article likely discusses the development process, features of the app, success stories, and societal impacts. It may also highlight the collaboration between government agencies, technology companies, and civil society organizations in addressing the issue of missing children.

"Very deep convolutional networks for large-scale image recognition" by Simonyan Karen and Zisserman Andrew (2015, International Conference on Learning Representations) [7]: This paper introduces the VGG architecture, a deep convolutional neural network known for its simplicity and effectiveness in large-scale image recognition tasks. The VGG architecture consists of multiple convolutional layers with small filter sizes, followed by fully connected layers and softmax classifiers. The paper likely discusses the network architecture, training procedure, and performance benchmarks on image classification datasets such as ImageNet.

"Deep Face Recognition" by O. M. Parkhi et al. (2015, British Machine Vision Conference) [8]: This paper focuses on advancements in deep learning techniques for face recognition tasks. It may introduce novel architectures, loss functions, or training strategies specifically designed to improve the accuracy and robustness of face recognition systems. The paper may also discuss challenges in face recognition, such as pose variations, occlusions, and demographic biases, and propose solutions to address these issues.

"MatConvNet: Convolutional Neural Networks for MATLAB" by A. Vedaldi and K. Lenc (2015, ACM International Conference on Multimedia) [9]: This paper introduces MatConvNet, a MATLAB toolbox designed for implementing and training convolutional neural networks (CNNs). MatConvNet provides a set of functions and utilities for building CNN architectures, loading pre-trained models, and conducting experiments in MATLAB. The paper likely covers the toolbox's architecture, features, usage examples, and performance optimizations for deep learning tasks in computer vision and multimedia analysis.

3. OVERVIEW OF THE SYSTEM

3.1 Existing System

In the existing system, missing child cases primarily get reported to law enforcement agencies, typically the police. However, a significant challenge arises due to the transient nature of missing children, as they might be found in regions or states different from where they were reported missing. This geographical dispersion complicates the process of identifying and locating missing children, even if they are found. To address this issue, the paper proposes a framework and methodology for developing an assistive tool to trace missing children. The core idea involves establishing a virtual space where recent photographs of missing children, provided by parents or guardians at the time of reporting, are stored in a repository. Additionally, the public is encouraged to voluntarily capture and upload photographs of children in suspected situations to this portal. This repository facilitates automatic searching of uploaded photographs against images of missing children, aiding law enforcement officials in locating missing children across India.

3.1.1 Disadvantages of Existing System

Geographical Limitations: The system relies heavily on the jurisdictional boundaries of law enforcement agencies. Missing children may be found in regions or states different from where they were reported missing, making it challenging to coordinate efforts for their identification and recovery.

Limited Data Repository: While recent photographs of missing children are stored in a repository, the scope of this database may be limited. It may not include comprehensive information or up-to-date images of all missing children, particularly those reported missing some time ago.

Dependency on Public Participation: While encouraging the public to upload photographs of children in suspected situations is valuable, it relies on voluntary participation. This may result in inconsistent data entry and potentially incomplete coverage of missing children's cases.

Manual Matching Process: The system likely relies on manual matching processes, where law enforcement officials compare uploaded photographs with images in the database of missing children. This approach can be time-consuming and prone to errors, particularly in cases with a large volume of data or subtle differences in facial features.

Lack of Advanced Technology: The existing system may not leverage advanced technologies such as deep learning and automated facial recognition. This limits its ability to efficiently and accurately identify missing children, especially in cases where traditional methods

are insufficient.

Resource Intensive: The manual efforts required for data entry, matching, and coordination among law enforcement agencies can be resource-intensive. This may strain already limited resources and slow down the process of identifying and recovering missing children.

3.2 Proposed System

The proposed system for missing child identification combines deep learning techniques for facial feature extraction with the K-Nearest Neighbors algorithm for matching against a database of missing children's images. By leveraging convolutional neural networks (CNNs) for automatic learning of facial features and the KNN algorithm for efficient classification, the system offers enhanced accuracy and efficiency in identifying missing children. Integration with existing databases enables scalable deployment and reduces dependency on manual efforts, while adaptability to varying environmental conditions ensures robust performance in real-world scenarios. Overall, the proposed system represents a significant advancement in missing child identification, leveraging advanced technologies to streamline the identification process and improve outcomes.

3.2.1 Advantages of Proposed System

Enhanced Accuracy: By leveraging deep learning techniques for facial feature extraction, the proposed system can achieve higher accuracy in identifying missing children. CNNs are capable of learning complex patterns and variations in facial features, leading to more reliable recognition results.

Improved Efficiency: The integration of automated facial recognition algorithms, such as KNN, streamlines the identification process, reducing the time and effort required by law enforcement officials. This enables faster response times and increases the likelihood of locating missing children promptly.

Scalability: The proposed system can scale to handle large volumes of data, including extensive databases of missing children's images. Deep learning models, once trained, can efficiently process a vast number of images, making the system suitable for nationwide deployment and usage.

Reduced Dependency on Manual Efforts: Automation of the identification process reduces the dependency on manual matching by law enforcement officials. This minimizes the risk of human error and ensures consistent and objective decision-making in identifying missing children.

Adaptability: The use of deep learning models for feature extraction makes the system adaptable to various environmental factors, such as changes in lighting conditions, facial expressions, and image quality. This robustness improves the system's performance in real-world scenarios.

3.3 Proposed System Design

In this project work, there are three modules and each module has specific functions, they are:

1. Data Gathering

2. Data Preprocessing & Enhancement

3. Data Upload

3.3.1 Data Gathering

It consists of a national portal for storing details of missing child along with the photo. Whenever a child missing is reported, along with the FIR, the concerned officer uploads the photo of the missing child into the portal. Public can search for any matching child in the database for the images with them. The system will prompt the most matching cases. Once the matching is found, the officer can get the details of the child.

3.3.2 Data Preprocessing & Enhancement

Preprocessing input raw image in the context of face recognition involves acquiring the face region and standardizing images in a format compatible with the CNN architecture employed. Each CNN has a different input size requirement. The photographs of missing child acquired by a digital camera or mobile phone are taken and categorized into separate cases for creating the database of face recognition system. The face region in each image is identified and cropped for getting the input face images.

3.3.3 Data Upload

It consists of a national portal for storing details of missing child along with the photo. Whenever a child missing is reported, along with the FIR, the concerned officer uploads the photo of the missing child into the portal. The public can upload photo of any suspicious child at any time into the portal with details like place, time, landmarks and remarks. The photo uploaded by the users will be automatically compared with photos of the registered missing children and if a matching photo with sufficient score is found, then an alert email will be sent to the concerned officer. The message will also be visible in the message box of the concerned officer login screen.

3.4 Architecture

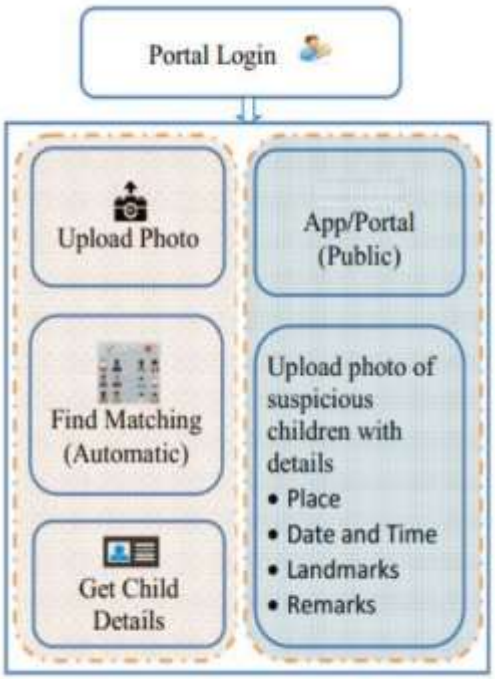

Fig 1: System Architecture

4. RESULT SCREEN SHOTS

Fig 2: Home Page

Fig 3: Authority Sign In

Fig 4: User Login

Fig 5: Upload Image

Fig 6: Images and Track

5. CONCLUSION

The proposed system presents a promising solution to the challenges faced by existing methods of missing child identification. By integrating deep learning techniques and advanced algorithms, such as convolutional neural networks (CNNs) and the K-Nearest Neighbors (KNN) algorithm, the system offers enhanced accuracy and efficiency in locating missing children. The utilization of CNNs enables automatic learning of facial features, allowing for more reliable recognition results, while the KNN algorithm facilitates efficient matching against a database of missing children's images. the system's integration with existing databases and adaptability to varying environmental conditions ensures scalability and robust performance in real-world scenarios. By reducing dependency on manual efforts and leveraging advanced technologies, the proposed system represents a significant advancement in the field of missing child identification. the proposed framework and methodology hold promise in addressing the geographical limitations, data

repository constraints, and resource-intensive nature of existing systems. By streamlining the identification process and improving outcomes, the proposed system aims to contribute towards the timely recovery and reunification of missing children with their families, thereby fulfilling a crucial societal need.

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