International Journal on Recent Researches in Science, Engineering & Technology (IJRRSET)
A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy. Journal Indexed in JIR, DIIF and SJIF.
Available online at: www.jrrset.com

ISSN (Print) : 2347-6729
ISSN (Online) : 2348-3105
JIR IF : 2.54
SJIF IF : 4.334
Cosmos: 5.395

Volume 10 Issue 4 - April 2022 - Pages 1-4

MISSING CHILD IDENTIFICATION SYSTEM USING DEEP LEARNING

M.Sathwik Reddy, M. Sireesha, Dr. B. Persis Urbana Ivy
Department of CSE, Vaagdevi College of Engineering

Abstract: In India, countless children are reported missing every year, with a large percentage remaining untraced. This paper introduces a novel approach using deep learning for identifying missing children from a multitude of available photos through face recognition. The public can upload photos of suspicious children to a common portal along with landmarks and remarks. These photos are then automatically compared with registered photos of missing children in a repository. Classification of the input child image is performed, and the photo with the best match is selected from the missing child database. A deep learning model is trained for this purpose, utilizing facial images uploaded by the public. Convolutional Neural Network (CNN), a highly effective deep learning technique for image-based applications, is employed for face recognition. Face descriptors are extracted from images using a pre-trained CNN model, VGG-Face deep architecture. Unlike normal deep learning applications, our algorithm uses a convolution network solely as a high-level feature extractor, with child recognition performed by a trained SVM classifier. Through careful selection of the best performing CNN model for face recognition, VGG-Face, and appropriate training, the resulting deep learning model demonstrates invariance to noise, illumination, contrast, occlusion, image pose, and child age, outperforming earlier methods in face recognition-based missing child identification. The achieved classification performance for the child identification system is 99.41%, evaluated on 43 child cases.

Keywords: Missing child identification, face recognition, deep learning, CNN, VGG-Face, Multi-class SVM.

Introduction:

Children are the greatest asset of any nation, and their proper upbringing is crucial for the future. India, as the second most populous country globally, sees a significant percentage of its population comprised of children. However, a concerning trend is the high number of missing children each year, attributed to factors like abduction, kidnapping, runaways, trafficking, and being lost. Alarmingly, many of these missing children remain untraced. According to the National Crime Records Bureau (NCRB), more than one lakh children were reported missing until 2016, with over half remaining untraced. NGOs suggest that the actual number of missing children may be higher than reported. Most cases of missing children are reported to the police, sparking a need for effective identification and tracing methods.

In India, a significant number of children are reported missing each year, and many of these cases remain unresolved. This paper introduces an innovative approach using deep learning methodology to aid in identifying missing children from a vast pool of available photos through face recognition. The proposed system involves the creation of a virtual space where recent photographs of missing children, provided by parents at the time of reporting, are stored in a repository. Additionally, the public is encouraged to voluntarily capture and upload photographs of children in suspicious situations to this portal. The system then automatically searches for these photos among the images of missing children, aiding police officials in locating the child anywhere in India.

International Journal on Recent Researches in Science, Engineering & Technology (IJRRSET)
A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy. Journal Indexed in JIR, DIIF and SJIF.
Available online at: www.jrrset.com
ISSN (Print) : 2347-6729
ISSN (Online) : 2348-3105
JIR IF : 2.54
SJIF IF : 4.334
Cosmos: 5.395
Volume 10 Issue 4 - April 2022 - Pages 1-4

Upon finding a missing child, their photograph at the time of recovery is compared against the images uploaded by the police/guardian at the time of their disappearance. However, a significant challenge in missing child identification is the age gap reflected in the images due to aging effects on the face and skin texture. Developing a feature discriminator invariant to aging effects poses a significant challenge compared to other face recognition systems. Furthermore, variations in facial appearance due to changes in pose, orientation, illumination, occlusions, background noise, etc., further complicate the identification process. Additionally, the quality of images taken by the public may vary, as some may be captured from a distance without the child's knowledge.

To address these challenges, a deep learning architecture tailored to handle these constraints is proposed. This system offers an easy, inexpensive, and reliable method compared to other biometrics like fingerprint and iris recognition systems. By leveraging deep learning techniques, the proposed system aims to improve the efficiency and accuracy of missing child identification, ultimately aiding in reuniting missing children with their families.

II. SYSTEM ANALYSIS

EXISTING SYSTEM

In the existing system, when a child goes missing, the case is typically reported to the police. However, due to various reasons, such as abduction or trafficking, a missing child from one region may be found in another region or state. Consequently, even if a child is located, it can be challenging to identify them from the reported missing cases. To address this issue, a framework and methodology for developing an assistive tool for tracing missing children is proposed. This involves maintaining a virtual space where recent photographs of missing children, provided by parents at the time of reporting, are saved in a repository.

Additionally, to enhance the search process, the public is given the provision to voluntarily take photographs of children in suspected situations and upload them to the portal. Automatic searching of these photos among the missing child case images is provided in the application, facilitating the efforts of police officials to locate the child anywhere in India.

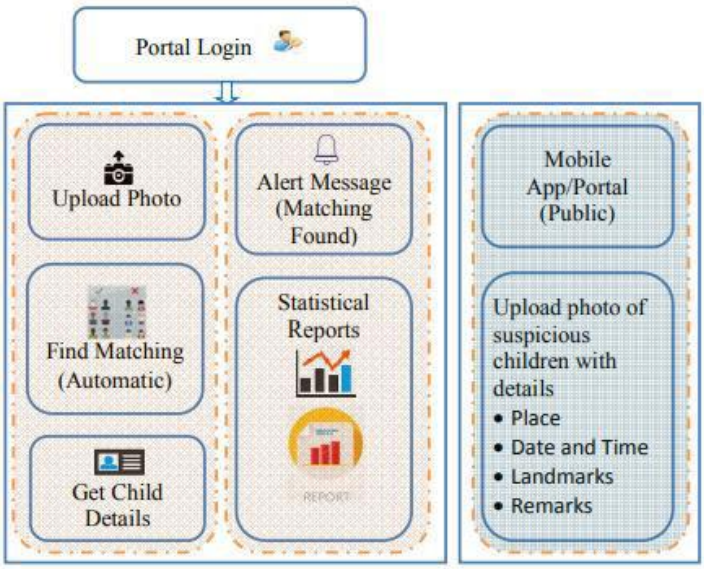
However, there are several challenges associated with missing child identification. For instance, when a child is found, the photograph at that time is matched against the images uploaded by the police/guardian at the time of the child going missing. Yet, sometimes the child has been missing for a long time, resulting in an age gap reflected in the images due to aging effects on the shape of the face and texture of the skin. Developing a feature discriminator invariant to aging effects poses a significant challenge in missing child identification compared to other face recognition systems.

Moreover, facial appearance can vary due to changes in pose, orientation, illumination, occlusions, noise in the background, etc. Additionally, the image taken by the public may not always be of good quality, as some may be captured from a distance without the child's knowledge.

To address these challenges, a deep learning architecture is designed, considering all these constraints. The proposed system offers an easy, inexpensive, and reliable method compared to other biometrics like fingerprint and iris recognition systems.

DISADVANTAGES: Early methods for face recognition commonly used computer vision features such as HOG, LBP, SIFT, or SURF. However, features extracted using a CNN network for obtaining facial representations yield better performance in face recognition than handcrafted features.

International Journal on Recent Researches in Science, Engineering & Technology (IJRRSET)
A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy. Journal Indexed in JIR, DIIF and SJIF.
Available online at: www.jrrset.com
ISSN (Print) : 2347-6729
ISSN (Online) : 2348-3105
JIR IF : 2.54
SJIF IF : 4.334
Cosmos: 5.395
Volume 10 Issue 4 - April 2022 - Pages 1-4



IV. IMPLEMENTATION

A. Face Detection: Initially, face patterns are generated using the Histogram of Oriented Gradients (HOG) algorithm. The images are converted to black and white, and the parts of the images resembling the original HOG face pattern are identified. Finally, the detected face is bounded by a bounding box.

B. Landmark Extraction: Sixty-eight specific points (landmarks) existing on every face are identified using the face landmark estimation algorithm. From these landmarks, image transformations such as scaling, shearing, and rotation are applied using OpenCV's affine transformation to ensure that the lips and eyes appear in the same location in every image.

C. Feature Extraction: The face images are then passed through a deep convolutional neural network (CNN). This process yields 128 measurements, forming a 128-dimensional hypersphere. The specific facial features represented by these 128 measurements are unknown, but the network outputs the same 128 numbers for two different images of the same person.

D. Result Matching: Finally, a linear Support Vector Machine (SVM) classifier is employed to recognize the face. The classifier is trained to take measurements from a test image and output the closest match.

V. CONCLUSION

A missing child identification system is proposed, which combines the powerful CNN-based deep learning approach for feature extraction and a support vector machine classifier for classifying different child categories. The system is evaluated using a deep learning model trained with feature representations of children's faces. By discarding the softmax layer of the VGG-Face model and extracting CNN image features to train a multiclass SVM, superior performance was achieved. The proposed system's performance was tested using photographs of children under various lighting conditions, noise levels, and different ages. The classification accuracy reached 99.41%, demonstrating that the proposed face recognition methodology could be used for reliable missing children identification.

International Journal on Recent Researches in Science, Engineering & Technology (IJRRSET)
A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy. Journal Indexed in JIR, DIIF and SJIF.
Available online at: www.jrrset.com
ISSN (Print) : 2347-6729
ISSN (Online) : 2348-3105
JIR IF : 2.54
SJIF IF : 4.334
Cosmos: 5.395
Volume 10 Issue 4 - April 2022 - Pages 1-4

VI. 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. Wikipedia contributors, "FindFace," Wikipedia, The Free Encyclopedia, https://en.wikipedia.org/wiki/FindFace (accessed February 29, 2024).
6. Reuters, "Mobile app helps China recover hundreds of missing children," Reuters, https://www.reuters.com/article/us-chinatrafficking-apps/mobileapp-helps-china-recoverhundreds-of-missing-childrenidUSKBN15J0GU (accessed February 29, 2024).
7. Karen Simonyan 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 2015.