

**Integrated Security  
Management System  
Internship Project at INS Valsura**

**By:  
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# **Integrated Security Management System**

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This is to certify that the Internship entitled **“Integrated Security Management System”** submitted by **Dhruv Pandya ( 20BCE517 )**, towards the partial fulfillment of the requirements for the degree of Bachelor of Technology in Computer Science and Engineering of Nirma University is the record of work carried out by him/her under my supervision and guidance. In my opinion, the submitted work has reached the level required for being accepted for examination.

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I would even like to put forward my gratitude to the team members of this project who guided me throughout the development phase. Not to forget I would even like to express my thanks to the INS Valsura team who made us feel welcome and comfortable during the whole course of the internship and taught us a lot about the work culture. Lastly, I would like to thank the University for bringing in this opportunity for us and my parents and friends who have always been a constant support.

With Best Regards,  
Dhruv Pandya

## **ABSTRACT**

This project aims to develop a security monitoring system for INS Valsura consisting of backend functionalities along with the front end. The objective of the Facial Recognition System is to recognize and authenticate personnel based on the information available in the database.

Facial Detection and Recognition is a biometric technique that identifies a person's facial features. These characteristics include the distance between the eyes and the lips, the distance between two eyes, the distance between the forehead and the chin, and so on. The goal is to find landmarks that help you recognize your own face. This technology is a sort of computer application capable of detecting, tracking, recognizing, or confirming human faces from a photograph or video taken with a camera.

This report explains the functionalities, operating parameters & applications of the aforementioned system and also the entire development of this project

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# **1 CHAPTER INTRODUCTION**

## **1.1 INTRODUCTION**

The purpose of this internship was to learn more about real-time software development in a professional environment and also to gain some additional knowledge in the field of Defence and the Indian Navy. The internship started with one week of orientation where we were made to acquaint ourselves with their environment and be comfortable with the system they provide for development. which would be used during the course of the internship. This was a 6-week internship that surrounded the development of the system for the Indian Navy that is used for recognizing the person using their face and marking entry or exit of that. We also need to develop a dashboard to visualize the entries of the persons.

## **1.2 ABOUT THE COMPANY**

During the peak of the Second World War, the Royal Navy felt the need to augment training facilities in the domain of Torpedo handling and operations. HMIS Valsura was created to fulfill this need and serve as the Torpedo Training School. The establishment was built on Rozi Island in Jamnagar, a site donated by the ruler of Navanagar state, Colonel Digvijay Singhji Jadeja Sahed Bahadur, Jamsaheb. A kind and noble-hearted royal, he agreed to part with 30 acres of land from his game reserve for a token rent of Rs.1 per annum. The establishment was commissioned on 15 December 1942 by then Maharani Gulab Kunverba Sahiba of Navanagar. A few months after India became a republic, HMIS Valsura was renamed as Indian Naval Ship Valsura.

Commodore Gautam Marwaha, VSM was commissioned into the Indian Navy on 05 Dec 1992. He is an alumnus of the Naval College of Engineering, Lonavala, and the Defence Services Staff College, Wellington. His career profile has been interspersed with a variety of afloat, staff, instructional and diplomatic appointments. His afloat tenures include those of WMO on-board Gomati, Electrical Officer of Nirghat, ALO (Msl), and later Electrical Officer of Trishul. His staff appointments include stints at Naval Headquarters as Joint Director at the Directorate of Weapon Equipment, Director at the Directorate of Ship Production, and Technical Assistant to the Chief of Materiel. He has served in Naval Dockyard (Visakhapatnam) as Asst Manager (Weapons) and Manager (Weapons) besides serving at Naval Dockyard (Mumbai) as the DGM (L) and AGM (L). He has been an instructor as part of the P 1135.6 Training Team and tenanted the prestigious appointment



of Defence Advisor at the High Commission of India, Nigeria. Prior to assuming command of INS Valsura he has been Additional General Manager (Planning) at Naval Dockyard, Mumbai.

IT School Setup in 1996, with aim of imparting training on subjects like Computers and Information Technology, Embedded Systems, and Advanced IT Subjects with professionalism at par with Industry Standards like Software Development, Network Administration, Server Administration, and Information Security. The school trains the Naval personnel to take on IT challenges on the front foot with the latest available trends and technologies. The school also conducts computer Literacy programs for Naval personnel and their families. Over the years, the school has expanded its infrastructure and has setup state-of-the-art labs which include an Artificial Intelligence and Big Data & Analytics lab, Embedded Systems and Interfaces, the Hardware and a Network Lab, the state of art Virtual Classrooms powered with NKN and so on. The school mentors a large number of student officers during their stay in Valsura. Officer instructors in IT Schools guide these trainees in various projects.

### **1.3 BACKGROUND OF THE PROJECT**

The system is built purely upon open-source frameworks and tools. It is a web-based system that uses Django for the backend and Reacts for the front and many packages such as OpenCV, CMake, face recognition, and so on so forth, web page is implemented for visualizing face recognition. The details for an existing user are stored in a database and the same can be visualized on the web page.

Whereas for a new user entry, photos are captured and stored in the system for retraining of the model. The system provides easy access to security personnel for identifying as well as checking the credibility of the visitor based on their previous logs.

The system provides a unified interface for several functionalities such as recognizing faces from the available database with the help of photos captured by the web camera. Provided face recognition, once the personnel is authenticated the unique identification details pop – up on the web page and entry to the premises is granted.

On the other hand, if the individual is recognized, the system detects one's face as "Unknown" and displays an unknown message in the red box. After aadhar

prompt is open and needs to aadhar card number to access that person's data. If aadhar is not in the database then need to enter person's data with their photos using add person page.

Once a new entry is made then need to store the embedding of the face which is 128 Dimension vector. That vector is for the recognition task.

## **1.4 TITLE OF THE PROJECT**

The title of the project was "Integrated Security Management System". In this, we need to develop a security system for entry and exit at INS Valsura. The detailed problem statement is mentioned below. we had to develop this system in 6 weeks.

## **1.5 PROBLEM STATEMENT GIVEN BY THE COMPANY**

A fundamental yet significant responsibility of most Security Officers or Departments is to control access (ingress and egress) to a facility, building, or area. The key purpose of controlling access is to ensure that only authorized personnel, vehicles, and materials are allowed to enter, move within, and leave the facility. Effective access control provides increased protection of personnel and property within the facility as well as increased protection of the facility itself. Security Officers, by their mere presence coupled with their overall demeanor and policy compliance, can effectively deter criminal activities and/or violations of company policy. As a rule of thumb, a Security Officer's fundamental responsibility is to detect, deter, observe, and report.

INS Valura, a premier naval training base located at Jamnagar employs a manual ingress-egress management system wherein rigorous checks are in place for controlling access to premises and ensuring the security of its operations. The primary reason for employing this system is its robustness, simplicity, and effectiveness. However, all these features come at a cost. The manual process takes a lot of time and requires a huge amount of manual bookkeeping which is certainly prone to human errors. Although certain automated ingress-egress systems have come into existence, they haven't been readily adapted by such premier institutions owing to their ratio of false positives and inadequate accuracy. However, the scenario has radically changed in the past couple of years. Technologies have come into existence that has an accuracy that can match and in some cases outperform human benchmarks. They also have the added benefit of being really fast in their operations, allowing their

users to focus on matters that really require human intervention. Owing to these developments, it was decided to implement a facial Ingress - Egress management system which is called "Integrated Security Management System".

A complete face recognition system includes several key processes in its pipeline. The major three that require a significant amount of effort are face detection, face preprocessing, and face recognition. Therefore, it is necessary to extract the face region from the face detection process and separate the face from the background pattern, which provides the basis for the subsequent extraction of the face difference features. The recent rise of the face based on the depth of learning detection methods, compared to the traditional method not only shortens the time, and the accuracy is effectively improved. Face recognition of the separated faces is a process of feature extraction and contrast identification of the normalized face images in order to obtain the identity of human faces in the images

## 2 CHAPTER SURVEY

In this section we discuss the modules, frameworks, and tools that are used in the development of this project. This Section shares information about the frameworks used for developing a Facial Recognition System and the commonly used frameworks and tools for the system making it an 'Integrated Security Monitoring System'.

### 2.1 LITERATURE SURVEY

Details of Tools & Technologies used – OpenSource Modules & Libraries:

- **Reactjs:** React (also known as React.js or ReactJS) is an open-source JavaScript library for creating user interfaces. It is maintained by Facebook and a community of developers and individual companies. React can be used as the basis for a single page or mobile application development. However, React only cares about presenting data to the DOM, so building react applications usually require the use of additional libraries for routing and state management. Components can be represented in specific elements in the DOM using the React DOM library. When rendering components, you can pass values called "props". We also use Bootstrap to create UI and WebRTC to access the camera and click the photos.
- **Django:** It is a high-level Python web framework for building secure and maintainable websites quickly. Django takes care of a lot of the work of web development, allowing you to focus on developing your app instead of reinventing the wheel. It is open source and free, with a vibrant and active community. It can assist in the development of websites ranging from content management systems and wikis to social networks and news sites. It can integrate with any client-side framework and serve material in nearly any format (including HTML, RSS feeds, JSON, XML, etc). It also offers a safe way to manage user accounts and passwords, avoiding common blunders like storing session information in cookies, which is vulnerable (instead, cookies only store a key) and the actual data is stored in the database) or directly storing passwords rather than a password hash.
- **Axios API:** It is a promise-based HTTP client that can be used in plain JavaScript as well as in advanced JavaScript frameworks like React, Vue.js, and Angular. this is use for making API calls over HTTP

It is similar to the Fetch API and returns a JavaScript Promise object but also includes many powerful features.

- **MongoDB:** Data is stored in a tabular manner in SQL databases. This information is maintained in a preset data schema that is inflexible in today's fast-growing real-world applications. Modern applications are more social, interactive, and networked than ever before. Applications are storing an increasing amount of data and access it at a faster rate. Because they are not horizontally scalable, relational database management systems (RDBMS) are not the best choice for dealing with large amounts of data. The database will encounter a scaling limit if it is run on a single server. NoSQL databases are more scalable and perform better than SQL databases. MongoDB is a NoSQL database that scales as more servers are added and boost productivity through its flexibility in the document model.

Hardware component we use to develop this system.

1. **CPU** : Specifications of CPU is :

- **Processor** : Intel Xenon Silver 4216
- **RAM Size** : 256 GB
- **Total Cores** : 16
- **Cache** : 22 MB
- **Memory Type** DDR4-2400
- **Max Turbo Frequency** 3.20 GHz
- **Base Frequency** 2.10 GHz
- **GPU** : NVIDIA GeForce RTX™ 3080 Ti
- **GPU RAM** : 11 GB

2. **Webcam** : We use Logitech C270 as a webcam. Specifications of WebCam is :

- **Max Resolution** : 720p/30fps
- **Camera mega pixel** : 0.9
- **Focus type** : fixed focus
- **Lens type** : plastic
- **Built-in mic** : Mono
- **Mic range** : Up to 1 m
- **Diagonal field of view** : 55°

## 3 CHAPTER METHODOLOGY

### 3.1 METHODOLOGY USED

As directed by our guiding mentors and after analysis of our abilities, we were assigned the task of creating an ingress-egress management system that uses face recognition. We were supposed to develop the system by using Django, a python-based framework, for our backend requirements and React.js for our frontend requirements.

The database choice was left up to us and we chose MongoDB for storing user data and SQLite DB for storing facial data. A conventional face recognition pipeline consists of three key processes which are face detection, face preprocessing, and finally face recognition. Therefore, it's important to detect faces from still frames or video streams to begin the process. Fortunately, the organization already had a database of pictures captured of personnel stationed at the base. For added accuracy and confidence, we also added the Labeled Faces in the Wild dataset to our dataset. We used a state-of-the-art library known as 'dlib' to detect faces.

We also configured the library to make use of the system's graphics processing capabilities and employ a dedicated GPU (Nvidia RTX 2080Ti) for the task. Upon detection, we then proceeded to preprocess the face for better accuracy and fulfilling the requirements of our face recognition model. We converted the array of detected face images to grayscale and resized the images to 160 x 160 resolution. Additionally, we aligned the face with reference to X and Y planes with help of some trigonometry. All of these steps were performed with the help of a library called 'DeepFace' which features multiple face detection backends such as 'opencv', 'dlib', 'MTCNN' etc. After preprocessing the faces as mentioned above, we then employed a pre-trained Keras model known as 'Google Facenet' to convert our map of images to labels to a 128-dimension vector for storage in our SQLite database. The primary reason for choosing this model was to reduce our efforts to recognize a face to simply comparing a target face image's vector to our vectors stored in the database, checking the cosine similarity of the results, and returning the target label if the similarity is above the threshold we have set (0.7 in our case).

The choice also supports readily adding faces to the database and completely omitting the time-consuming requirement to train the system for newly added faces.

## 4 CHAPTER RESULTS

### 4.1 RESULTS AND DISCUSSION

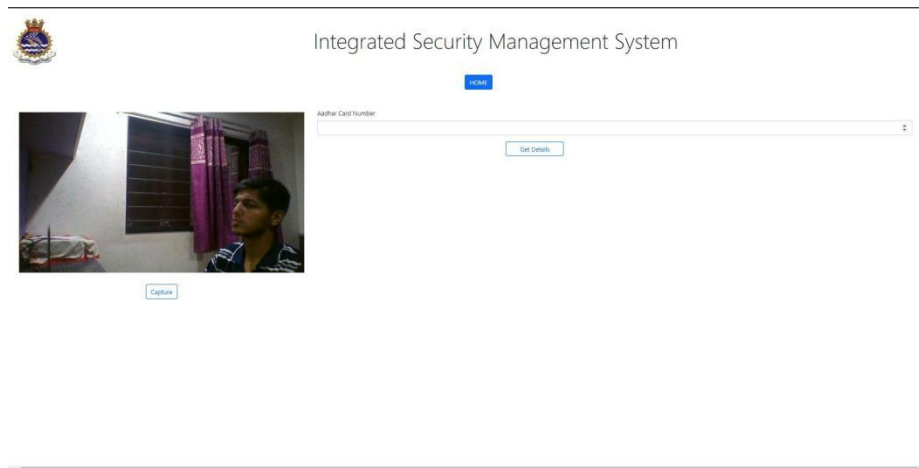


Figure 1: Main Page for Integrated Security Monitoring System

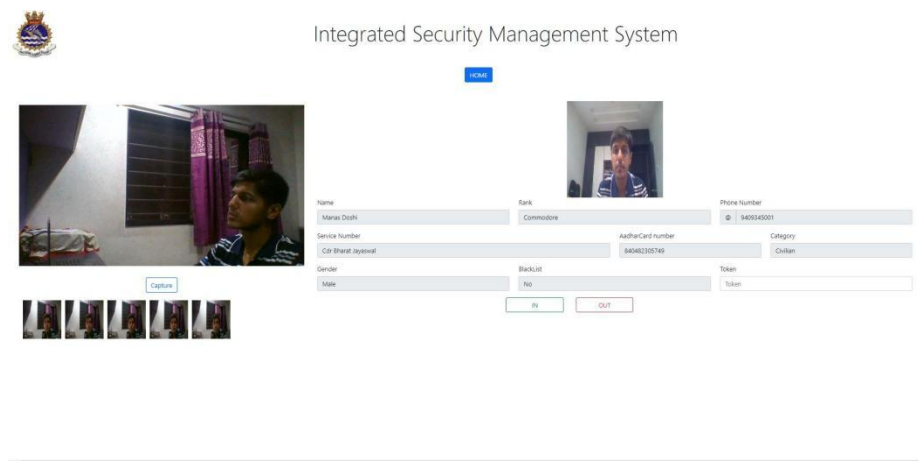


Figure 2: Detection and View Details for Integrated Security Monitoring System

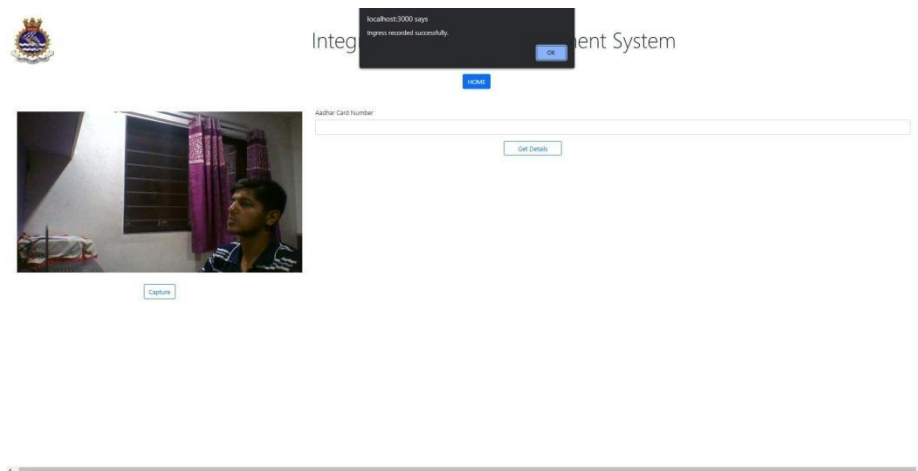


Figure 3: Press IN button for Entry

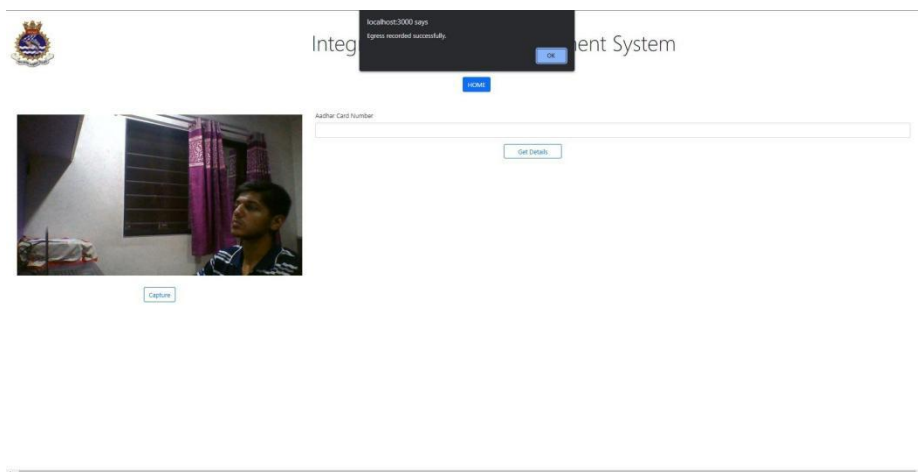


Figure 4: Press Out button for Exit



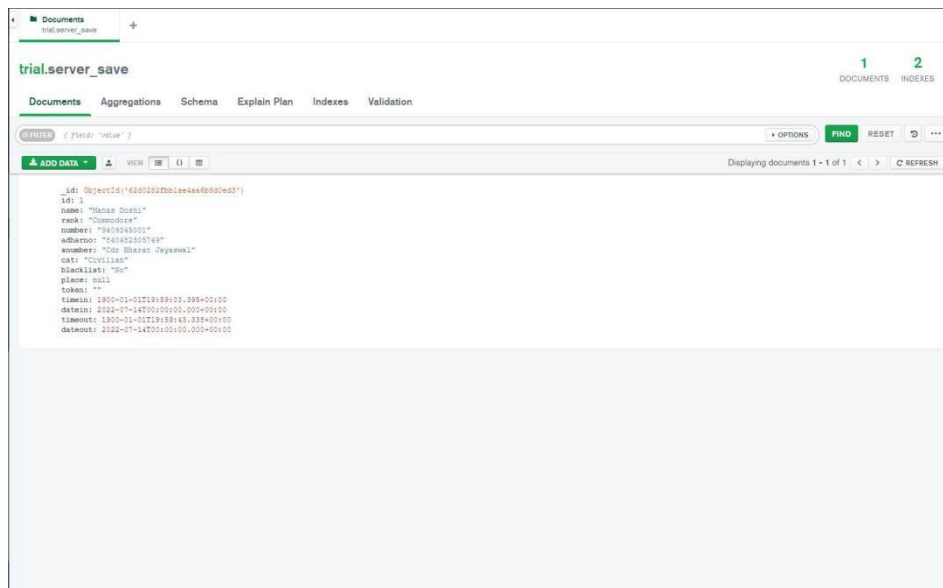


Figure 5: Data entry in Database

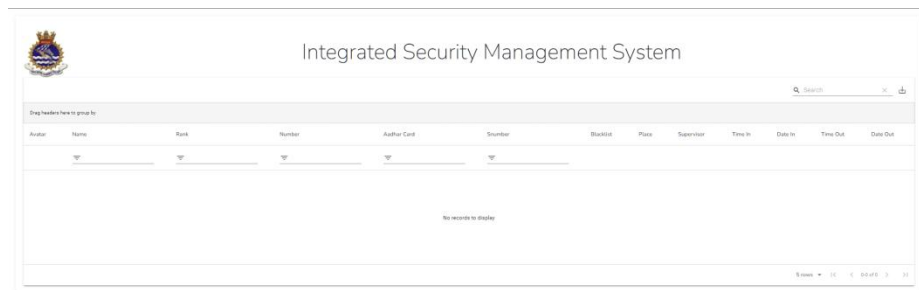


Figure 6: Dashboard For Data Visualization

## 4.2 Discussion

The system can only be accessed through login. If in any case user is new, there is an option to add details for creating a new user account that will provide access to the system. Initially, after successful sign-in, the index page with a live web camera feed gets rendered. This page also contains a table

that consists of different parameters required for identification purposes. As it can be observed from Figure 4 that whenever personnel that exists in the database goes for authentication, is detected by the name that was fed into the system while creating his/her new personnel entry into the database. If the personnel does not exist in the database, then that person will be detected as 'unknown'. Once, the authentication is successful, the supervisor or operator has to press 'IN' to punch in the time of entry for that specific person. The same process is repeated at the time of dismissal from the premises but this time on successful authentication the supervisor has to press the 'OUT' button to punch in the time of exit.

## **5 CHAPTER CONCLUSION**

### **5.1 SUMMARY**

The tech stack was itself a challenge for us wherein we had to learn Django and ReactJS. We took this challenge as an opportunity to explore this part of web development, Image Recognition as well as make a dashboard that was internship project-worthy!

### **5.2 CONCLUSION**

Integrated Security Monitoring System can ease the analysis and monitoring of visitors and personnel to INS Valsura base. This system shall be very efficient for easy processing and authentication of Civilian and Service Personnel to INS Valsura base. All the data that is collected can be monitored for security purposes. This system shall also enhance the traceability of any personnel as and when required.

The internship was also good to find out what my strengths and weaknesses are. This helped me to define what skills and knowledge I have to improve in the coming time and also I got to know about the current trends and the technologies prevalent in the industry. At last, this internship has given me new insights and motivation to pursue a career in technology.

### **5.3 FUTURE SCOPE**

- Using the Login module we can prevent unauthorized access to the website. That this is a major future requirement of the system.
- The system can be integrated with additional biometrics identities such as fingerprint sensors. For enhanced security and authentication, personnel A's facial data and fingerprint data can be mapped.
- Currently, the system uses image embedding and cosine similarity for recognition, So we can develop a new model to improve accuracy for recognition.

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of Defence Advisor at the High Commission of India, Nigeria. Prior to assuming command of INS Valsura he has been Additional General Manager(Planning) at Naval Dockyard, Mumbai. IT School Setup in 1996, with aim of imparting training on subjects like Computers and Information Technology, Embedded Systems, and Advanced IT Subjects with professionalism at par with Industry Standards like Software Development, Network Administration, Server Administration, and Information Security. The school trains the Naval personnel to take on IT challenges on the front foot with the latest available trends and technologies. The school also conducts computer literacy programs for Naval personnel and their families. Over the years, the school has expanded its infrastructure and has setup state-of-the-art labs which include an Artificial Intelligence and Big Data & Analytics lab, Embedded Systems and Interfaces, the Hardware and a Network Lab, the state of art Virtual Classrooms powered with NKN and so on. The school mentors a large number of student officers during their stay in Valsura. Officer instructors in IT Schools guide these trainees in various projects. 1.3 BACKGROUND OF THE PROJECT The system is built purely upon open-source frameworks and tools. It is a web-based system that uses Django for the backend and React for the front and many packages such as OpenCV, Flask, face recognition, and so on so forth, web page is implemented for visualizing face recognition. The details for an existing user are stored in a database and the same can be visualized on the web page. Whereas for a new user entry, photos are captured and stored in the system for retraining of the model. The system provides easy access to security personnel for identifying as well as checking the credibility of the visitor based on their previous logs. The system provides a unified interface for several functionalities such as recognizing faces from the available database with the help of photos captured by the web camera. Provided face recognition, once the personnel is authenticated the unique identification details pop-up on the web page and entry to the premises is granted. On the other hand, if the individual is recognized, the system detects one's face as "Unknown" and displays an unknown message in the red box. After Aadhar prompt is open and needs to Aadhar card number to access that person's data. If Aadhar is not in the database then need to enter person's data with their photos using add person page. Once a new entry is made then need to store the embedding of the face which is 128 Dimension vector. That vector is for the recognition task. 1.4 TITLE OF THE PROJECT The title of the project was "Integrated Security Management System". In this, we need to