

# MISSING CHILDREN IDENTIFICATION USING DEEP LEARNING

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**Abstract:** According to the NRCB, a report submitted in the year 2020 a total of 1,08,564 missing children cases are filed. The percentage of tracing the missing children is very low. India is the second most populated nation with most of its number in youth and the number of missing children cases is increasing. This paper boons an innovative use of deep learning models for finding informed missing children from the pictures of the system database, using face recognition. The community is allowed to upload snapshots of a doubtful child into a community portal with found location and contact details. The snapshot will be accordingly compared with the system database of the registered missing children and the photo with the matched facial features will be selected from the system database and displayed. The Convolutional Neural Network (CNN), is specially designed and developed to process pixel data which helps in face recognition and processes the data for face recognition. The CNN is suitably trained to find the missing kid from the database using face recognition. CNN uses multilayer perceptron for reduced processing requirements. The neuron layers are organized in such a way as to cover a detailed visual field excluding the image processing problem of the existed traditional neural networks. This algorithm uses a convolution network as a high-end feature extractor and the child recognition is taken care of by the trained K-NN classifier. The K-Nearest Neighbour is a lazy learner algorithm that also has no Parameters unlike the other algorithm on the data. The K-NN set does not learn from the training It stores the data in the event of classification. Later, It performs the acton the algorithm uses CNN's convolutional layer. It keeps the dataset and classifies the data into a category when new data is received that is much similar to the received data and the network for feature extraction. child matching is talien care by the K-NN Classifier.It stores the dataset and classifies the data into a category when new data is received that is much similar to the received data.

**Keywords** — Face Recognition, CNN network, K-NN classifier, Training, Deep learning, Searching.

## I. INTRODUCTION

Children of today are tomorrow's citizen, thus it is very important to safeguard the children of our country. The future scope and development of our nation depends upon the today's children. So, it's our responsibility to provide them a safer nation. A large figure of children are lost each year in India due to kidnapping, runaway, trafficking and getting lost in crowded places.

But the actual missing cases can be much higher Children who go missing may be used for illegal works and abused. India is the second-largest populated country and the number of missing children cases is increasing. According to the NRCB, a report submitted in the year 2020 a total of 1,08,234 missing children cases are filed.

than the number submitted in the report. Non-Government Organizations (NGOs) like Bachpan Bachao Andolan (BBA), and Kailash Satyarthi Foundation's sister organization alone have rescued around 15,000 children from across the country said to the executive directors. According to a new report by NGO Child Rights On average, 39 children in Madhya Pradesh and 18 in Rajasthan went missing every day in 2021. The share of missing girl children has increased from about 70 percent according to the NRCB reports and the ministry of women and child development. It is disappointing that these lakhs of missing children end up in forced labor, slavery, and sex work.

It's difficult to find the lost child from the registered files even if the missing child is found. A solution for developing a tool for tracing missing children is proposed in this paper. That business of such people harming some poor child in such a way makes it a threat to the present society. So even if a child is found, it is difficult to find from the huge missing case list. An idea for developing a tool that helps in identifying the missing children is described in this paper. A community platform is developed in such a way that it is user-friendly and people with basic knowledge can understand the requirements of the children that are needed to be provided in the platform for recognition in the database. The authority is also given an authorized login such that he can view the missing cases uploaded by the public and if any match is found he/she can know the details of the matched child.

## **II. RESEARCH BACKGROUND**

### **Observation 1:**

S. A. Kumar and A. Kumaresan's research work on "Towards building intelligent systems to enhance the child safety and security,"[4] contributed their work in describing the use of machine learning in building a system for child safety. They have employed the usage of several machine learning algorithms which help in recognizing faces and helps in classification. The results of the trials showed that the merging of the K-Nearest Neighbours Classifier resulted in an efficient classification.

### **Observation 2:**

The study paper by J. Chenkai, S. Tao and Z. Lei, "A review of face recognition based on the deep convolutional neural network",[1] primarily focuses on face recognition using CNN. Which provides efficient knowledge on training CNN. CNN network is used for facial expression and facial representation and gives good performance in face recognition and the identification of human faces. The CNN network is connected by many neurons and the connections between neurons are biased by weights and activation functions.

### **Observation 3:**

The study paper by J. Guo and X. Wang, "Image Classification Based on SURF and KNN,"[10] have delved into the plethora of machine learning models. By using K-NN algorithm which helps in classification. Where no parameters are taken unlike the other algorithms. The paper also described about the SURF, the early method of facial recognition.

### **Observation 4:**

Reports submitted by the NRCB, [8] briefed about the current missing cases of children in India, and the various articles written on missing children cases helped in gaining knowledge about the ground reality.

## **III. EXISTING METHODOLOGY**

Usually, missing children are reported to the police. FIR is filed on the missed kid and the officers assign a team for search operations. A child missing in one location can be found at another location.

Missing cases are increasing day by day. many complaints are filed at the police station. Due to this the manpower required for the searching operations are limited and the number of complaints is pending and the files are being laid unsolved.

The manual process of searching requires more manpower and also involved huge costs as the persons need to search at various locations for finding the missing child.

When it comes to the success rate it is not even a quarter of the registered cases. Police are also responsible for solving other cases like murder, theft, patrolling, and investigation. An increase in missing cases will lead to delays in other cases. So, an automated and efficient system is required to make the police job easier and help the police to work with the public. An idea for a virtual portal is proposed for the identification of the missing child. The proposed system also enables the police officials in giving access to statistical reports easily by manually entering the missing cases into the police database.

#### IV. PROPOSED METHODOLOGY

as the inputs and outputs are marked by the activation function and final convolution.

In this paper, we introduce a procedure for missing children identification that combines facial feature recognition and extraction of facial features based on a deep learning model and the matching based on the K-NN classifier. The proposed mode uses face feature recognition for missing children identification. This helps the public and the police officials in the investigation of a missing child.

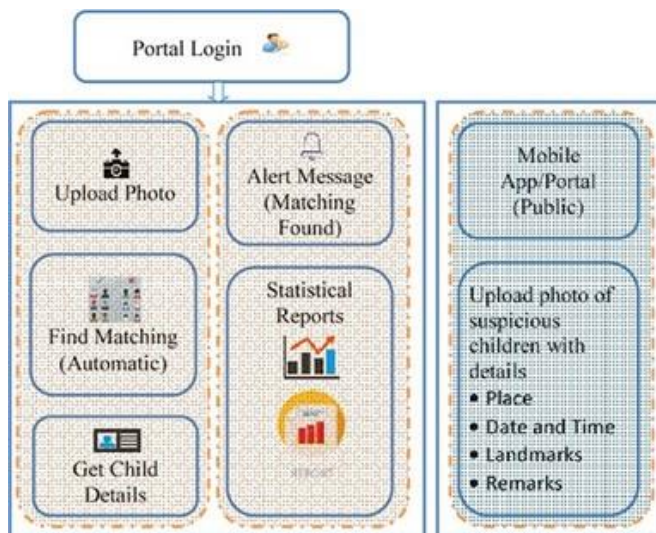


Fig 1 : System Architecture for the proposed methodology

In this paper, the model for missing children identification combines facial feature recognition and extraction of facial features. The CNN is mainly used for processing and recognizing the images. Here we are using CNN algorithm in our application as it produces accurate results in processing the image. The CNN is trained in such a way for identifying missing children from the labeled data. CNN uses the multilayer perceptron for reducing processing requirements.

Compared to other image classifications the CNN uses less preprocessing which means the network learns to make the kernels effective through automated learning.

Cnn is a type of artificial neural network which uses mathematical operations called convolutional instead of general matrix multiplication in any of the layers.

Cnn consists of an input layer, hidden layer, and output layer. The middle layer is called hidden

If the photo is present in the database the system will show a dialog box displaying a match has been found and displays the details of the missed child. If no match is found it takes the details and photo of the missed child for further use.

### **Pre-processing :**

The CNN is suitably trained to recognize faces and identify the lost kid from the system database. CNN uses the multilayer perceptron for reduced processing requirements. The neuron layers are arranged in such a way as to cover the all-round visual field avoiding the image processing problem of traditional neural networks. Face descriptors are extracted from the pictures using a pre-trained convolutional neural network model with the VGG-Face deep architecture. Such that face embedding is possible.

### **Upload Image :**

The police officer uploads the photo provided by the parents to the police. The officer also provided the last location, identification marks, and contact details. Whenever someone in public finds any missed child in public places. He/She will take a snapshot of the child and upload it to the provides public portal.

### **Search Image :**

The system uses classification and regression for image matching. The K-Nearest Neighbour is a lazy learner algorithm that also has no Parameters unlike the other algorithm on the data. The K-NN algorithm set does not learn from the training It stores the data in the event of classification. Later, It performs the action the algorithm uses CNN's convolutional layer. It keeps the dataset and classifies the data into a category when new data is received that is much similar to the received data.

### **Algorithms :**

#### **Convolutional Neural Network Algorithm (CNN) :**

The Convolutional Neural Network Algorithm (CNN), is specially designed and developed to process pixel/image data.

which helps in image recognition and processing and is adopted here for face recognition. The CNN is suitably trained to identify the missing child from the database. CNN uses the multilayer perceptron for reduced processing requirements. Each convolutional neuron processes data just for its field. Fully connected feedforward neural networks will help learn features and classify the data. Then this architecture will become impractical for large inputs like high-resolution images.

layers and pooling layers. The classification is later done by the fully connected layers.

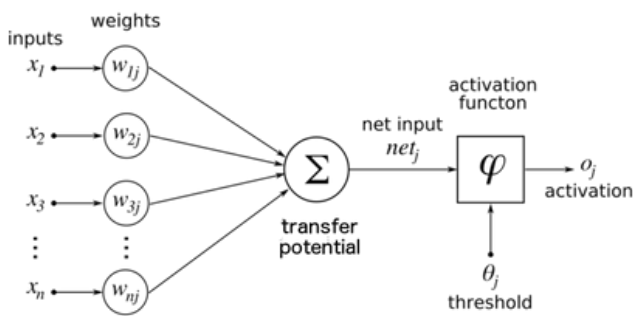
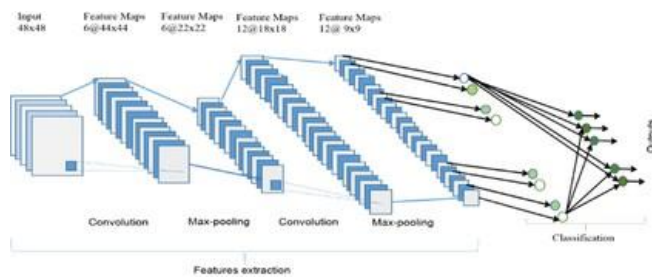


Fig 2: Convolutional Neural Network

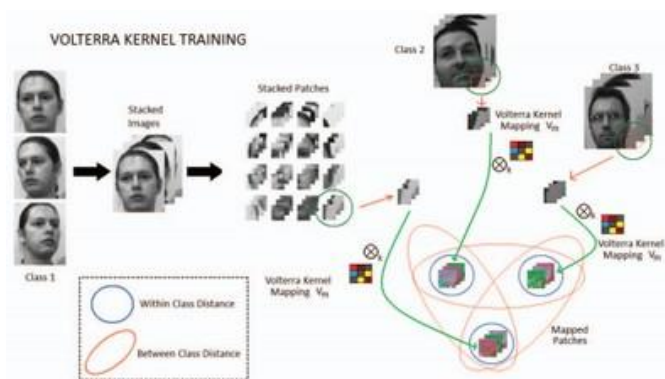


Fig 3 : VCG Face- Trainable Convolutional Filter

Activation functions like Tanh, ReLU, and Sigmoid are used after several convolutional

The hidden layers are the layers that perform convolution. The CNN layer processes the given data and then sends the obtained data to the next layer.

CNN is used in various applications, one such application is facial recognition.

With the help of CNN in facial recognition, there has been a decrease in error rate.

In order to avoid overfitting, CNN requires a huge amount of data.

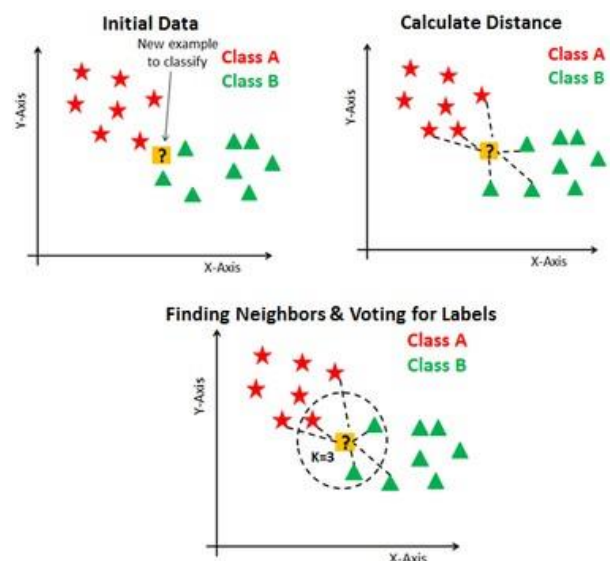
The CNN has a benefit of acquiring the knowledge from the features on its own. For instance, given a large number of cats and dogs, it learns unique features from each category on its own. Convolutional layers combine the input and pass its result to the subsequent layer. This can be the same as the response of a neuron within the visual area to a particular stimulus.

### K-Nearest Neighbours Algorithm (K-NN) :

The K-Nearest Neighbour is a lazy learner algorithm that also has no parameters unlike the other algorithms on the data.

The K-NN set does not learn from the training. It stores the data in the event of classification. Later, it performs the action. The algorithm uses CNN's convolutional layer. It keeps the dataset and classifies the data into a category when new data is received that is much similar to the received data and the network for feature extraction. Child matching is taken care of by the K-NN Classifier.

Fig 4: K-Nearest Neighbours Algorithm (K-NN)



The subsequent is that the pseudocode for K-NN:

1. Load the information.
2. Choose the K value from the uploaded information.
3. For each piece of information within the data:
  - Evaluate the Euclidean distance to all or any training samples.
  - Stores the distance on an ordered list and type it.
  - Select the highest K entries from the sorted list.
  - From the majority of classes present in the list, select the test point.

4. END.

A confusion matrix can be employed for the validation of the K-NN classification accuracy.

In the case of KNN regression, the bulk of steps is identical. the average of the neighbors' values is calculated rather than assigning the class with the majority votes and assigned to the unknown information.

How to select the precise value of K

There isn't a specific way to determine the simplest K value – in other words – the number of neighbors in KNN.

One way to try and do this is often by considering (or pretending) that part of the training samples is "unknown". This implies that you simply may need to experiment with some values before deciding which one to travel forward with.

K-NN or the training dataset the distance is calculated for each of the K-Nearest data points now classification is done based on the rule of the majority of votes. The object property is known by taking for a set of objects for which the class is known. Depending largely on the value of k the best decision is taken. It is a special case of a variable bandwidth with a uniform kernel.

k-NN including feature extraction :

Haar-Cascade, Mean shift tracking analysis, Fisher LDA, Projection into feature space and are followed by the K-NN classifier.

### Mathematical Equations :

The following algorithms are implemented and work on the recognition and classification using mathematical equations. Mathematical equations used by the algorithms are listed according to the algorithm.

### Algorithms :

#### Convolutional Neural Network (CNN) :

The convolutional formula :

$$(f * g)(t) \stackrel{\text{def}}{=} \int_{-\infty}^{\infty} f(\tau) g(t - \tau) d\tau$$

#### Equations for the activation functions :

**Tanh :**  $f(x) = \frac{(e^x - e^{-x})}{(e^x + e^{-x})}$

**ReLU :**  $f(x) = \max(0, x)$

**Sigmoid :**  $f(x) = \frac{1}{1 + e^{-x}}$

#### K-Nearest Neighbours (K-NN) :

$$d(x, y) = \sqrt{\sum_{i=1}^n (x_i - y_i)^2}$$

#### Distance functions (K-NN classifier) :

**Euclidean :**  $\sqrt{\sum_{i=1}^k (x_i - y_i)^2}$

**Manhattan :**  $\sum_{i=1}^k |x_i - y_i|$

**Minkowski :**  $\left( \sum_{i=1}^k (|x_i - y_i|^q) \right)^{1/q}$



**V. RESULT**

The below screenshots shows the working of the missing children identification system.



Fig 5.1: Home page of Identification system



Fig 5.2: Missing Child Form

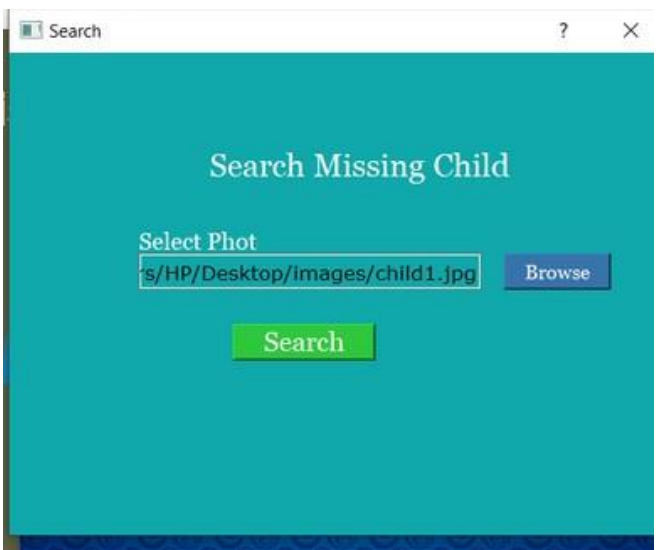


Fig 5.3: Searching Missing Child

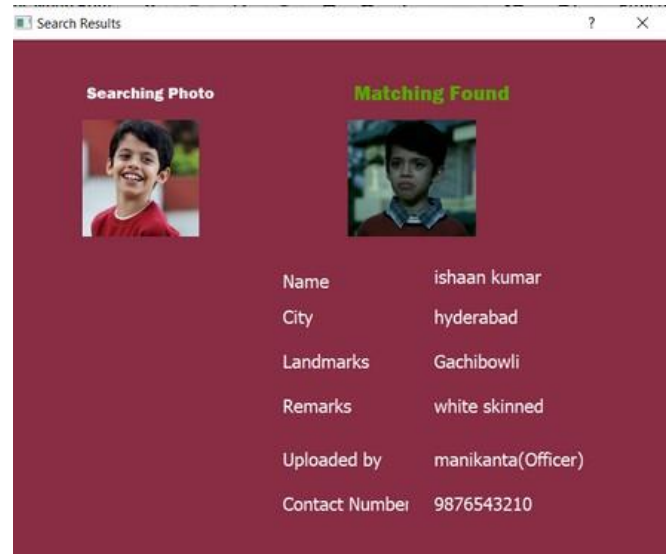


Fig 5.4: Final Result

**Result Analysis Graphs :**

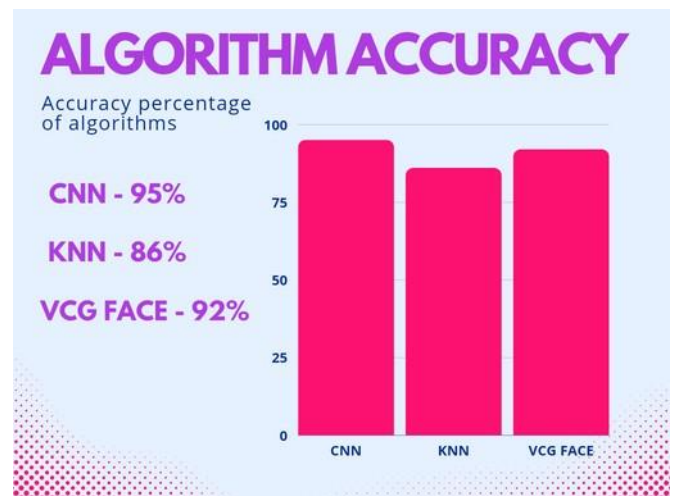


Fig 6.1: Bar Graph showing Algorithm Accuracy Percentage

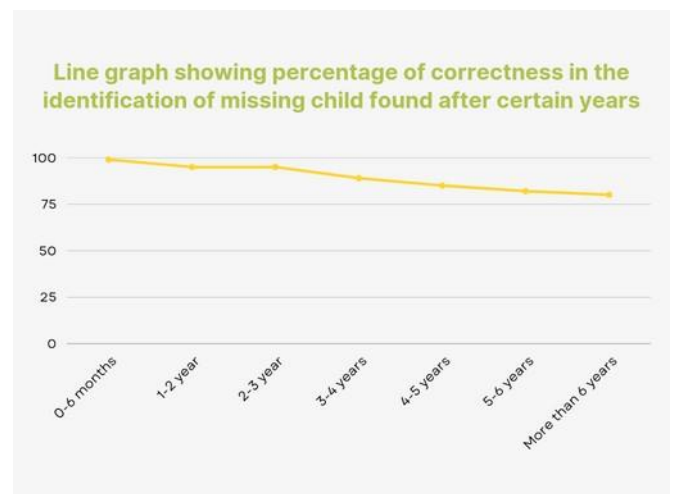


Fig 6.2: Line Graph showing correctness in the identification of missing children found after certain

years of missing

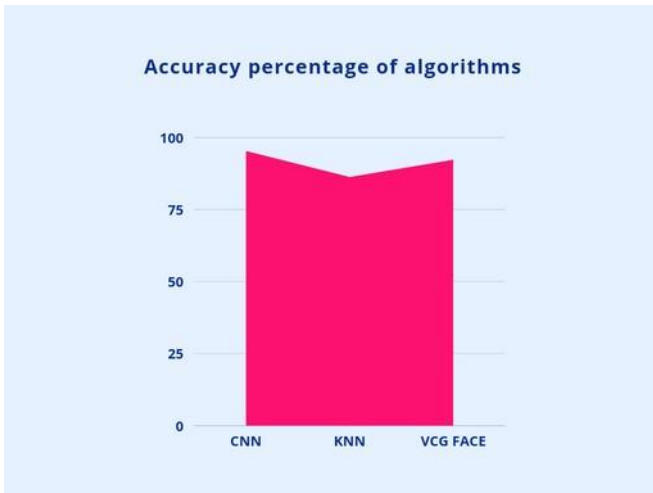


Fig 6.3: Stacked Area Chart

## VI. CONCLUSION

Missing children identification using deep learning is proposed. Using a powerful deep learning approach for face feature extraction of different children categories. The system is trained in real-time by uploading the pictures of the children and training the multiclass K-NN. The performance of the proposed system is evaluated under various conditions like low lighting, and noise images. The identification system is also tested by uploading sample images of children with the age gap. The proposed system showed excellent results in identifying the child in his/her different aged photographs.

The classification of the system achieves a percentage of 97.8. which shows that the proposed system mode can be used to solve the missing child cases.

The analysis of the system shows that the system developed using the Algorithms CNN and K-NN has a good percentage of accuracy and performance in recognition and classification. The identification system is also tested by uploading sample images of children with age gaps. The proposed system showed excellent results in identifying the child in his/her different aged photographs.

The system enables the finding of the missing child easily without any manpower needed to conduct a search operation. Even if the child is found after several years the system can easily identify the child as the system has shown good

## ACKNOWLEDGMENT

### T

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