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Child Trafficking Mitigating System using Transfer Learning and Modified Deep Learning

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Abstract: *In India, the National Human Rights Commission said that 11,000 of the 40,000 kidnapped children go unrecoverable each year. This project suggests a method for creating a useful app to locate a missing person by correlating the database and the identification feed. To check if the suspected child is a victim of child trafficking and is listed as a missing child, the person can scan their image. A facial recognition system has been employed which uses CNN (Convolution Neural Network) a deep learning technology for digital image processing and to identify or confirm a person. Current world scenarios and technology make substantial use of facial feature detection and recognition but here we have also introduced alert system The problems of the modern world, on the other hand, have remedies thanks to artificial intelligence. To improve communication between humans and machines, artificial intelligence (AI) has been developed. Convolution neural networks and deep learning will be heavily utilised to analyse images and make appropriate inferences as part of the implementation of the aforementioned solution. By sending the victim's position information and photo to the closest police station, the user initiates the rescue effort and minimises the area that needs to be searched for the youngster.*

Keywords: Child Trafficking, Mitigating, CNN, Transfer Learning

I. INTRODUCTION

A common modern-day type of slavery that occurs both locally and internationally is child trafficking. Our culture has recently been more aware of the issue of child trafficking because to news reporting, celebrity advocacy, and new outreach and advocacy campaigns intended to stop this horrible crime. According to the most recent federal estimates, between 14,500 and 17,500 men, women, and children are smuggled into the US every year to engage in forced labour or sex services, with woman and child making up the majority of the victims. United States citizens, who may also be trafficked, are not included in this number. According to current predictions, up to 100,000 American citizens' children are smuggled in the country every year. The Trafficking Victims Protection Act (TVPA), passed by the US in 2000, established new human trafficking offences and gave victims of the crime access to services, benefits, and safeguards. Although the terms "child trafficking" and "human trafficking" may be new legal terms, the reality of minors being forced to do labour or services or to be sexually exploited for commercial gain is not new, not even globally.

To run tests on Alexnet using a variety of test images and thereafter identify any issues with the developed method. Assessment will be based on the success rate, time required, and the algorithm's ability to perform under different conditions. According to a report by India's National Human Rights Commission, 11,000 of the 40,000 kidnapped children go unrecoverable each year. The best solution is to create an app that is efficient at finding a missing person by connecting the database and the person's identification feed. Face recognition provides several advantages as a biometric identification method, including low cost and great reliability. It is extensively employed in industries including education, e-commerce, security, and others. The person can scan the image of the suspicious victim of child trafficking (or unattended child) to see if he/she is registered as missing child. The purpose is to identify the missing child who is the victim specifically of Child Trafficking through Deep Learning algorithms like Convolution Neural Networks more specifically Alexnet and to Rescue the Child by reducing the search space of the child(Victim).The proposed technique has a 96% detection rate with 3099 features. Faces can be recognized using Convolution neural networks. to carry out certain activity like categorization a multilayer network is very efficient, Alexnet a pretrained

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model on CNN can be used for this purpose With a class of 2500 variant photos, it has a 98.5% accuracy rate. These smart glasses can help with authentication in the security realm.

II. LITERATURE REVIEW

AI for Detection of Missing Person this research is done by B. Vinavatani; Medha Rachel Panna; Premila H Singha G. Jaspher Willsie Kathrine. The challenges of recovering missing persons are not fully resolved in this paper. Technology in computing has advanced. They've employed face recognition software, a software program that can identify or confirm a person by examining a digital image or a video frame from a video source. Current world scenarios and technology make substantial use of facial feature detection and recognition. On the other side, artificial intelligence has provided answers to the problems facing the modern world. The development of artificial intelligence (AI) aims to improve communication between machines and people. When compared to 59% using KNN and 43% using SVM with PCA, the proposed technique has been effectively executed to reliably identify a face with a precision of 90%. [1]

DEEP LEARNING NEURAL NETWORK a paper by Umme Aiman , Vishwakarma P Virenderi in which they inferred face representation from a smaller dataset, a modified Deep learning neural network is proposed in this research. A selection of intricately built Convolution NeuralNets, RELUs, and fully connected layers make up the proposed network. By introducing Poisson and Gaussian noise to each sample in the training set, the training dataset is supplemented with artificially generated samples, doubling its size. They use experiments to show that the expanded Training dataset does, in fact, increase the generalisation capability of CNNs. Utilizing the standard AT&T face Database, the network is trained. With the proposed method and small amounts of training data, the recognition rate is significantly improved. [2]

Face Recognition Based on Convolution Neural Network this research paper is done by Kewen Yan ,Shaohui Huang, Yaoxian Song, Wei Liu1, Neng Fan. A facial recognition technology called neural nets(convolution nn) is described here in this paper. 3 convolution layers, 2 pooling layers, 2 fully connected layers, and 1 softmax regression layer make up this network. The classifer and feature extraction, which can take out facial traits and automatically classify them, are trained using the stochastic gradient descent approach. The over-fitting issue is resolved using the Dropout approach. The training and testing phases employ the Convolution Architecture for Feature Extraction (Caffe) framework. The ORL face dataset and AR face dataset based on this network have a respective face detection and recognition rate of 99.82% and 99.78%. [3].

Face Recognition from Video using Deep Learning this paper is done Saibal Manna ,Sushil Ghildiyal, Kishankumar Bhimani. In today's world, face recognition (FR) and verification is the incomparable technology to catch any criminal activity. With the impressive applications ranging from criminal identification, security, and observation to entertainment websites. For consumer screening, this technique (facial recognition) is incredibly useful in banks, airports, and other organisations. Convolutional neural networks (CNN) for facial recognition have gained popularity in deep learning, but training CNN takes more data, which is highly challenging for applications like criminal activities (robbery, murder, etc). In order to effectively assist police and administration, this article developed a facial recognition system that makes looking for criminals quick and straightforward while taking up less time. In this study, face identification from video is accomplished using the FaceNet (FN) pre trained model. The face pictures are modified by FN into a compact Euclidean space where the distances between faces are extended. [4]

Face Detection and Tagging using Deep Learning this paper is done by Jinesh Mehta , Eshaan Ramnani and Sanjay Singh. By offering a tagging method for the detected faces, they expand the idea of Multi view Face Detection using Convolution Neural Networks (CNN) employed by Farfade et al. Researchers use Deep Dense Face Detector, which employs a single deep convolutional neural network-based model, for face detection. Using the Local Binary Patterns Histograms (LBPH) approach, all faces that have been spotted are identified. The parameters that are used to gauge the algorithm's performance include precision, recall, and F-measure. For labelling the faces that are successfully detected, 85% accuracy is attained.The remainder of the paper is structured as follows. The relevant research on face detection algorithms and techniques is summarized in Section II. The suggested face-tagging method is described in Section III, and then tests leveraging this system are shown in Section IV. The experiment findings employing the face detection and tagging method are also discussed [5]. Shachi Mall et al. [8], N. Shelke et. al. [10] and S. L. Bangare et. al. [11-14],

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V. Durga Prasad Jasti et. al. [15] AND a. s. Ladkat et. al. [16] have shown different methods for classification and Machine learning.

Face Recognition with Convolutional Neural Network and Transfer Learning this paper is done by R.Meena Prakash , N.Thenmoezhi , M.Gayathri They have expanded on the idea of utilising a Convolutional Neural Network (CNN) with a transfer learning strategy to recognise faces automatically. The photos from the face database are trained using the CNN with weights learned from the pre-trained model VGG-16 on the massive ImageNet database. The fully connected layer and softmax activation are given the obtained characteristics for classification. The efficacy of the proposed method is evaluated using two publicly accessible facial image databases, Yale and AT&T. According to experimental results, the strategy produces superior recognition results than earlier techniques. [6]

III. PROBLEM STATEMENT

Even though the Indian government is making a lot of effort to stop trafficking, it falls short. India remained on Tier II because of government's constant efforts in comparison to the last reporting year, taking into account the impact of the COVID-19 pandemic on its ability to combat smuggling. Their activities included tracking down new human trafficking victims, primarily those who had been bound or made to work. States like Maharashtra and Odisha Tamil Nadu had provided funds for Anti-Human Trafficking Units (AHTUs), and Andhra Pradesh government had manifested to build more AHTUs. Indian law enforcement in collaboration with foreign governing officials from Bangladesh, the Gulf states, and other nations on investigations into smuggling. Due to the hazards of trafficking brought on by the pandemic, the federal government helped state governments fight trafficking by offering support and advice. States like Karnataka, Kerala, and Tamil Nadu also offered online training sessions on human trafficking for officials. The government, however, fell short in a number of crucial areas. Law enforcement looked into additional bound labour-related offences, while measures to combat bonded labour trafficking remained insufficient. Of the 36 states and union territories in India, twenty-two did not open identifying the victims of bonded labour or bringing a claim under the bonded labour System (Abolition) Act. The main concern was to identify the victims of child trafficking and thus reduce the search space of the child for the police and to retrieve the child and hand the victim back to the guardian of the child.

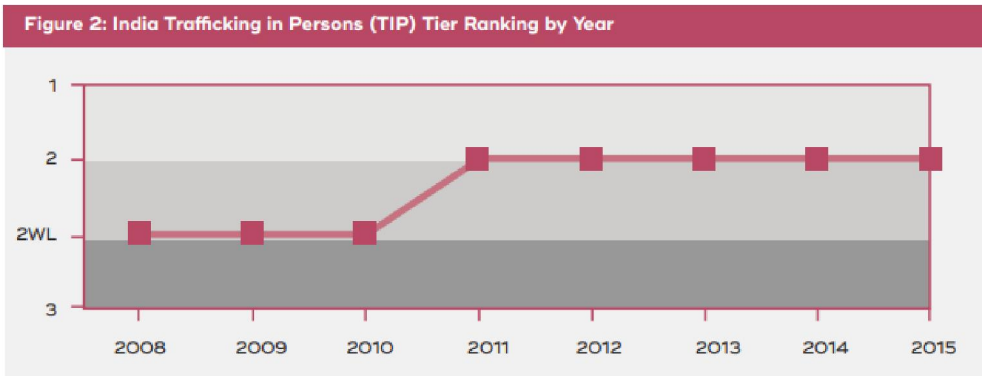

Fig 1: India Trafficking in Persons Tire Ranking by Year

Child Trafficking is the major problem in the current situation in India and needs to be mitigated through the extensive use of technology and smart system. A seamless usage of Deep learning Neural Networks can be employed to detect faces and map them with already.

IV. PROPOSED SYSTEM

4.1 CNN for Face Prediction

To increase the precision of facial picture categorization, CNN model is developed. The model's structure is comparable to that of the traditional AexNet model, but few characteristics, like input data, network width, and the whole connection layer, are not same. 2 convolutional layers (C1 and C2) and two pooling layers makes up the newly created CNN (S1 and S2). As shown in Figure below, these layers are kept on one another alternately in the pattern C1-S1-C2-S2.

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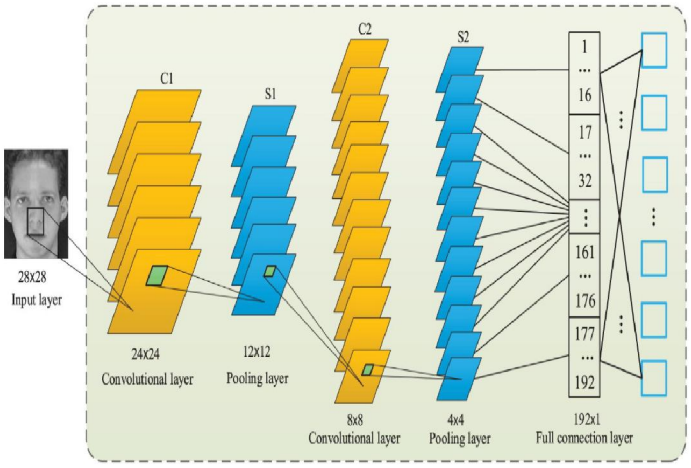

Fig 2: CNN For Face Prediction

The CNN model receives the normalised face image from the input layer, which only contains one feature map. A randomly generated convolution kernel is used to convolve each neuron in the first convolutional layer, C1, which has six feature maps and a size of 5*5 5*5 pixels. Using the outcomes of the layer above as a guide, six feature maps are produced for S1, the initial pooling layer. The average convolution kernel of the feature map in the C1 layer is connected to every feature map element, which reduces the risk of overlap between the elements' receptive fields. Both the pooling layer (S2) and the second convolutional layer (C2) use the identical computing techniques as their predecessors. C2 comprises. Single-layer perceptron is placed between the S2 layer of cnn and output layer of cnn. Figure 2 illustrates the output, which is a 40-dimensional vector for the recognition of 40 different faces and multi-label classification using the sigmoid function.Here the proposed system has alerting and tracking features which were absent in the existing system.The system makes a rest api call to get the address of the nearest police station with respect to the current location of the user. The process of face detection is done by fine-tuning data set using the AlexNet model [2][4].Using a modified deep learning strategy, we apply the data augmentation technique to increase the amount of training data and enhance the network's generalisation ability[3].

4.2 ALEX NET

In order to win the 2012 ImageNet Large Scale Visual Recognition Challenge, AlexNet employed an 8-layer CNN. By proving firstly that features obtained through learning can outperform manually-designed features, this network posed a challenge to the pre-existing method in computer vision. As seen, AlexNet and LeNet's architectures are remarkably similar. Please take note that we have simplified the design of AlexNet a little bit from its 2012 iteration in order to fit it on two tiny GPUs. Additionally, AlexNet and LeNet differ significantly from one another. First, compared to the relatively modest LeNet5, AlexNet is substantially deeper. 2 fully connected hidden layers, 1 fully connected output layer, and 5 convolutional layers total the 8 layers that make up AlexNet. Secondly, AlexNet's activation function was the ReLU rather than the sigmoid. Let's look at the specifics below.

The first layer of AlexNet's convolution window has the shape 11*11. Since ImageNet photos are 8 times high and wide than images from MNIST, ImageNet data object frequently cover more pixels and include more visualising data. Hence, a more larger conv window is put in place to capture the object. The window of the second layer is re-shaped into a 5*5 form and then a 3*3 shape. The max-pooling layers with a window shape of 3*3 is proceeded byfirst, second, and fifth convolutional layers and a stride of 2. Moreover, LeNet has ten times less convolution channels than AlexNet. The last convolutional layer is followed by two gigantic fully linked layers with a total of 4096 outputs. For these layers, a little bit more than 1GB of model parameters are required. The original AlexNet employed a dual data stream strategy to get around the memory restrictions of the early GPUs. As a result, each of the two GPUs could store and process just one half of the model. We rarely need to split models across GPUs because there is now plenty of GPU RAM

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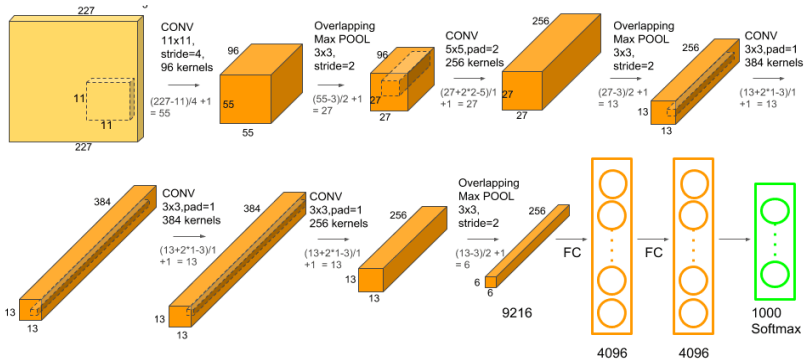

Fig 3: AlexNet Architecture

V. SYSTEM DESIGN

Module 1: Police Module

In this module each police station will have their login to the CTMS system app. Police station can upload filed case of missing child metadata to the system for system can use for mapping. Police module gets alert from system to nearest police station like specific child is found at specific location. Police can update the status of missing child like child found but not yet rescued, not found, or rescued successfully by using this status system generate certificate to Citizen.

Fig 4: Use Case Diagram for Proposed System

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Module 2: Citizen Module

In this citizen module a normal citizen can also help the police to find missing child by using this system. So, in this module citizen firstly create his/her account for login to application, then if citizen found any abundant child, then user can scan his/her face and upload photo along with current location to the system using app. If uploaded photo is match with missing child dataset, then system alert to the nearest police station. After successfully rescued child then user get certificate.

Module 3: Child Trafficking Mitigating System Module

The Child Trafficking Mitigating System use Image Processing algorithm CNN Alexnet for mapping the image uploaded by user and dataset of missing child generated from metadata of cases. If user uploaded image matches with any image, then immediately system alert to nearest police station is sent. If Child is successfully rescued then system assign certificate to that user.

VI. CONCLUSION

The above suggested method, which is being implemented through an app that makes use of CNN's and Deep Learning, can be a very trustworthy, complete, and effective way to address Child/Human Trafficking Crimes and would be able to safeguard one's future. The fully automatic frontal view face detection system, which when exhibited realistically, demonstrates a flawless accuracy, requires additional work.

In the field of computer vision, especially the challenging face recognition problem, deep convolutional NeuralNets have demonstrated notable performance. CNN models perform exceptionally well when trained on large datasets, however they aren't suited for learning from datasets with small sample.

We offer a novel method that projects training data with manned curated samples by including Gaussian or Poisson noise. This method nullifies the issue of grasping face representation. In fact, this strengthens the resiliency against overfitting the model and increases the generalisation capability. On AT&T face databases, 95.21% recognition rate for 4 training samples and 99.92% for 5 training samples were achieved using the above suggested paradigm for limited training dataset.

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