**Project report**
**on**

# AI Investigation Helper

A Dissertation submitted in partial fulfillment of the academic requirements for the award of the degree.

## Bachelor of Technology
## In
## Computer Science & Engineering


Submitted by

IFFAT MARIA
19H51A05A2

Y. ARCHANA
19H51A05C1

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19H51A05J2

Under the esteemed guidance of
Mr. G Saidulu




**Department of Computer Science and Engineering**

**CMR College of Engineering & Technology**

(An Autonomous Institution under UGC & JNTUH, Approved by AICTE, Permanently Affiliated to JNTUH, Accredited by NBA.)


**2019- 2023**

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**2019- 2023**

# CMR COLLEGE OF ENGINEERING & TECHNOLOGY

KANDLAKOYA, MEDCHAL ROAD, HYDERABAD – 501401

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING


# CERTIFICATE

This is to certify that the Project report entitled **"AI Investigation Helper"** being submitted by Iffat Maria(19H51A05A2), Y.Archana(19H51A05C1), V. Bhuvana (19H51A05J2) in partial fulfillment for the award of **Bachelor of Technology in Computer Science and Engineering** is a record of bonafide work carried out his/her under my guidance and supervision.

The results embody in this project report have not been submitted to any other University or Institute for the award of any Degree.

**Mr. G Saidulu**
**Assistant Professor**
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Submitted for viva voice Examination held on _____

**External Examiner**

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Finally I express my sincere thanks to **Mr. Ch. Gopal Reddy**, Secretary, CMR Group of Institutions, for his continuous care. I sincerely acknowledge and thank all those who gave support directly and indirectly in completion of this project work.

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# ABSTRACT

In India, missing person cases are nothing new. In our nation, 300 kids are reported missing every day. Numerous NGOs and government initiatives are available to assist with it. The goal of this project is to put a solution in place. This project makes it easier for the police and higher-ups to find missing people swiftly. Investigation is the typical method for finding someone, but it takes time and expertise. The research method generally yields positive results, although it takes time and may be fruitless if the subject has been relocated. Examining CCTV footage and supporting documentation is the best course of action in such situations. However, given the number of persons who go missing every day, it might be difficult to keep up with this. Through the posting of pictures of those they believe to be missing, the public can assist in the search for the missing through this project.

# CHAPTER 1

## INTRODUCTION

# 1 INTRODUCTION

People go missing every day, which includes women, children, old-aged people with dementia, etc. And a lot of these cases remain unresolved. We, as a team propose a solution that uses face recognition to help accelerate the process. Face Recognition is a distinctive technology which has grown tremendously in the past years. In our project, the admin can register a case concerned with the missing person which gets stored in the database. Also, any person can upload the image which will collate with the images in the database and result will be displayed.

## 1.1 NEED STATEMENT

The usual process to track a person is using investigation which is a lengthy procedure where the concerned family member has to register an FIR to start an investigation. The investigation involves going through CCTV footages and evidences. Again, this can be very time consuming and given the number of people that go missing every day. Automating the task of finding the particular person by comparing that image with other image with same characteristics. With this project we will come to know whether the missing person in the image clicked from particular location is correct or not, and if it is correct then police can start their next steps to find the person from that area.

## 1.2 OBJECTIVE & SCOPE

### *1.2.1 Objective*

Our project aims to design, develop and implement an AI Investigation Helper, that performs the following tasks:

- Ensures that the admin and users can easily upload images to the database.
- Storing, processing and retrieving information concerning the missing person cases from both desktop as well as mobile application.
- Support fast searching to find matches for the registered cases.

### *1.2.2 Scope*

The stakeholder of this project is the investigation unit/ admin who starts the investigation. Our project covers 4 basic operations:

- Logging-In: The first step is for the admin to login using his/her username and password.

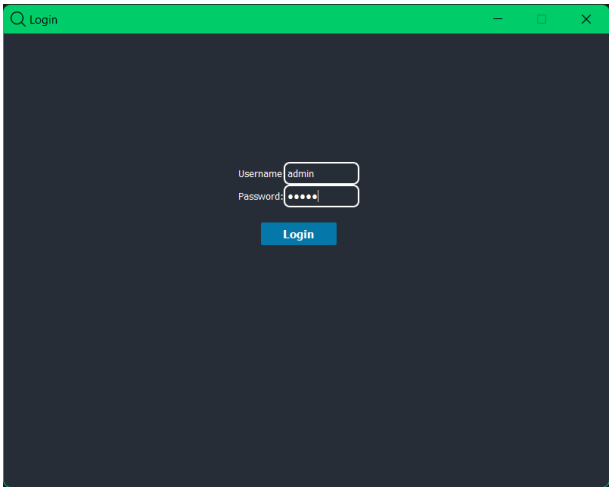



***Fig 1.1 Login-window***

- Registering new cases: The next step is to register a new case. The GUI application is built using PyQT5 that allows you to collect all relevant information and store it in database Postgres.

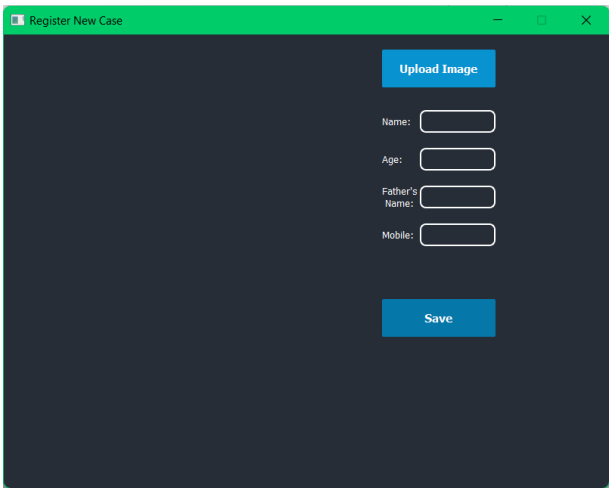



***Fig 1.2 Registering New Case-window***

- Waiting for users to upload images: The common people will use an application on their mobile to submit photos of people who they think are lost while keeping their identity anonymous. The anonymous part is very important due to potential trouble from the local goons, etc.

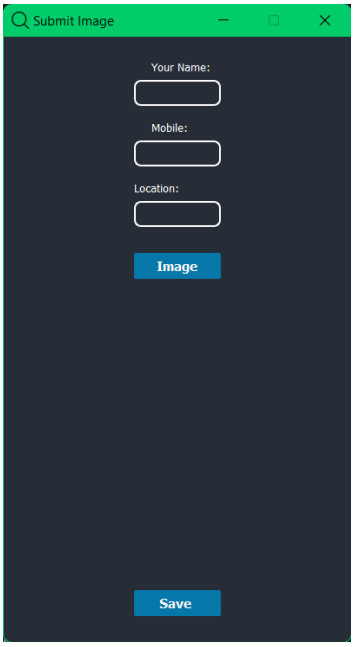



***Fig 1.3 User Application***

- Matching the cases: The next step is to match the case images and user submitted images. To match KNN Algorithm is used.

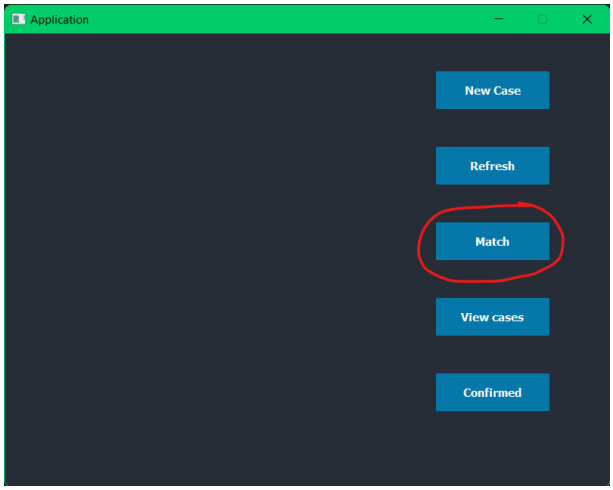



***Fig 1.4 Application Home Page to Find Matched Cases***

# CHAPTER 2

## BACKGROUND WORK

# 2 BACKGROUND WORK

## 2.1 INTRODUCTION

This section discusses findings and observations done by some research works on Finding missing person using Face recognition techniques.

## 2.2 LITERATURE SURVEY

Previously, S. Ayyappan et al., 2020 [1] proposed a system which makes use of deep learning for extraction of facial features via Stacked Convolutional Auto Encoder (SCAE). Photographs of the missing are stored in a database, and only those images are used for detection. SVM classifier is used for identification, and the entire project is maintained accessible to the public without any explicit permissions. This has the negative effect of giving human traffickers information on the missing people, which is detrimental to the overall concept. This point, rather than making the investigation or search easier, may make the missing person case worse and expose the victim to a variety of crimes, such as human trafficking, child labour, abuse, kidnapping/homicide, etc. This effort, in contrast to ours, has no public support or interest in reporting suspected missing victims. The aforementioned project's sophisticated algorithm slows down the extraction and classification.

Another study done by Rohit Satle et al., 2016 states about a face recognition system using Principal component Analysis(PCA) method. When held in contrast with our project, we can point out two main drawbacks. One being the recognition of faces with similar expressions only and the other being recognition is made possible with no extra features of the face, examples include spectacles or moustache. We here make use of simple face recognition patterns via plot points and KNN algorithm which places 68 overall points capturing facial features in an accurate manner.

In their research work, Birari Hetal et al. 2021 suggested an android application that compares two photos using the SWF-SIFT technique. In their programme, the data set can only be regularly updated by Admin and a small group of trusted users, such as police. The primary distinction between our system and theirs is that ours will permit application users to share pictures of questionable individuals, such as young beggars they believe to be missing. Although only the Police Department has access to the photographs that particular user has posted, this keeps the information secure [3].

Additionally, Swarna Bai Arniker[4] et al. put up an alternative solution involving RFID technology in relation to the same problem. The project's primary motivator was the RFID scanning hardware. It can be kept at all police stations and public meetings and is used as reading equipment. Applications include locating the lost and persons with physical disabilities. The only need in this scenario is the actual possession of the RFID chip tag in order to track the subject. Given the population and the rising number of missing persons instances on a daily basis, the physical carrying of the chip represents a significant restriction. These significant issues are solved by our approach since no tag carrying condition is required. Anybody may use their smartphones to post their photo into the app when they are suspected of being the lost person; all we need is a picture to be uploaded from the guardian's side and stored in the database. This streamlines the procedure and makes it easier to keep track of the number of open cases.

Thomas M. Omweri and Andrew M. Kahonge developed a system that uses a mobile-based online service to look for missing individuals in a paper they presented in 2015 [5]. Modern search methods are not employed here. The guardian enters the missing person's information in the portal. Anyone who sees the missing person in the portal may call the guards using the information they supplied to report it. This is a fairly simple strategy, yet it is ineffective.

Shefali Patil and his colleagues from the SNDT Women's University in Juhu, Mumbai, have already published a study that addresses a similar issue description and purpose. They employ the KNN Algorithm, which requires 136 * 3 data points to detect faces, in their suggested system. The accuracy of the KNN approach, which is 71.28%, and the fact that it ignores cross-age face recognition are its key drawbacks. The primary distinction between our work and theirs is that in this case, we'll use volunteer effort from individuals to construct a dataset utilising a mobile application. We will make advantage of the cross-age face recognition feature of AWS facial rearrangement. Additionally, a cloud database will be used to store our dataset.[6]

The Jaypee Institute of Information Technology, Noida, India team of Sarthak Babbar, Navroz Dewan, Kartik Shangle, and others published a paper in 2020 that gave us a very clear understanding of how Amazon Web Services (AWS) Recognition functions and contrasts AWS recognition with other algorithms and systems like CDAC-VS, CNN. Therefore, this article assisted us in choosing the method we would employ for our project, such as Amazon Web Services (AWS) Recognition. As we become older, our faces will alter but the images in our dataset don't change.For cross-age face recognition, we want to investigate Residual Network's (ResNet) precision. Cross-age reference coding (CARC), Amazon Web Services, and performance are compared.[7]

The earliest techniques for face identification relied on aspects of computer vision like HOG, LBP, SIFT, or SURF [8 - 9]. Though handmade features perform worse than features derived using a CNN network to obtain facial representations in face recognition.

## 2.3 EXISTING SOLUTIONS

i. National Tracking System for Missing and Vulnerable Children:

This system is an initiative by the Govt. of India along with the ministry of Women and Child Development. It is a web-enabled data management system on child. It has a nationwide facility ‘TrackChild’, developed to find missing children.

However the initiative wasn't using the power of machine learning. As shown in fig 2.1, we can access the all information of missing person under the tab of 'Photographs of Missing persons'.

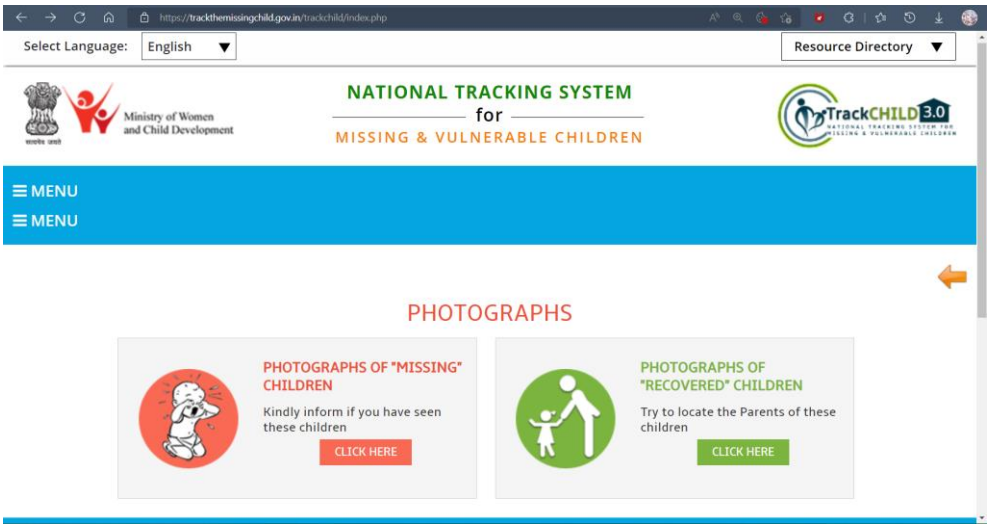



***Fig 2.1 The TrackChild Portal***

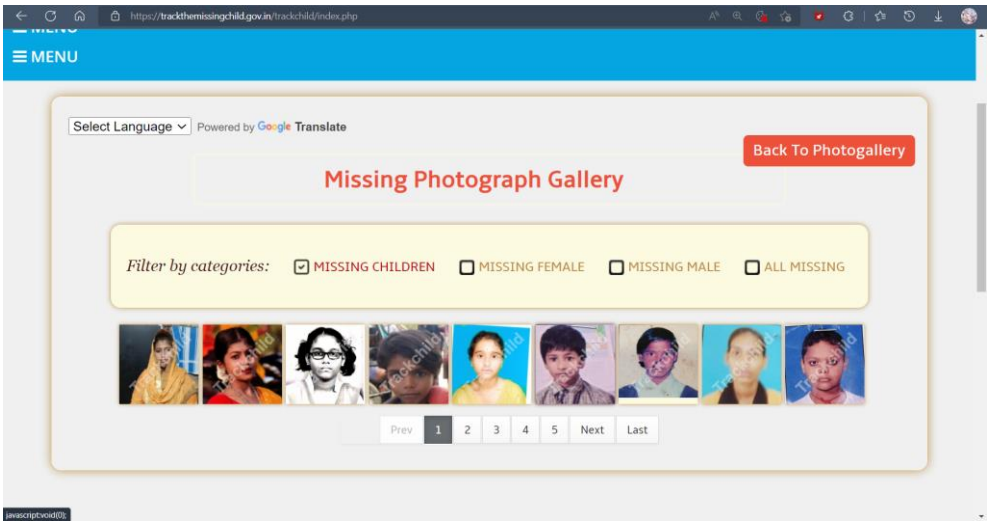



***Fig 2.2 Photographs of Missing Children***

By clicking on 'Photographs of Missing children' we can get all information as well as photographs of missing persons as shown in fig 2.2, this is a major drawback as this information can be misused.

ii. FindFace: The Russian Facial Recognition Company:

When the FindFace app was launched, users could take a photo of someone and compare their face to their social network accounts on the Russian website Vkontakte (VK). Later, it offered real-time, live recognition that can instantaneously determine whether or not faces in a crowd match those in police databases of wanted offenders. It is superior to the more traditional, "archived," facial recognition, which is slower since authorities must use recorded footage and a facial recognition technology to match faces.

The system's shortcomings include the loss of public anonymity and the fact that there are only 30 free search choices before the service must be paid for.Fig 2.3 shows the services provided by Ntechlabs website.

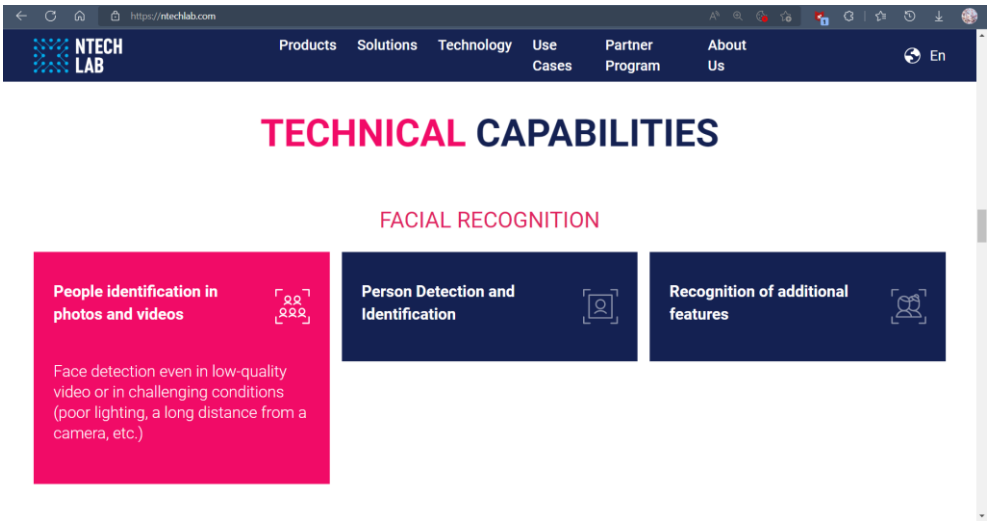



***Fig 2.3 Facial Recognition Services Provided by Ntechlab, Russia***

iii. Tuanyuan (Reunion): China’s Missing Children Alert Platform

4,707 lost children have been found in the past five years thanks to a website that China's public security officials launched in 2016 to inform people of missing youngsters. When a child is reported lost, the platform spreads information about the missing person via social media and mobile application terminals in the area where the youngster vanished. This enables nearby phone users to precisely gather pertinent data and offer fast leads to aid the search.

This system's disadvantage is that it depends on 25 additional mobile apps that are linked to the platform, including Alipay, Didi, Tencent QQ, Eleme, and others.

# CHAPTER 3

## PROPOSED SYSTEM

# 3 PROPOSED SYSTEM

## 3.1 INTRODUCTION

This section presents the research methodology used in the study, the research design, and the data collection process.

## 3.2 THEORETICAL/ CONCEPTUAL FRAMEWORK

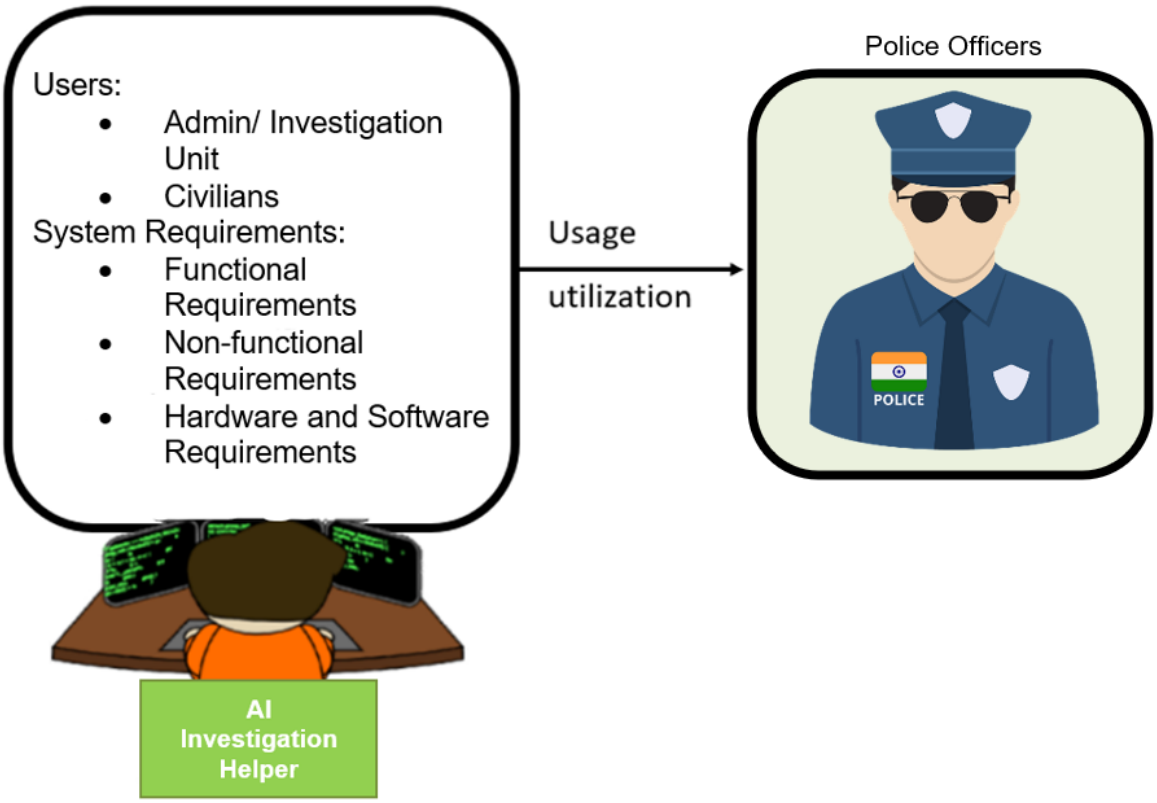



***Fig 3.1 Conceptual Framework***

The conceptual framework (fig 3.1) helps illustrate the research design and the relationships of the variables involved. Based on the figure above, the usage or utilization of the AI Investigation Helper can lead to the enhancement or improvement of the system.

### *3.2.1 Functional Requirements*

- Admin login.
- Registering New Case about missing person.
- Uploading image and other details of the missing person(eg. Name, age, father's name, mobile number).
- Mobile application: Filling in name, mobile number, location and image of suspected missing person.
- Search the uploaded image with a stored database, if found then give result as match, if not then store as a new entry.

### *3.2.2 Non-functional Requirements*

- **Security:** The admin inventory is safely protected with a password.
- **Performance:** The system is interactive and the delays involved are less.
- **Reliability:** The system is reliable for performing it's designated tasks and secures the inventory with a password.

### *3.2.3 Hardware Requirements*

- Platform: **Windows** 2008 R2 (64-bit) and later versions,
- Intel Core i7, CPU: 4vCPU, Frequency: 2.2 GHz and Threads :16
- RAM: 8 GB
- Hard Disk: 512 GB

### *3.2.4 Software Requirements*

- Operating system : Windows 7 and newer versions.
- IDE : Any IDE (PyCharm, VSCode, Python IDLE).
- Database : Postgresql.
- Anaconda Navigator (anaconda3).
- GUI : PyQT5.
- Language : Python.

## 3.3 ADVANTAGES

- The model ensures data security.
- It keeps redundancies in check, as compared to the manual system
- It occupies less space and only requires a desktop or laptop.
- Simple and efficient user interface.
- It can be accessed from anywhere in the world, at any time and has a quick search.

## 3.4 PROPOSED MODEL

The model has the following three layers:

i. Presentation Layer: This is the front-end component. Admin must log in and register by providing the necessary data. In order to file a complaint and add the information to the database, the user will interact with the login page.

ii. Business Layer: The business layer sends the user's request to the database in order to perform between presentation layer and database layer. This layer is in charge of gathering data from the user, processing it, and finally storing it in the database.

iii. Database Layer: The database layer is in charge of keeping the information in the databases. Additionally, it reacts to user-fired requests. The suggested concept stores data in a Postgres database.

Fig 3.2 Shows the Flow information in the system.

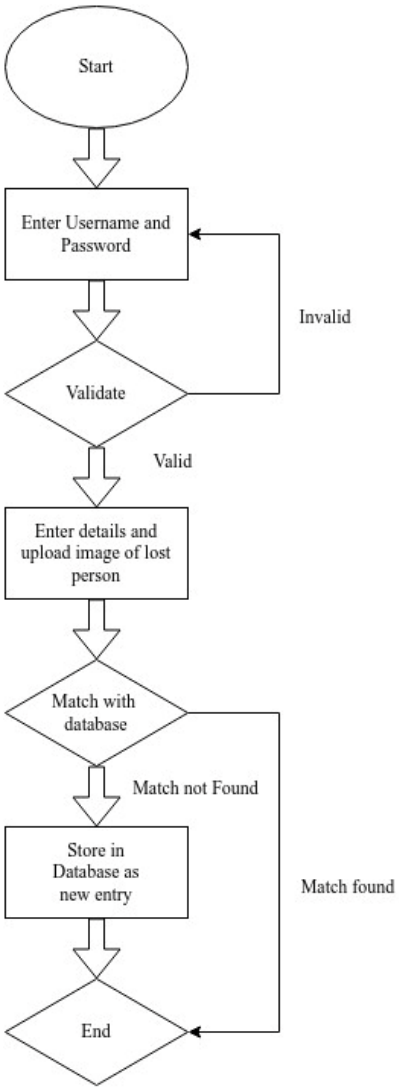



***Fig 3.2 Flow Chart of The System***

## 3.5 METHODOLOGY

Facial key points of the lost person are detected with dlib, the facial landmark produces about 68 unique points for a face. It uses a one-shot learning technique. Those produced points are float values with accuracy of about 8 points after the decimal.

Fig 3.2 shows the facial landmark and Fig 3.3 shows the face encodings generated.

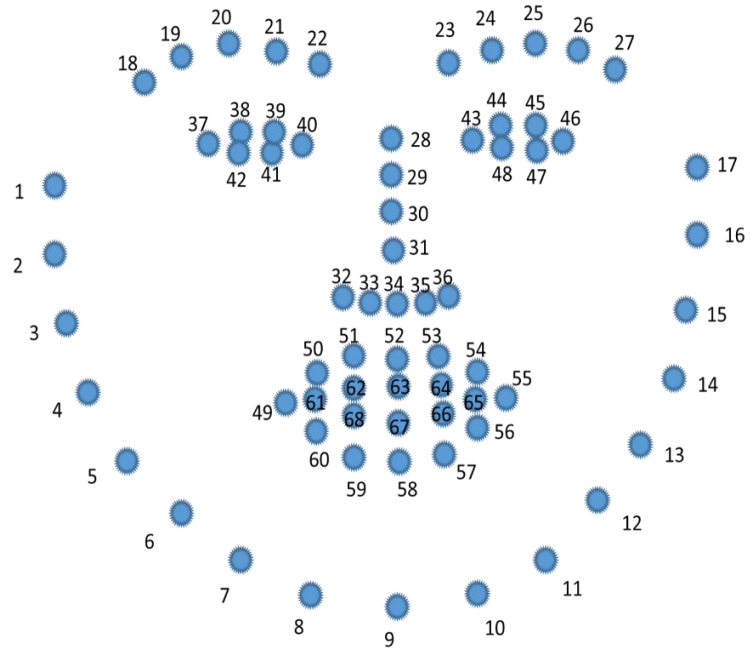
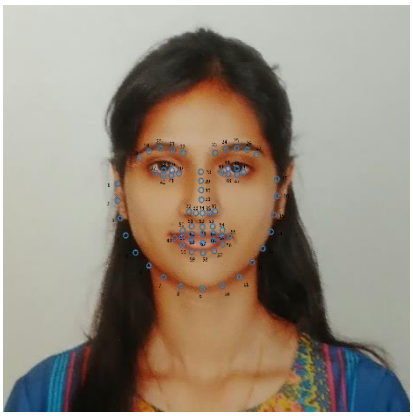



***Fig 3.3 Facial Landmark***

Input image



128 measurements generated from image

```
[-0.16597123  0.11949642  0.10122138 -0.12254387 -0.11838274 -0.02759848
  0.01384261 -0.07288168  0.06527785 -0.13963827  0.17559825 -0.08519795
 -0.25020906 -0.0102928  -0.01079375  0.21948609 -0.21553843 -0.19072869
 -0.13214052 -0.10856642  0.01477439  0.07908501 -0.05431245  0.11583221
 -0.1715932  -0.23868942 -0.10927209 -0.01475592  0.01510147 -0.08837818
 -0.00252565  0.03029939 -0.17696191  0.00717495  0.04937807  0.12862331
 -0.01091681 -0.09640069  0.1934087   0.01389313 -0.23863317  0.01766105
  0.15954995  0.26412117  0.21739453 -0.00336392 -0.03702538 -0.05539587
  0.10163558 -0.28075284  0.05129996  0.20316276  0.02803321  0.16820049
 -0.02042791 -0.12237336 -0.00515839  0.22946236 -0.21929839  0.03012473
  0.10334508 -0.19385433  0.010464   -0.1046315   0.159848    0.14616895
 -0.19181257 -0.22495562  0.19514428 -0.23470432 -0.11755507  0.07461189
 -0.0839375  -0.09592333 -0.35081255  0.03915626  0.32692659  0.20959754
 -0.10889891 -0.01162777 -0.09144997 -0.02747694  0.00839157  0.15324235
 -0.02081387 -0.0425766  -0.06370837  0.0559925   0.19876704  0.04837478
  0.00898859  0.25267416  0.04914283  0.0009048   0.00353496  0.14037418
 -0.15166469 -0.07702    -0.10442869  0.03603458 -0.10455432 -0.05006842
  0.01399595  0.18746354 -0.10759938  0.24044091 -0.03882578 -0.01190661
 -0.12068785  0.03638472 -0.02094681 -0.02857181  0.10984001 -0.22919109
  0.14735889  0.20415246 -0.00772358  0.09734803  0.10852756  0.12523061
 -0.03349054 -0.08732443 -0.17586364 -0.09488015  0.04729999 -0.0654182
  0.10575557  0.07663471]
```

***Fig 3.4 Face Encodings Generated from An Input Image***

When the application registers n cases, dlib generates 128 * n facial landmark points. 128 is the count as x, y coordinate would be generated for each point. Then the classifier is trained based on these points.

In Fig 4, KNN dispose the facial landmark points in the plot where, RED corresponds to Person 1, GREEN for Person 2 and BLUE for Person 3.

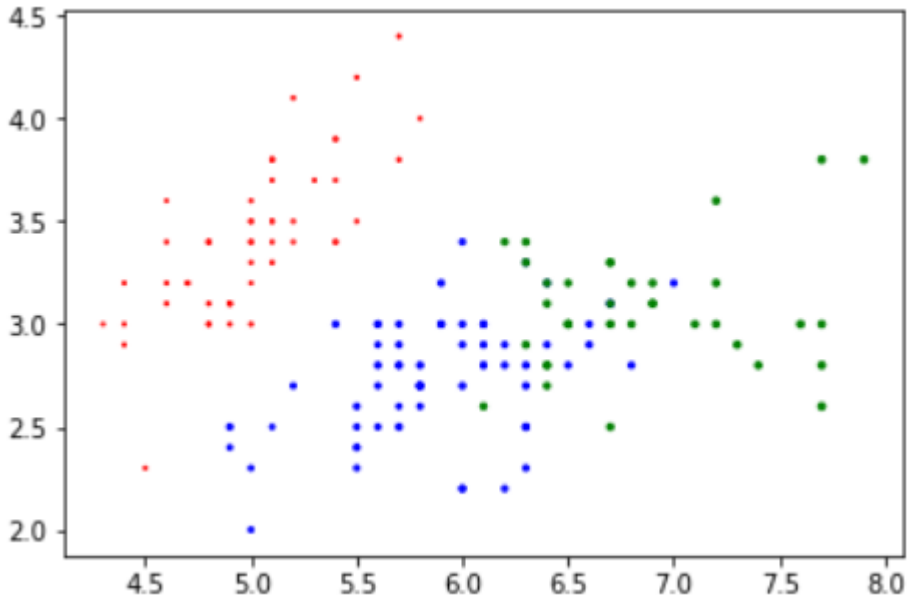



***Fig. 3.5 Working of KNN Classifier***

After this for matching any person's face, we need to simply produce facial landmarks of that person and we will then try to predict the confidence using the KNN classifier, which we trained, if the confidence goes above 60 then it is said that it is the same person.

Now, if a person is matched using the KNN model, we trained then as output, we will get the encoded label. This encoded label will contain information of that person.

# CHAPTER 4

## DESIGNING

# 4 DESIGNING

## 4.1 PRELIMINARY DESIGN

Tools, which assist in preliminary design process, are UML Diagrams and ER diagrams.

### *4.1.1 UML Diagrams*

i. Use-case Diagram:

The Use Case Diagram in Fig 4.1 graphically depicts the interactions among the elements of AI Investigation Helper. The main actors of this system in this Use Case Diagram are: Admin/ Investigation Unit, Mobile application users.

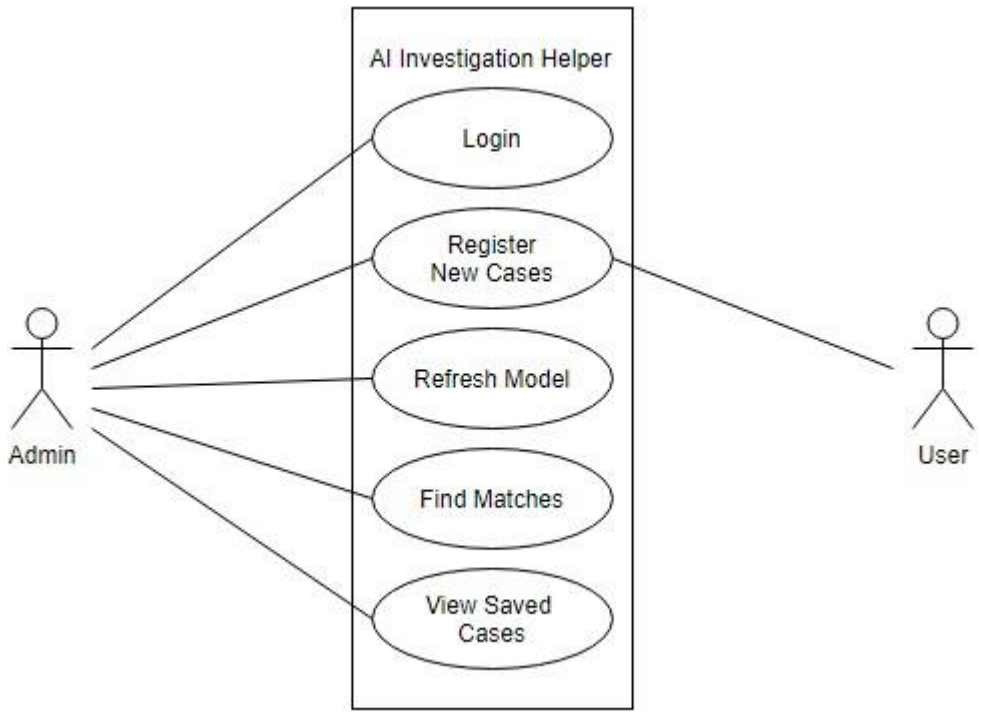



***Fig 4.1 Use Case Diagram for The System***

ii. Data Flow Diagram:

The data flow diagram of AI Investigation Helper shows components, provided and required interfaces, ports and flow of information in the system. Refer fig 4.2 for Data flow diagram of the system.

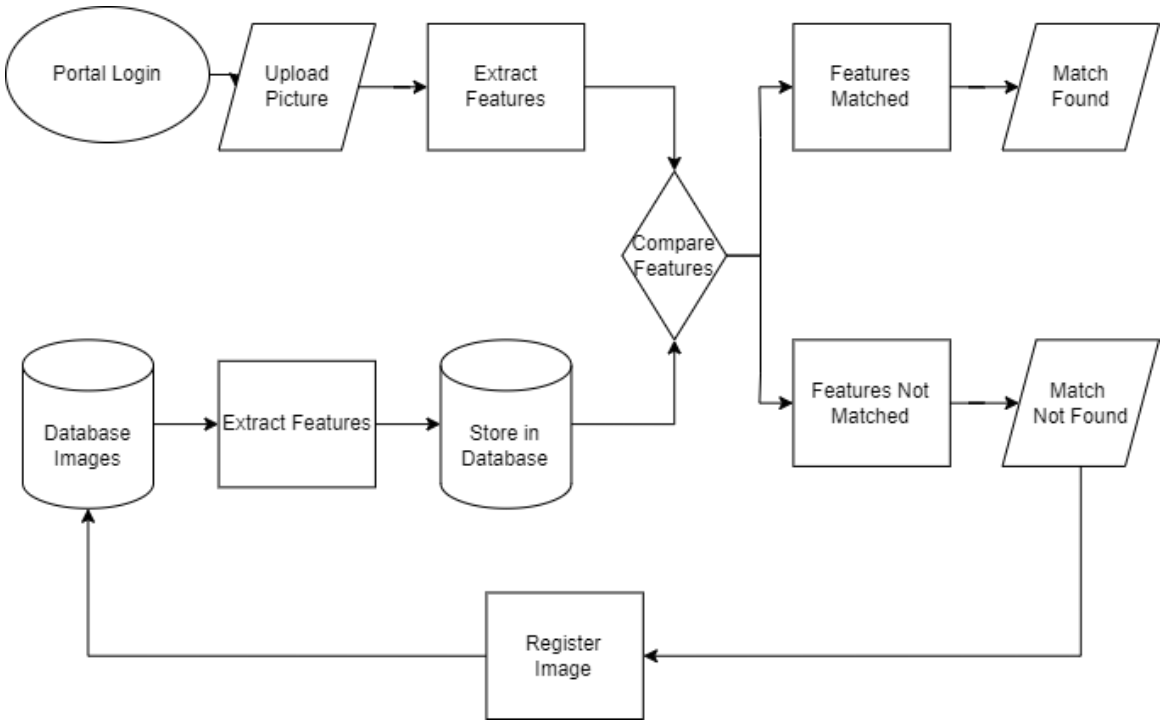



***Fig 4.2 Data Flow Diagram for The System***

### *4.1.2 ER Diagram*

The entity-relationship diagram of this system shows all the visual instrument of database tables and the relations between users, user submission cases, registered cases. The main entities of the system are submitted cases, user submissions and users. Refer fig 4.3 for ER diagram of the system.

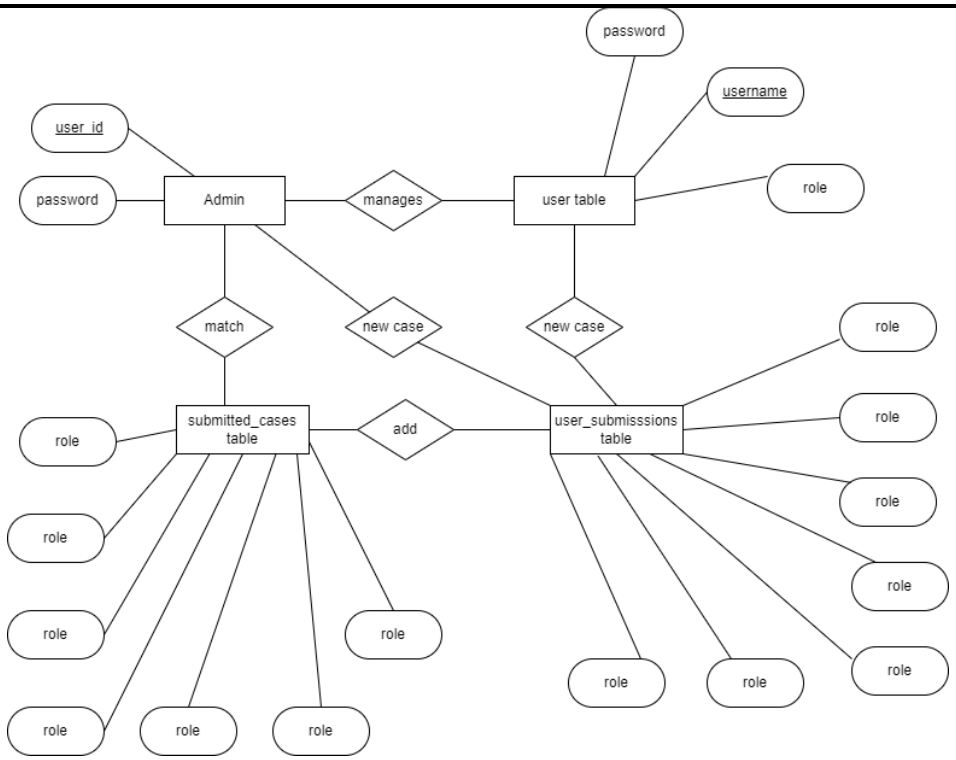



***Fig 4.3 ER Diagram for The System***

## 4.2 DATABASE DESIGN

The database tables used in this system are:

i. Submitted cases:

Used to register the missing person's case by the admin. Refer table 4.1 for various fields used in submitted_cases table.

**Table 4.1. Submitted_cases**

| Column | Type | Collation | Nullable | Default |
|---|---|---|---|---|
| case_id | character varying(64) | | not null | |
| submitted_by | character varying(24) | | not null | |
| name | character varying(64) | | not null | |
| father_name | character varying(64) | | not null | |
| age | integer | | not null | |
| mobile | integer | | | |
| face_encoding | jsonb | | | |
| image | character varying(200000) | | | |
| submitted_on | timestamp without time zone | | not null | CURRENT_TIMESTAMP |
| updated_on | timestamp without time zone | | not null | CURRENT_TIMESTAMP |
| status | character varying(24) | | not null | |

Indexes:
"submitted_cases_pkey" PRIMARY KEY, btree (case_id)

ii. User Submissions:

Used by the users of the application to upload images. Refer table 4.2 for various fields used in user_submissions.

**Table 4.2 user_submissions**

| Column | Type | Collation | Nullable | Default |
|---|---|---|---|---|
| id | character varying(64) | | not null | |
| submitted_by | character varying(64) | | | |
| face_encoding | jsonb | | | |
| location | character varying(64) | | not null | |
| mobile | integer | | | |
| image | character varying(200000) | | | |
| status | character varying(16) | | | |
| submitted_at | timestamp without time zone | | | |

Indexes:
"user_submissions_pk" PRIMARY KEY, btree (id)

iii. Users:

**Table 4.3 user**

| Column | Type | Collation | Nullable | Default |
|---|---|---|---|---|
| username | character varying(20) | | not null | |
| password | character varying(64) | | not null | |
| role | character varying(10) | | not null | |

Indexes:
"users_pk" PRIMARY KEY, btree (username)

# CHAPTER 5

## RESULTS AND DISCUSSION

# 5 RESULTS AND DISCUSSION

## 5.1 RESULT

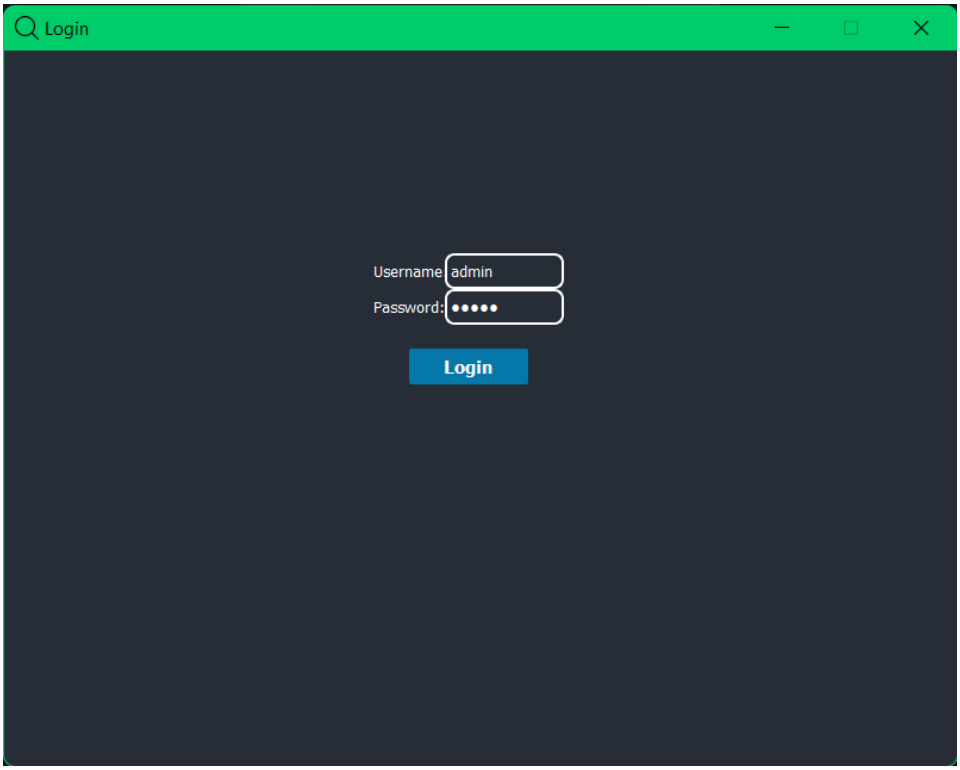



***Fig 5.1 Admin Login***

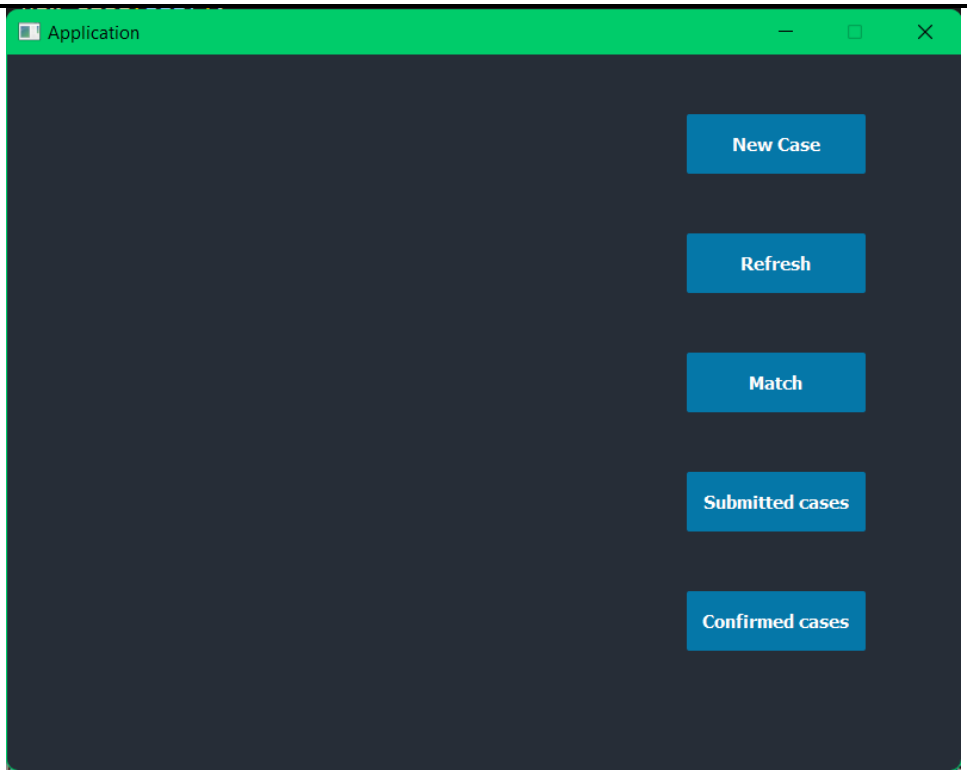



***Fig 5.2 Admin Application Window***

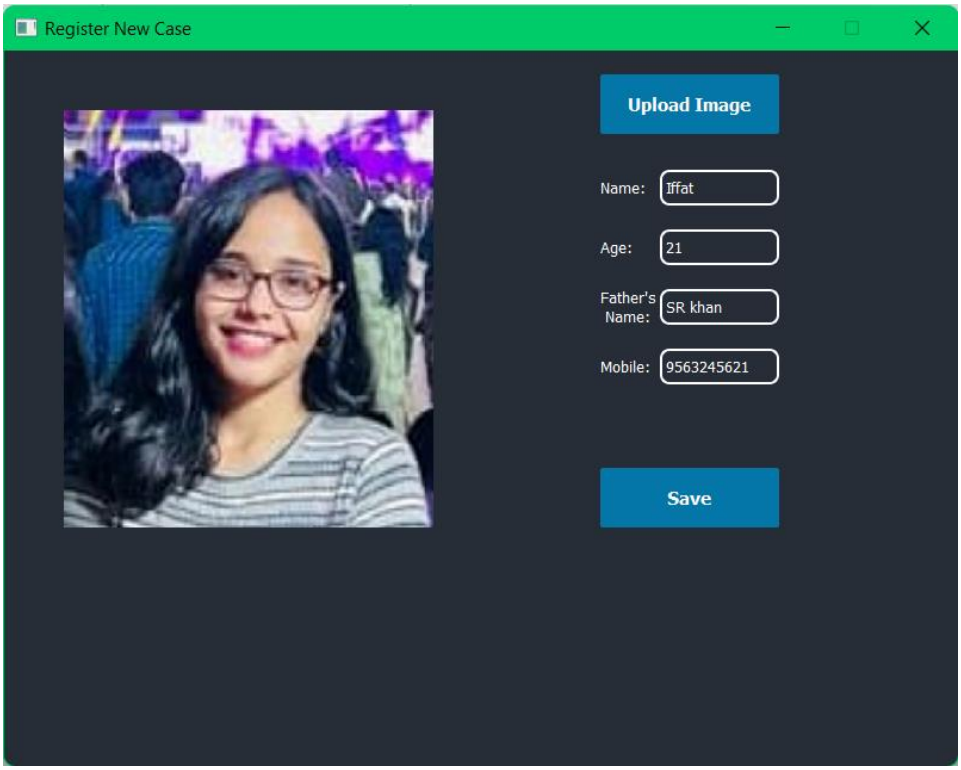



***Fig 5.3 New Missing Person Case***

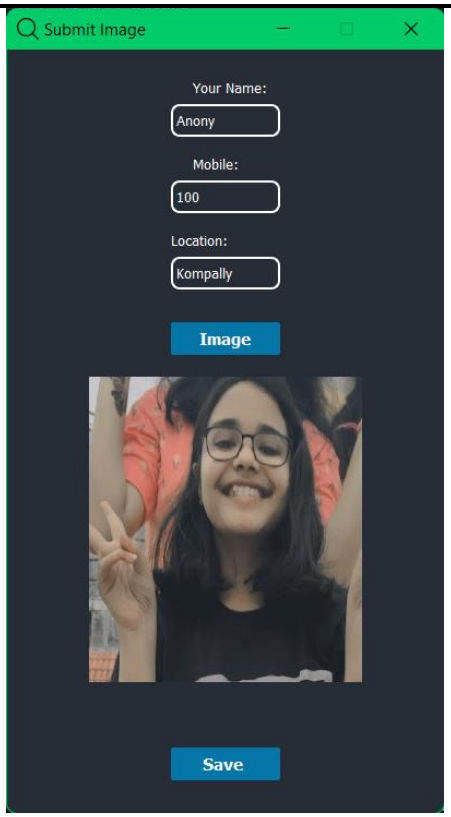



***Fig 5.4 User Application***

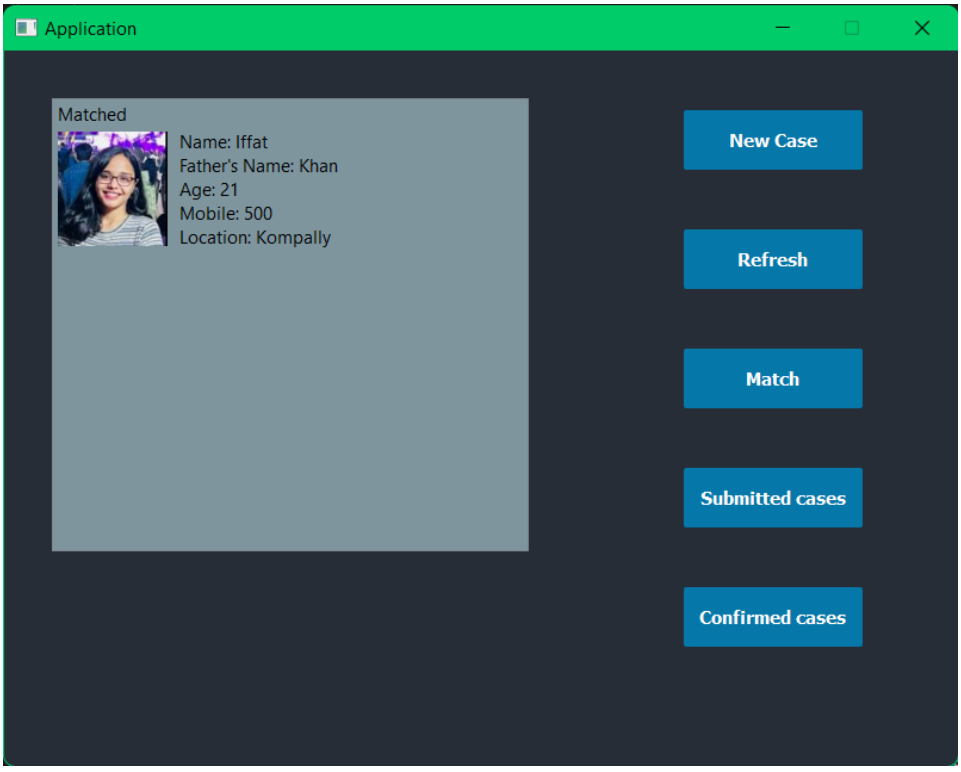



***Fig 5.5 Current Match from User Submission***

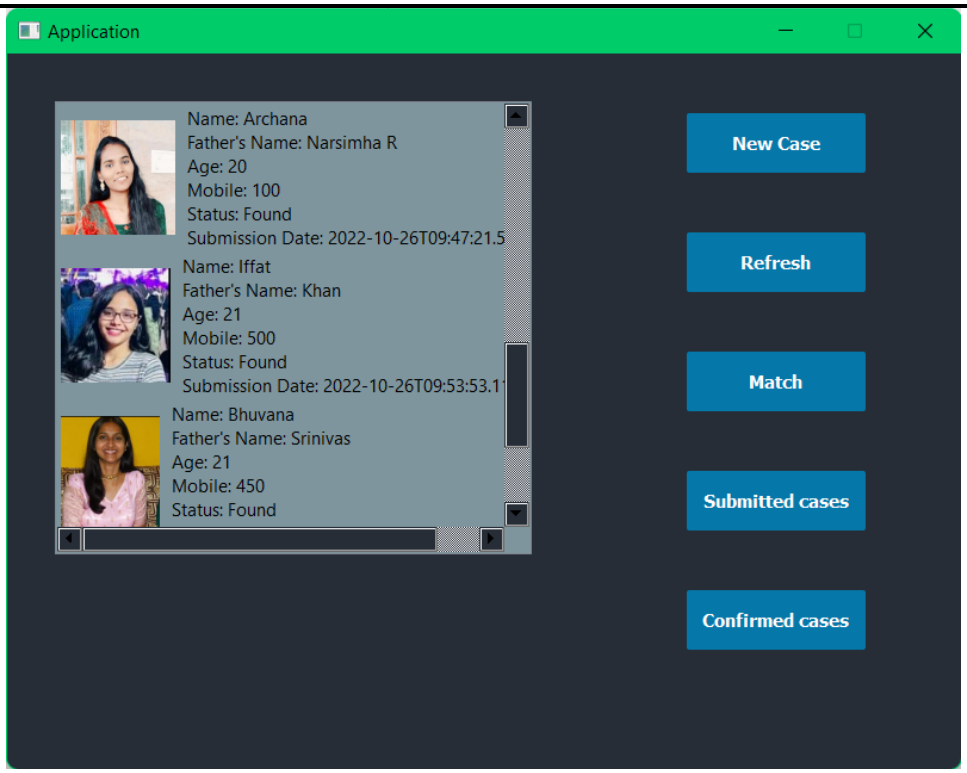



***Fig 5.6 Submitted Cases in the Database***

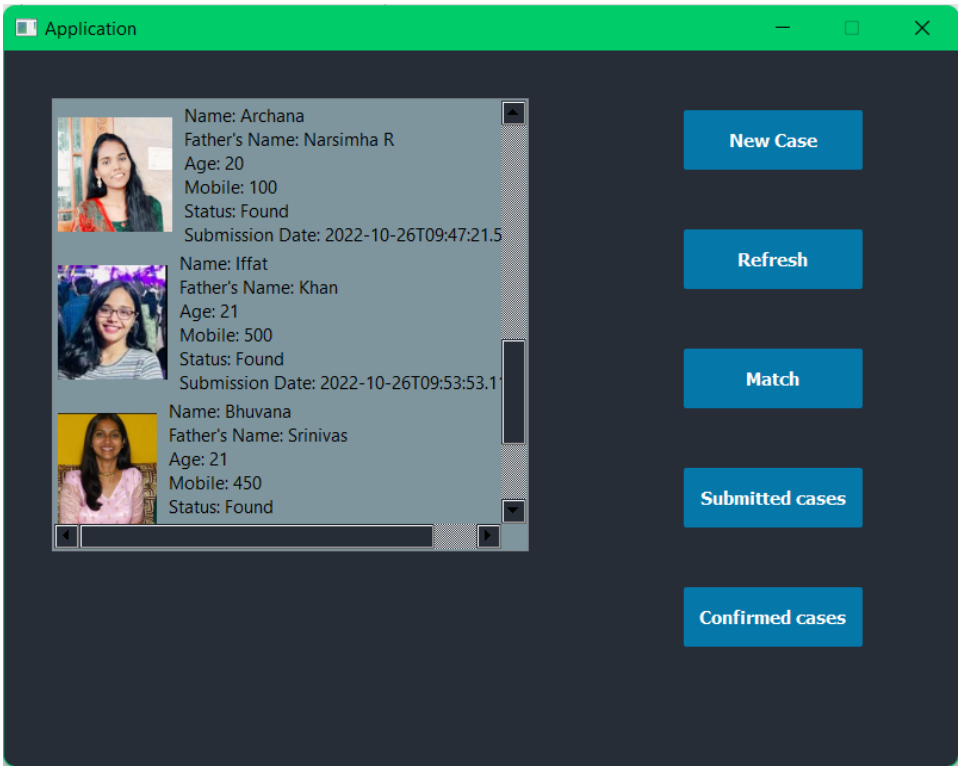



***Fig 5.7 Found Cases Matched in Database***

# CHAPTER 6

## CONCLUSION

# 6 CONCLUSION AND FUTURE WORK

## 6.1 Conclusions

In the paper, a straightforward method for face recognition is presented that reduces computing time while achieving excellent detection accuracy. The test results demonstrate that the algorithm handles the majority of problems, such as changing backgrounds, lighting issues, changing poses, and the quantity of faces in the database, quite well. Future research on high-quality facial recognition systems that are prediction-based is possible.

## 6.2 Future works

In the future, the software may be added to CCTV cameras in homes, shopping centres, hotels, restaurants, and other public areas. This makes it simpler to conduct investigations in various locations and at various times. This enables an application to operate quickly and anywhere at any time.

# CHAPTER 7

## REFERENCES

# 7 REFERENCES

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