International Journal of Multidisciplinary Engineering in Current Research - IJMEC

Volume 10, Issue 5, May-2025, http://ijmec.com/, ISSN: 2456-4265

Missing Child Identification System Using Deep Learning And Multiclass SVM

Patchipala Sandeep
PG scholar, Department of MCA, CDNR collage, Bhimavaram, Andhra Pradesh.
K.Suparna
(Assistant Professor), Master of Computer Applications, DNR collage, Bhimavaram, Andhra Pradesh.

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 SVM 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. The classification performance achieved for child identification system is 99.41%. It was evaluated on 43 Child cases.

Keywords: SVM, CNN, model VGG-Face deep architecture.

1 Introduction

The safety and prompt recovery of missing children are paramount concerns in today's society. The ability to swiftly and accurately identify missing children from various sources of information, such as images and databases, is critical in aiding law enforcement agencies and communities in their efforts to locate and reunite these children with their families. Leveraging advancements in Deep Learning and Multiclass Support Vector Machine (SVM) techniques offers a promising approach to address this challenge.

The Need for Advanced Identification Systems

Traditional methods for identifying missing children often rely on manual examination and comparison of visual features, which can be

time-consuming and prone to errors. In response to these limitations, the implementation of sophisticated technological solutions becomes imperative.

Proposed Solution: Missing Child Identification System

The proposed system aims to harness the power of Deep Learning algorithms, particularly Convolutional Neural Networks (CNNs), to extract intricate visual features from images of missing children. The CNN model is trained to understand and distinguish distinct facial characteristics, features, and patterns specific to each child.

Complementing the Deep Learning approach, Multiclass Support Vector Machine (SVM) classifiers are utilized to further categorize and match extracted facial features with a comprehensive database of missing children. SVMs efficiently classify the extracted features into multiple categories, aiding in the identification and retrieval process.

The amalgamation of Deep Learning and Multiclass SVM methodologies in a Missing Child Identification System holds significant promise in revolutionizing the process of identifying missing children. By leveraging advanced technologies, this system aims to provide an efficient, accurate, and timely solution to aid in the crucial task of reuniting missing children with their families and ensuring their safety and well-being.

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, 20-03- 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. 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. 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.

LITERATURE SURVEY

[1] Y. LeCun, Y. Bengio, and G. Hinton, "Deep learning", Nature, 521(7553):436–444, 2015.

Deep learning allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods have dramatically improved the state-of-the-art in speech recognition, visual object recognition, object detection and many other domains such as drug discovery and genomics.

Deep learning discovers intricate structure in large data sets by using the backpropagation algorithm to indicate how a machine should change its internal parameters that are used to compute the representation in each layer from the representation in the previous layer. Deep convolutional nets have brought about breakthroughs in processing images, video, speech and audio, whereas recurrent nets have shone light on sequential data such as text and speech.

[2] O. Deniz, G. Bueno, J. Salido, and F. D. la Torre, "Face recognition using histograms of oriented gradients", Pattern Recognition Letters, 32(12):1598–1603, 2011.

Face recognition has been a long standing problem in computer vision. Recently, Histograms of Oriented Gradients (HOGs) have proven to be an effective descriptor for object recognition in general and face recognition in particular. In this paper, we investigate a simple but powerful approach to make robust use of HOG features for face recognition.

The three main contributions of this work are: First, in order to compensate for errors in facial feature detection due to occlusions, pose and illumination changes, we propose to extract HOG descriptors from a regular grid. Second, fusion of HOG descriptors at different scales allows to capture important structure for face recognition. Third, we identify the necessity of performing dimensionality reduction to remove noise and make the classification process less prone to overfitting. This is particularly important if HOG features are extracted from overlapping cells. Finally, experimental results on four databases illustrate the benefits of our approach.

[3] C. Geng and X. Jiang, "Face recognition using sift features", IEEE International Conference on Image Processing(ICIP), 2009.

Scale Invariant Feature Transform (SIFT) has shown to be a powerful technique for general object recognition/detection. In this paper, we propose two new approaches: Volume-SIFT (VSIFT) and Partial-Descriptor-SIFT (PDSIFT) for face recognition based on the original SIFT algorithm. We compare holistic approaches: Fisherface (FLDA), the null space approach (NLDA) and Eigenfeature Regularization and Extraction (ERE) with feature based approaches: SIFT and PDSIFT. Experiments on the ORL and AR databases show that the performance of PDSIFT is significantly better than the original SIFT approach. Moreover, PDSIFT can achieve

comparable performance as the most successful holistic approach ERE and significantly outperforms FLDA and NLDA.

[4] Rohit Satle, Vishnuprasad Poojary, John Abraham, Shilpa Wakode, "Missing child identification using face recognition system", International Journal of Advanced Engineering and Innovative Technology (IJAEIT), Volume 3 Issue 1 July - August 2016.

The human face plays an important role in our social interaction, conveying people's identity. Face recognition is a task that humans perform routinely and effortlessly in their daily lives. Face recognition, as one of the primary biometric technologies, became more and more important owing to rapid advances in technologies such as digital cameras, the Internet and mobile devices, and increased demands on security. A facial recognition system is a computer application capable of identifying or verifying a person from a digital image or a video frame from a video source. Face Recognition System is a computer based digital technology and is an active area of research.

[7] Simonyan, Karen and Andrew Zisserman, "Very deep convolutional networks for large-scale image recognition", International Conference on Learning Representations (ICLR), April 2015.

In this work we investigate the effect of the convolutional network depth on its accuracy in the large-scale image recognition setting. Our main contribution is a thorough evaluation of networks of increasing depth using an architecture with very small (3x3) convolution filters, which shows that a significant improvement on the prior-art configurations can be achieved by pushing the depth to 16-19 weight layers. These findings were the basis of our ImageNet Challenge 2014 submission, where our team secured the first and the second places in the localisation and classification tracks respectively. We also show that our representations generalise well to other datasets, where they achieve state-of-the-art results. We have made our two best-performing ConvNet models publicly available to facilitate further research on the use of deep visual representations in computer vision.

[8] O. M. Parkhi, A. Vedaldi, and A. Zisserman, "Deep Face Recognition," in British Machine Vision Conference, vol. 1, no. 3, pp. 1-12, 2015.

The goal of this paper is face recognition – from either a single photograph or from a set of faces tracked in a video. Recent progress in this area has been due to two factors: (i) end to end learning for the task using a convolutional neural network (CNN), and (ii) the availability of very large scale training datasets. We make two contributions: first, we show how a very large scale dataset (2.6M images, over 2.6K people) can be assembled by a combination of automation and human in the loop, and discuss the trade off between data purity and time; second, we traverse through the complexities of deep network training and face recognition to present methods and procedures to achieve comparable state of the art results on the standard LFW and YTF face benchmarks.

PROPOSED METHOD

4.1 WORK FLOW OF FACE RECOGNITION

Here we propose a methodology for missing child identification which combines facial feature extraction based on deep learning and

matching based on support vector machine. The proposed system utilizes face recognition for missing child identification. This is to help authorities and parents in missing child investigation. The architecture of the proposed frame work is given below,

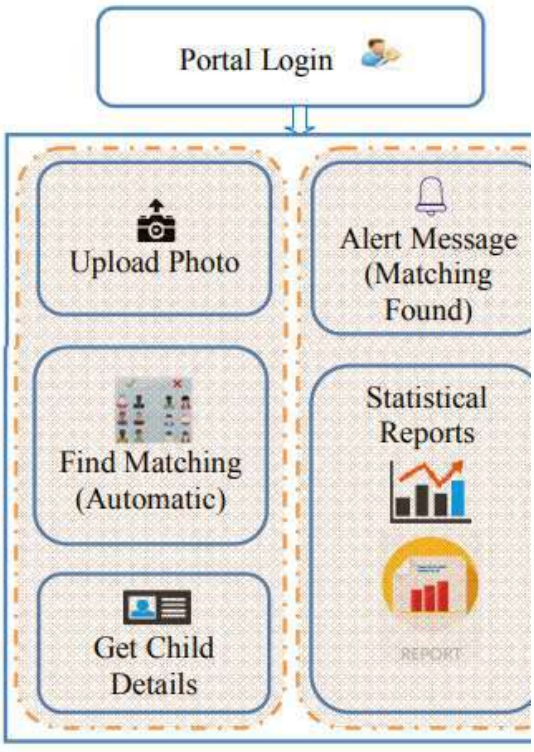

Fig. 1. Architecture of proposed child identification system

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. The system also generates various statistical reports.

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 public will be automatically compared with photos of the registered missing children and if a matching photo with sufficient score is found, then an alert message will be sent to the concerned officer. The message will also be visible in the message box of the concerned officer login screen. The portal for the public can also be maintained as a mobile app, where he or she can upload photo of suspicious children with details.

In the mobile app, location of the person updating the photo will also be automatically recorded. Whenever public uploads photo of a suspected child, the system generates template vector of the facial features from the uploaded photo. If a matching is found in the repository, the system displays the most matched photo and pushes a message to the concerned Officer portal or SMSs the alert message of matching child. Similarly the Officer can check for any matching with the database at any time using the proposed system. In the following sections the paper details the work flow for child matching methodology. The flow chart of the automatic child face identification methodology is as shown in Fig 2.

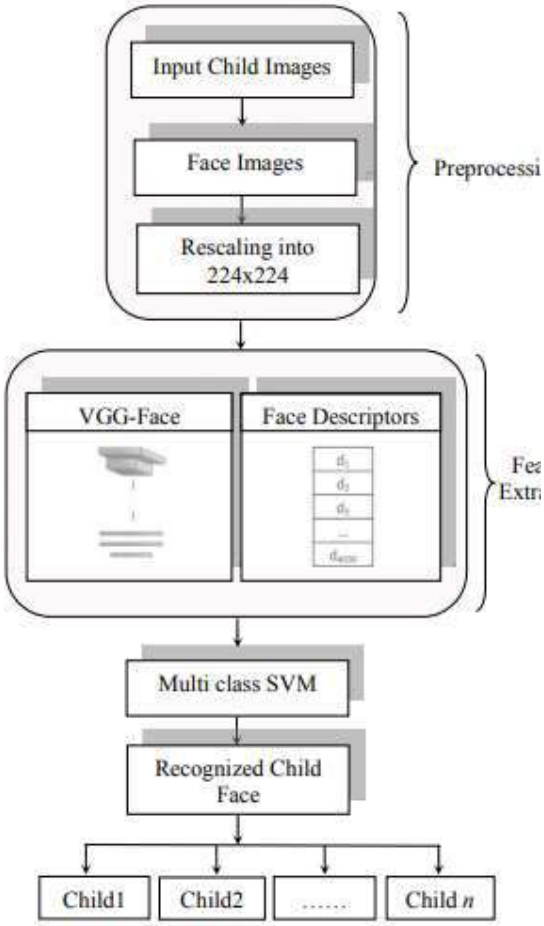

Fig. 2. Software Flow of face recognition system

Images of reported missing children are saved in a repository and the face area is selected for cropping to obtain input face images. Learned features from a Convolutional Neural Network (CNN), a specific type of deep learning algorithm, are used for training a multi class SVM classifier. This machine learning approach is used to correctly label the child using the name indicated in the database provided by the concerned authority

RESULT

Missing Child Identification System using Deep Learning and Multiclass SVM

In this paper author is describing concept to identify missing children by using Deep Learning and Multiclass SVM classifier and to implement this project author has used below modules

1) Using public dataset of missing children's called FGNET is used to train deep learning CNN prediction model. After training model whenever public upload any suspected child image then this model will check in trained model to detect whether this child is in missing database or not. This detected result will store in database and whenever want official persons will login and see that detection result.
2) SVM Multiclass classifier use to extract face features from images based on age and other facial features and then this detected face will input to CNN model to predict whether this face child exists in image database or not.

First we used below dataset to train deep learning CNN model

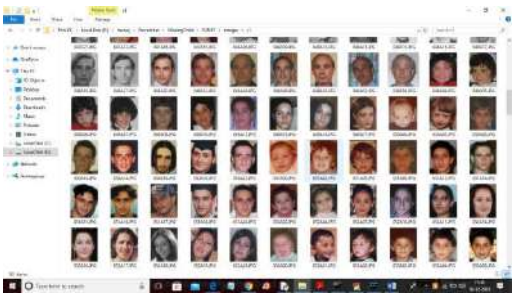

Fig.5.1 Dataset

To run project follow below steps

1) First create database in MYSQL by copying content from 'DB.txt' file and paste in MYQL

2) Install python, DJANGO and MYSQL software

3) Create 'Python' folder in C directory and put 'MissingChilds' folder in it

4) start DJANGO server and run in browser to get first page

SCREEN SHOTS

Fig.5.2 Public Upload Suspected Child

In above screen public can click on 'Public Upload Suspected Child' link to get below page and to add missing child details

Fig.5.3 Enter suspected child details

In above screen public will enter suspected child details and then upload photo and then click on 'Submit' button and to get below result

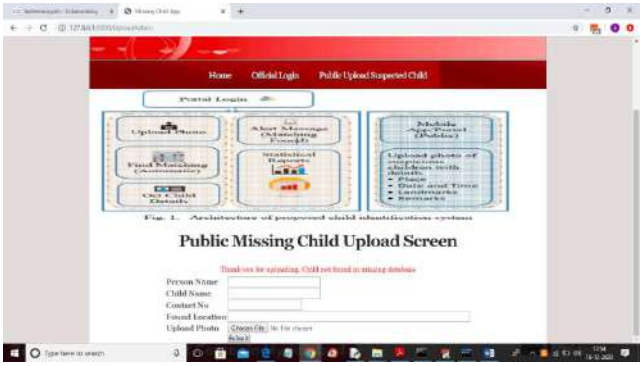

Fig.5.4 child not found in missing

In above screen we can see child not found in missing DB and we can try with other image

Fig.5.5 Upload another child data

And below is the result for new above child details

Fig.5.6 uploaded child found in database

In above screen uploaded child found in database and now click on 'Official Login' link to get below login screen

Fig.5.7 admin can login by entering username and password

In above screen admin can login by entering username and password as 'admin' and 'admin' and after clicking on 'Login' button will get below screen

Fig.5.8 View Public Upload Missing Childs Status

In above screen official can click on 'View Public Upload Missing Childs Status' link to view all uploads and its result done by public

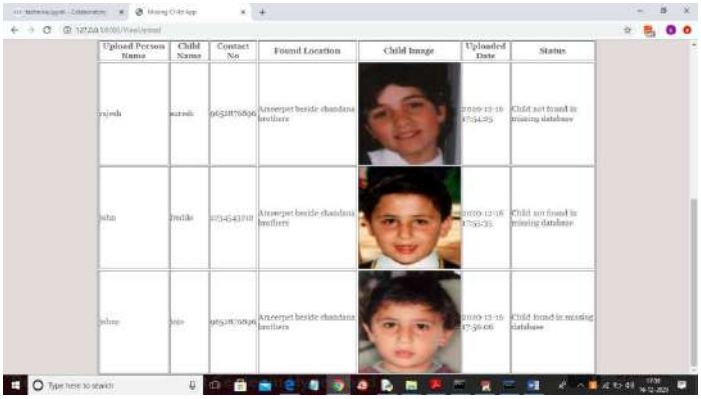

Fig.5.9 officials can see all details

In above screen officials can see all details and then take action to find that child

CONCLUSION

A missing child identification system is proposed, which combines the powerful CNN based deep learning approach for feature extraction and support vector machine classifier for classification of different child categories. This system is evaluated with the deep learning model which is trained with feature representations of children faces. By discarding the softmax of the VGG-Face model and extracting CNN image features to train a multi class SVM, it was possible to achieve superior performance. Performance of the proposed system is tested using the photographs of children with different lighting conditions, noises and also images at different ages of children. The classification achieved a higher accuracy of 99.41% which shows that the proposed methodology of face recognition could be used for reliable missing children identification.

REFERENCES

[1] Y. LeCun, Y. Bengio, and G. Hinton, "Deep learning", Nature, 521(7553):436–444, 2015.

[2] O. Deniz, G. Bueno, J. Salido, and F. D. la Torre, "Face recognition using histograms of oriented gradients", Pattern Recognition Letters, 32(12):1598–1603, 2011.

[3] C. Geng and X. Jiang, "Face recognition using sift features", IEEE International Conference on Image Processing(ICIP), 2009.

[4] Rohit Satle, Vishnuprasad Poojary, John Abraham, Shilpa Wakode, "Missing child identification using face recognition system", International Journal of Advanced Engineering and Innovative Technology (IJAEIT), Volume 3 Issue 1 July - August 2016.

[5] https://en.wikipedia.org/wiki/FindFace

[6] https://www.reuters.com/article/us-china-trafficking-apps/mobileapp-helps-china-recover-hundreds-of-missing-childrenidUSKBN15J0GU

[7] Simonyan, Karen and Andrew Zisserman, "Very deep convolutional networks for large-scale image recognition", International Conference on Learning Representations (ICLR), April 2015.

[8] O. M. Parkhi, A. Vedaldi, and A. Zisserman, "Deep Face Recognition," in British Machine Vision Conference, vol. 1, no. 3, pp. 1-12, 2015.

[9] A. Vedaldi, and K. Lenc, "MatConvNet: Convolutional Neural Networks for MATLAB", ACM International Conference on Multimedia, Brisbane, October 201