TECHNICAL DOCUMENTATION

PRA-VIGIL

Presented By

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PRA-VIGIL DOCUMENTATION

This documentation contains the detailed overview of my project PRA-VIGIL - AI driven Automated License plate reader security for gated communities. This Automated license plate detection technology is currently being used across different industries for law enforcement and security, parking management, Automated toll collection(FASTag), Commercial and fleet management etc.

Myself being a AI enthusiastic and with the zeal of learning the new things by experimenting with the technologies that I learnt in my academics I started doing this project .As there are multiple implementations that are already going on regarding this topic in public domain, I took the idea of implementing this project for security management in gated communities. Main reason behind this is to test my practical knowledge and gain extra knowledge in this process of implementing this project.

The name PRA-VIGIL is a combination of Sanskrit and Latin words , **PRA** stands for **protection** from Sanskrit and **VIGIL** stands for **watchfulness** or **alertness** from Latin.

Github repository link:

https://github.com/21a31a4324/PraVigil

My Project automates the intelligent license plate recognition using image processing, deep learning and optical character recognition ensuring real time performance. This system improves operational efficiency and scalability while replacing manual methods used for security check process in gated communities. This project is developed for gated community admin usage purpose and residents can login through the ID given to them for otp generation only.

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MOTIVE

Manual license plate recognition requires more man power and human expertise to an extinct which often suffers from human errors, inconsistencies, and inefficiencies. Traditional methods cannot scale effectively to meet modern demands that calls for security. The need for an automated solution is more emphasized by the challenges that are being faced in terms of man force and security. Developing an automated, and scalable system that addresses these challenges is critical for applications in access control.

SYSTEM ARCHITECTURE

Every problem or challenge will have a solution in order achieve less manual efforts and more secure access control systems for gated communities I came up with the Idea of implementing the Automated license plate recognition.

Input: Image upload in my access check page.
Step 1: YOLOv5 detects license plates.
Step 2: Detected plates cropped and fed into easyocr.
Step 3: CRNN extracts text characters.
Output: License plate number along with details of the person corresponding to it.
Step 4: Now the license plate number that is extracted will be checked in blocklist.csv file if matches access denied popup will be opened in my un_matched.html file.
Step 5: Next it will be checked in the residents.csv file if the vehicle_no matches then access granted popup will be shown in matched.html file.
Step 6: If vehicle_no is not found in both the .csv files the user will be redirected to non_resident.html file.
Step 7: In this it will ask for whether the person is coming for order/delivery or coming to visit a person in the community . In order to grant the access residents community ID or phone no should be verified for security reasons.
Step 8: Upon community ID verification , Otp verification will be done . Currently for otp verification I am generating a random six digit number which will be generated using residents ID by the residents in Resident login page (user_login.html). The otp generated by resident should match with the one entered by the non resident in order to get access.
Step 9: If otp matches access will be granted
Step 10: If not matches access will be denied and vehicle_no will be added to suspect list
Step 11: If otp failure increases more than 3 times then the vehicle_no will be added to blacklist

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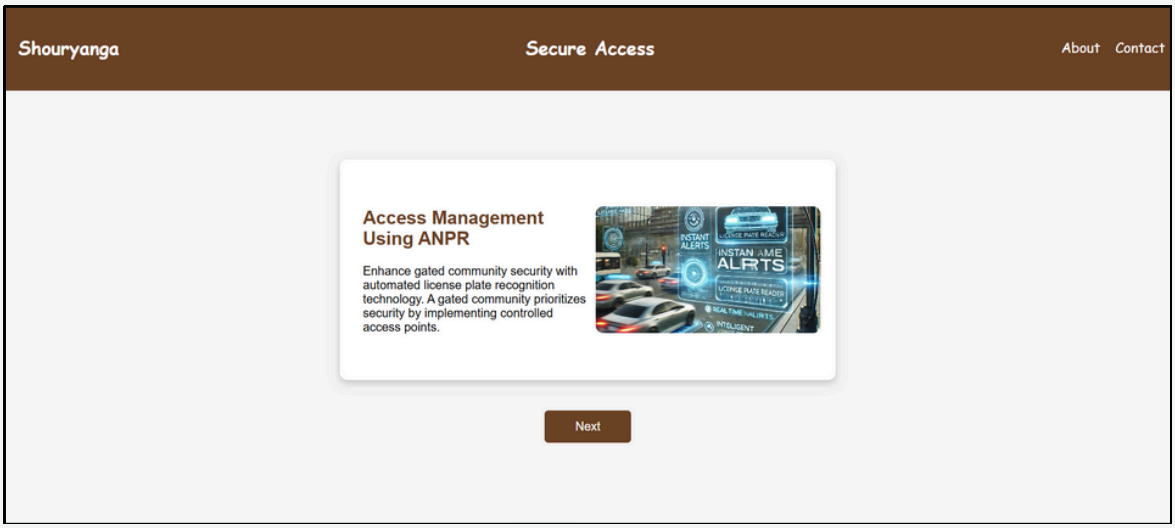
To achieve the detection of license plate and extraction of license plate number , I prepared a custom dataset of 1000 images . I collected those images from google and I captured some of them manually . I trained my deep learning model using this custom dataset . I used the 80% of images for training and remaining 20% for testing my model. I used YOLOV5 for detection and Easy OCR for extraction of digits from license plate. You can see the best.pt file in my repository which have extracted features and fully trained model for ALPR.

FEATURES OF PRA-VIGIL:

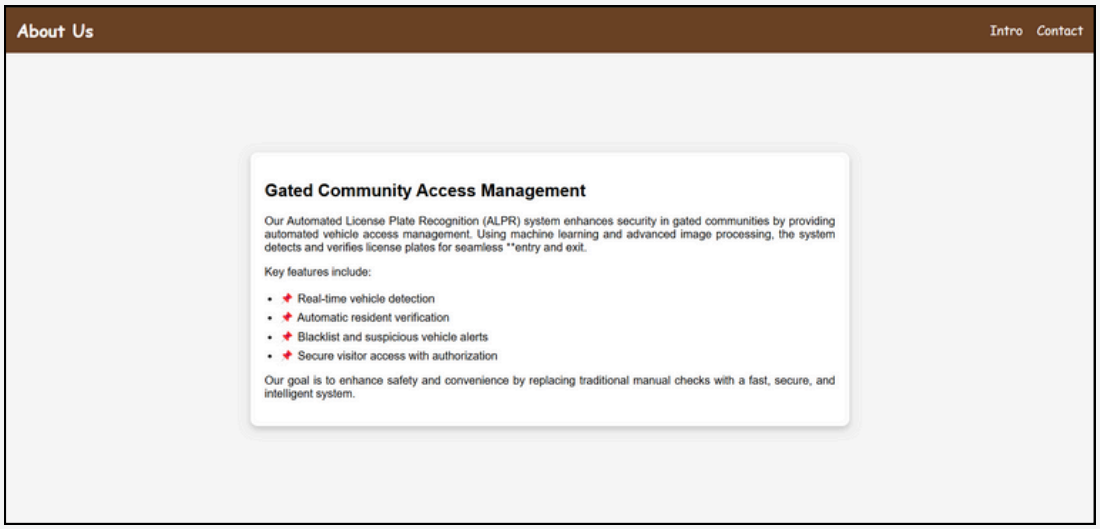
- The above mentioned procedure will happen in access_check.html page.
- We can see the residents of community in residents.html page along with their personal details.
- We can see the Vehicle numbers that are in suspect list
- We can see the Vehicle numbers that are in block list.
- We can add a new resident to our community by using the add resident button in home page.
- We can delete the resident from residents , suspect and blocklist using delete resident button.
- We can check the statics of number of vehicles entered , block listed vehicles, suspect list vehicles and access granted vehicles in a responsive dashboard which contains both bar graph and donut chat.

DETAILED WORKING IMAGES OF PROJECT:

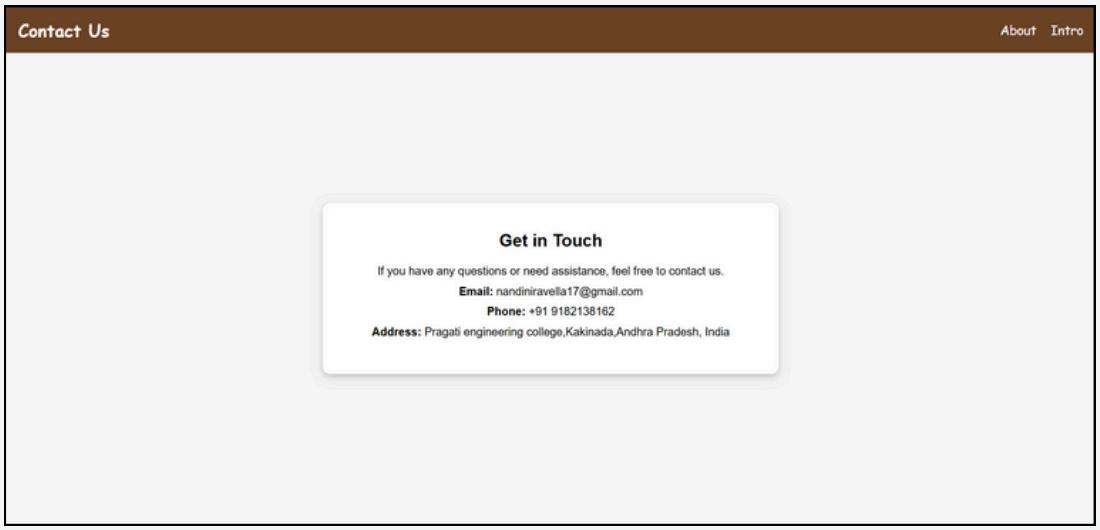


This is the introduction page of my project

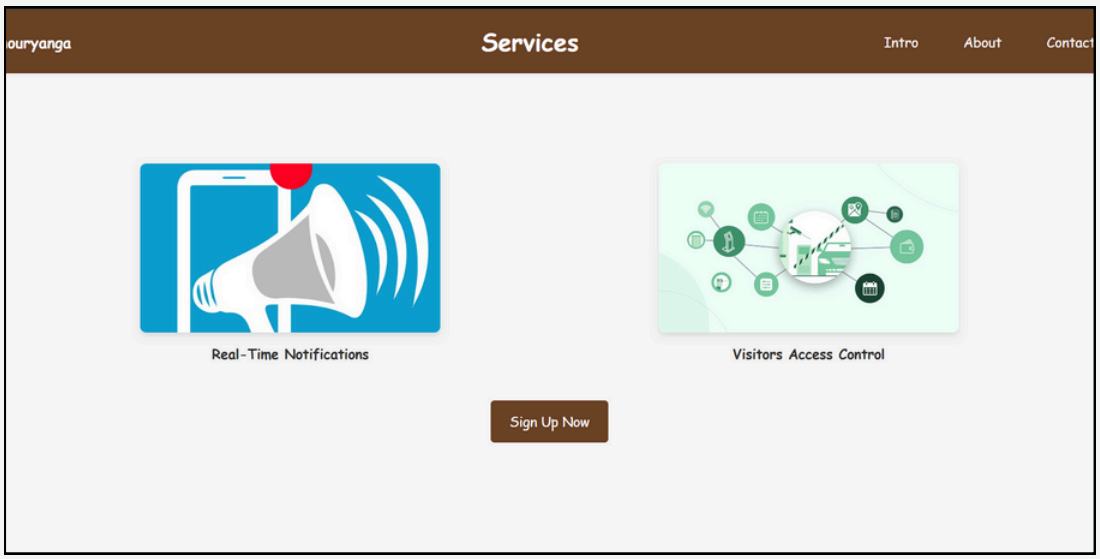
PRA-VIGIL DOCUMENTATION



This is the about page



This is the contact page



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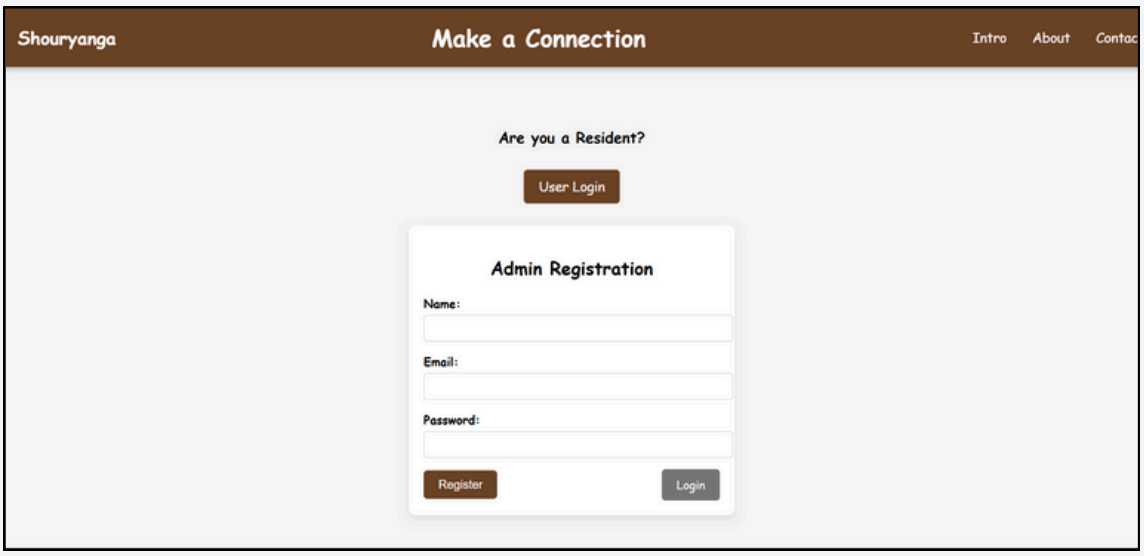
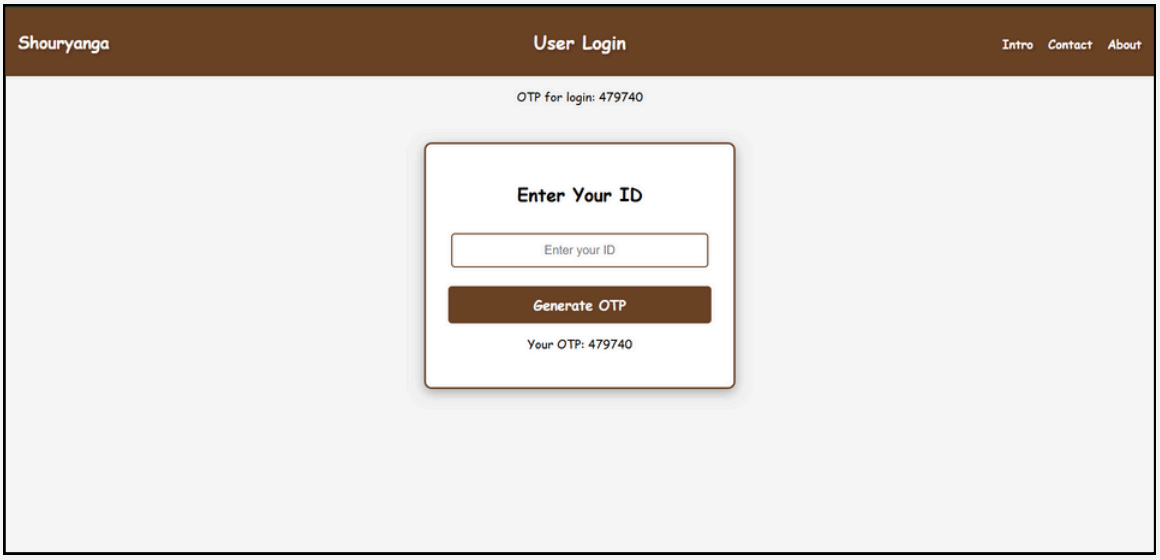
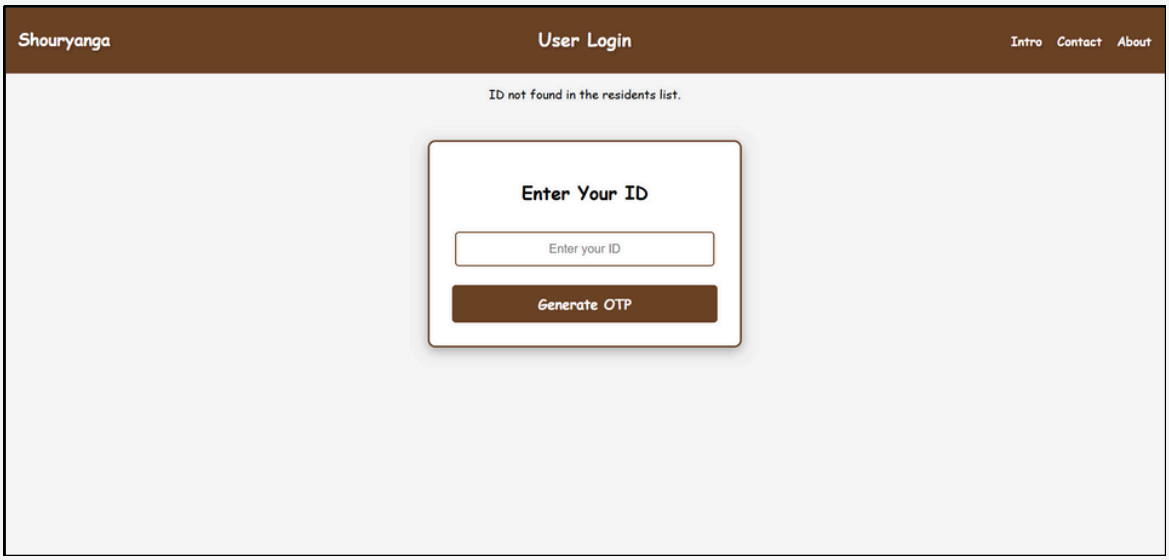


This page contain buttons for resident login for otp generation and new admin registeration and a login button for already exsisting admins to login



We need to enter the ID in the space if ID exsists , OTP will be displayed as shown above. If not it displays a flash message as shown below.



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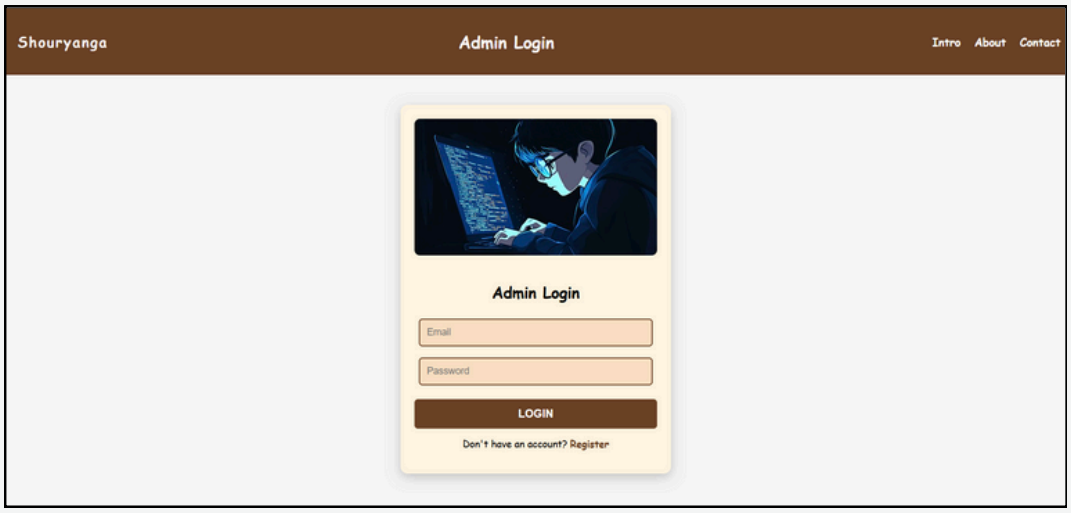
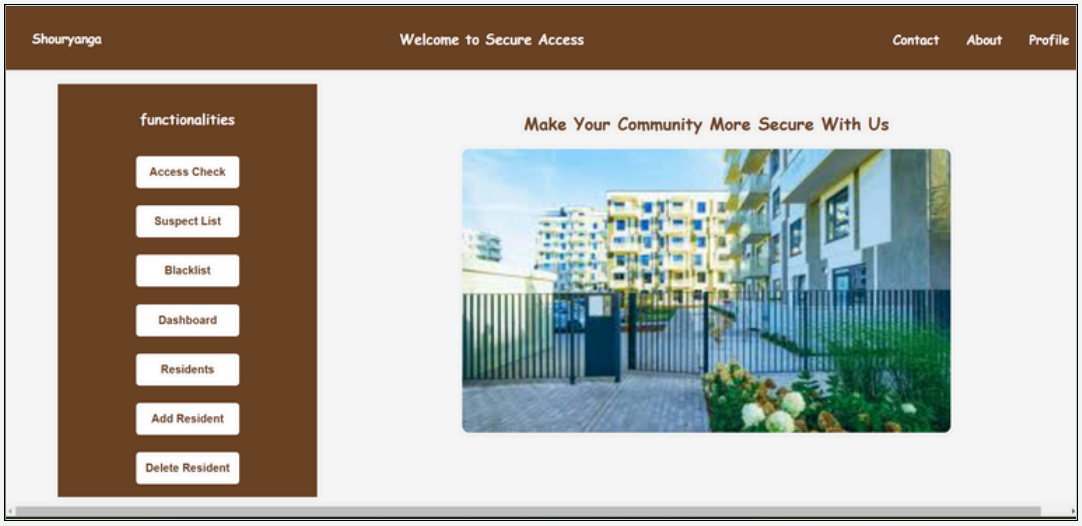
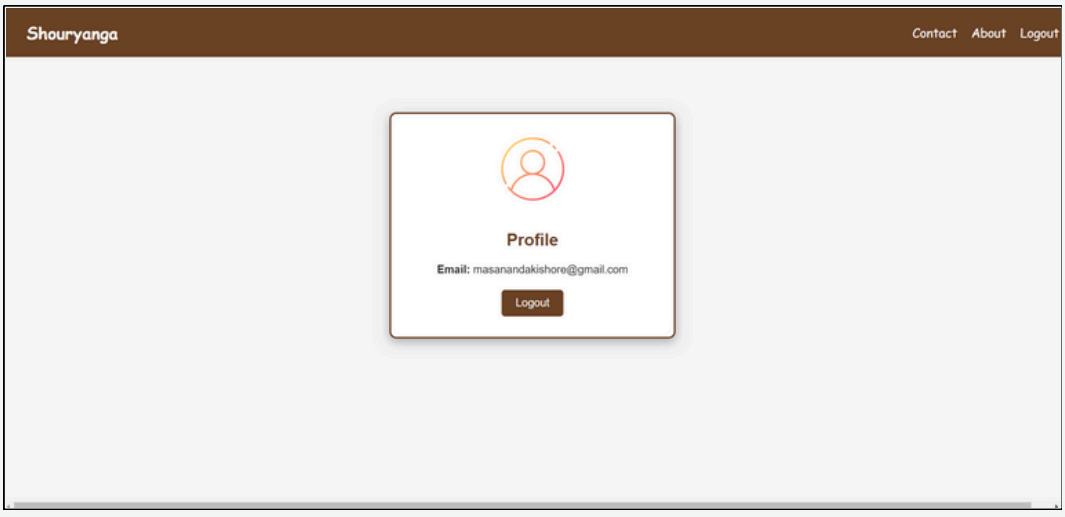


Admin Login Page



This is home page which only be displayed to admins



The session users email Id will be displayed here along with a logout button which redirects to admin login page.

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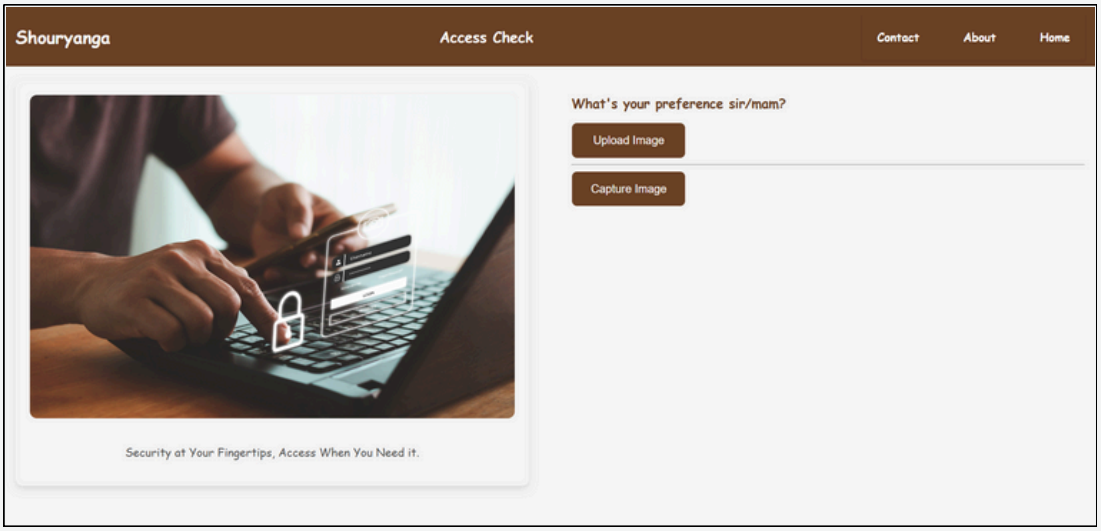
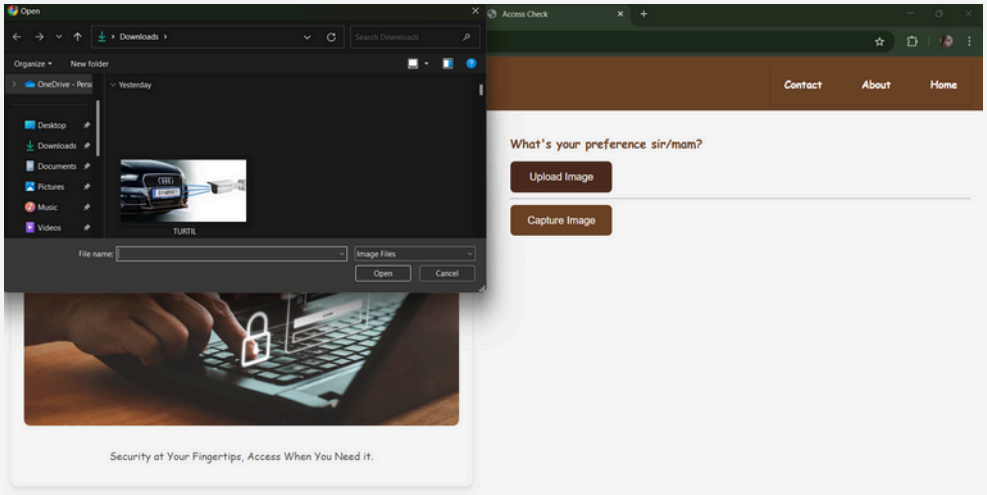
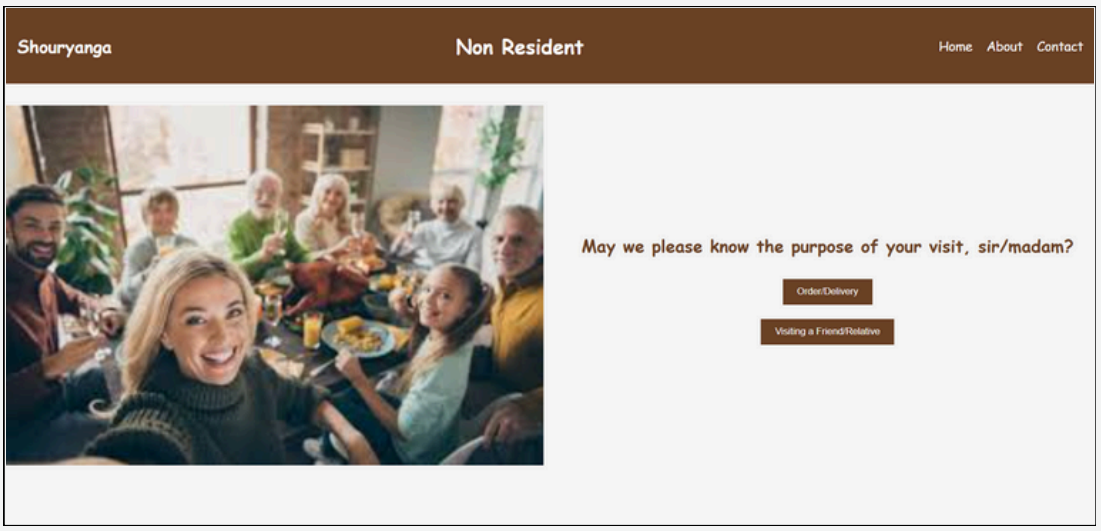


Upon clicking access check button we will be redirected to this page which asks for image upload or capture you need to have a webcam for capturing.only certain file extensions will be accepted here





Incase the extracted vehicle no is not in residents and blocklist it will redirect to this page

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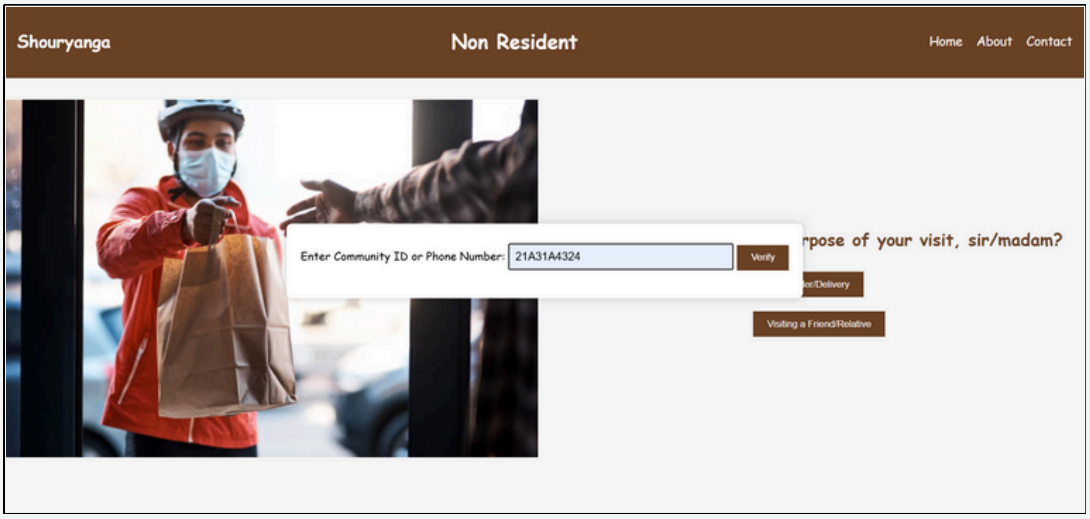
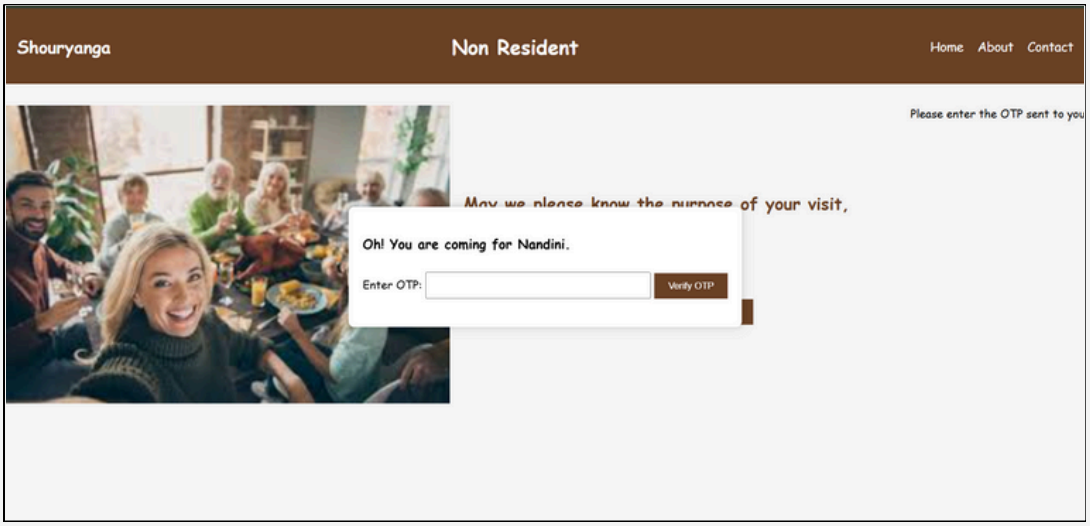
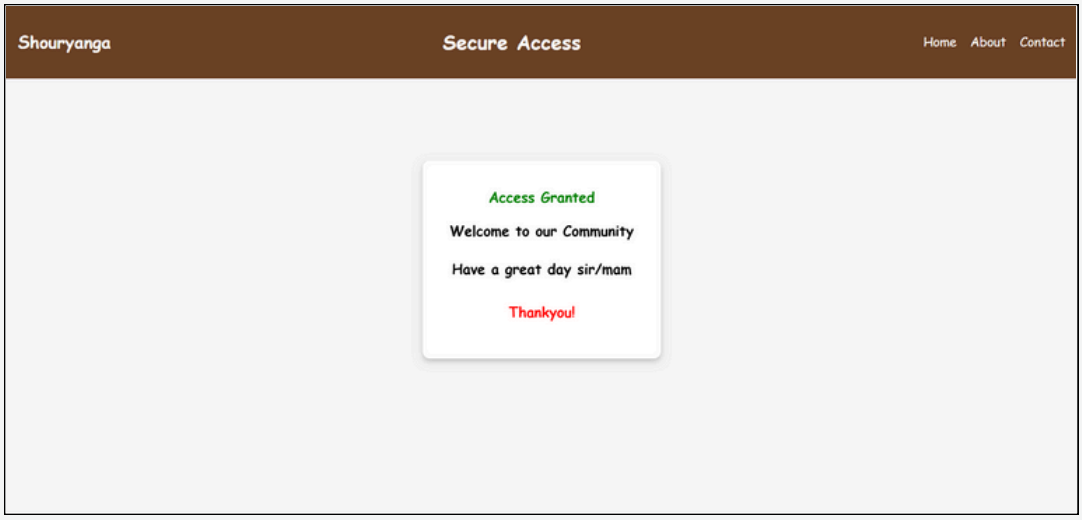


They should tell their purpose of visiting and community ID/phone number of resident they are visiting for to the admin he will verify



Here the visitors should ask the residents for otp which will be generated by them in the user login page for otp verification by communicating to the resident if otp matches then access will be granted and vehicle no will be added to access_granted.csv.



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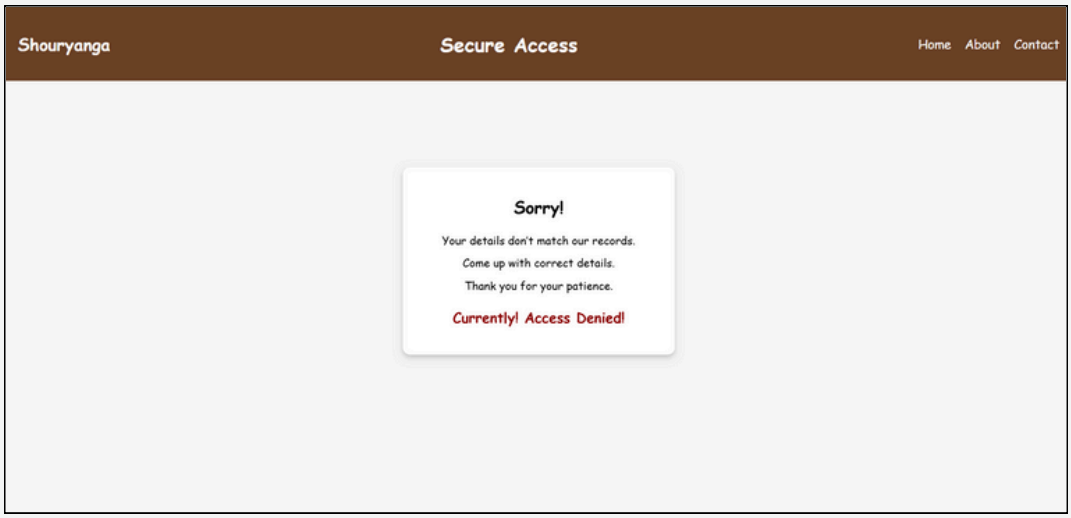
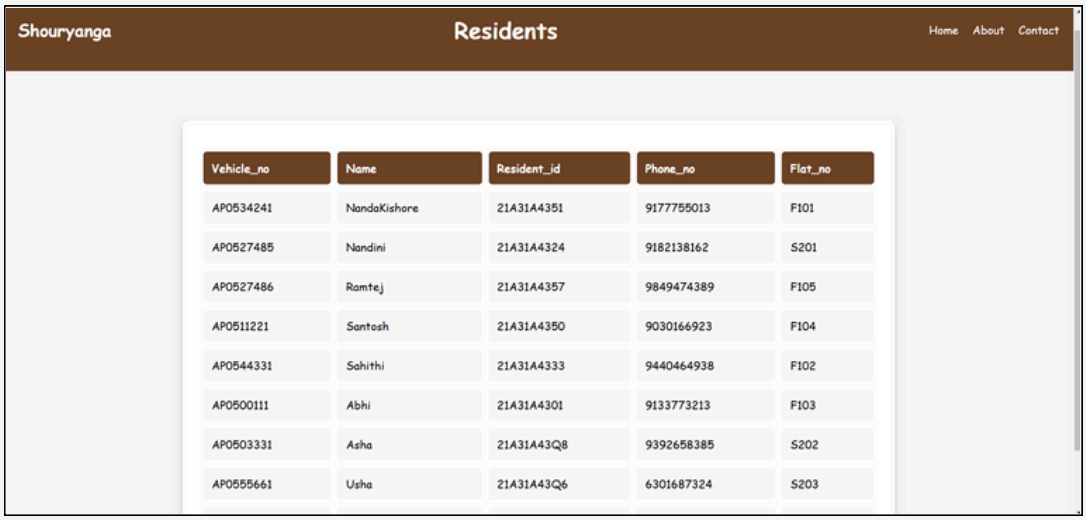
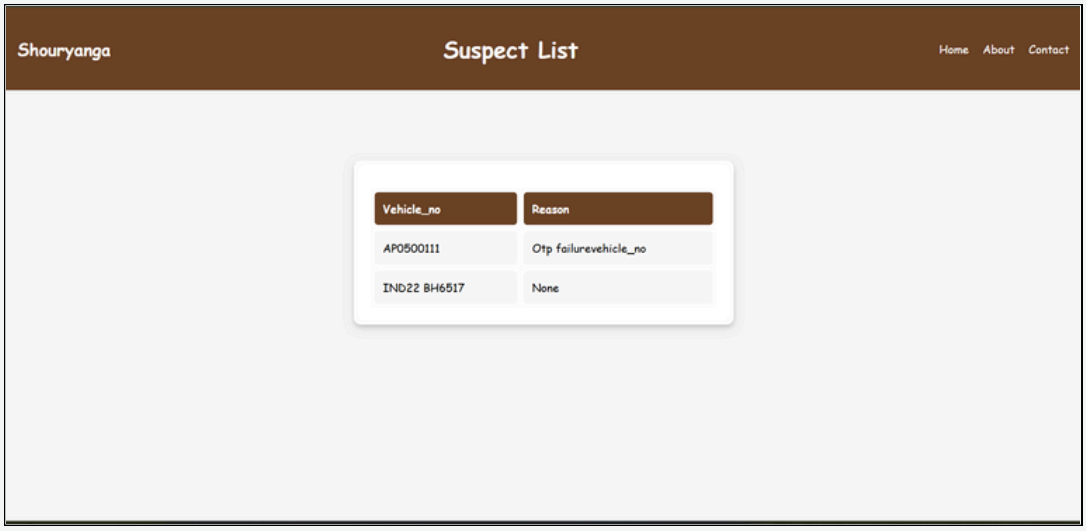


If OTP does not match access will be denied and vehicle no will be added to suspect list .
If OTP failure is more than three times then the vehicle will be added to block list



Residents list



Suspect list

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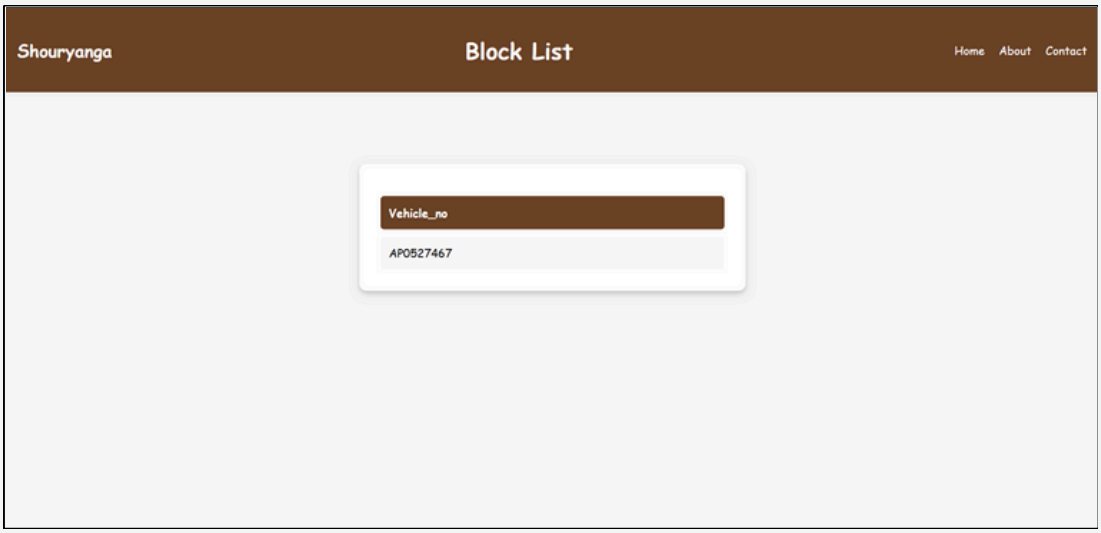
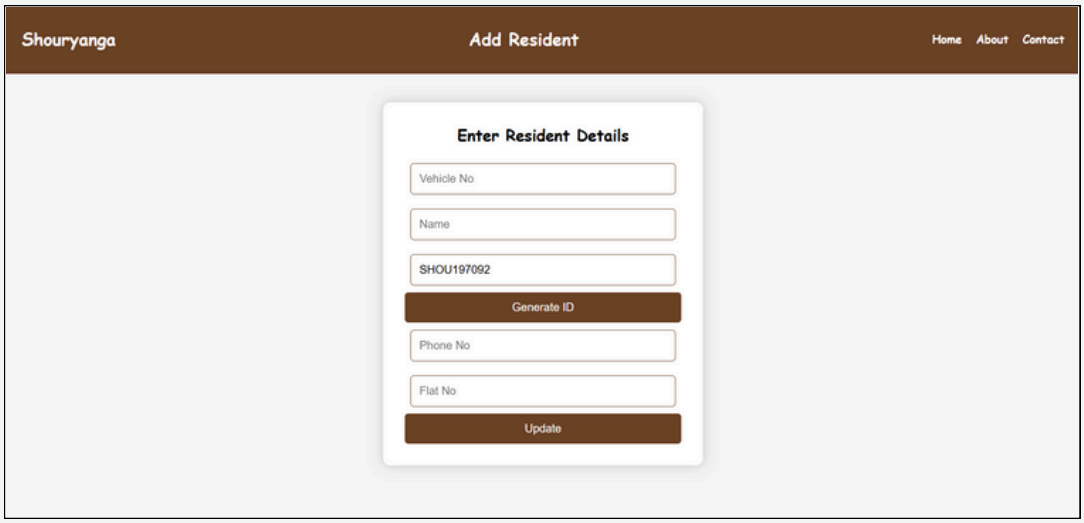
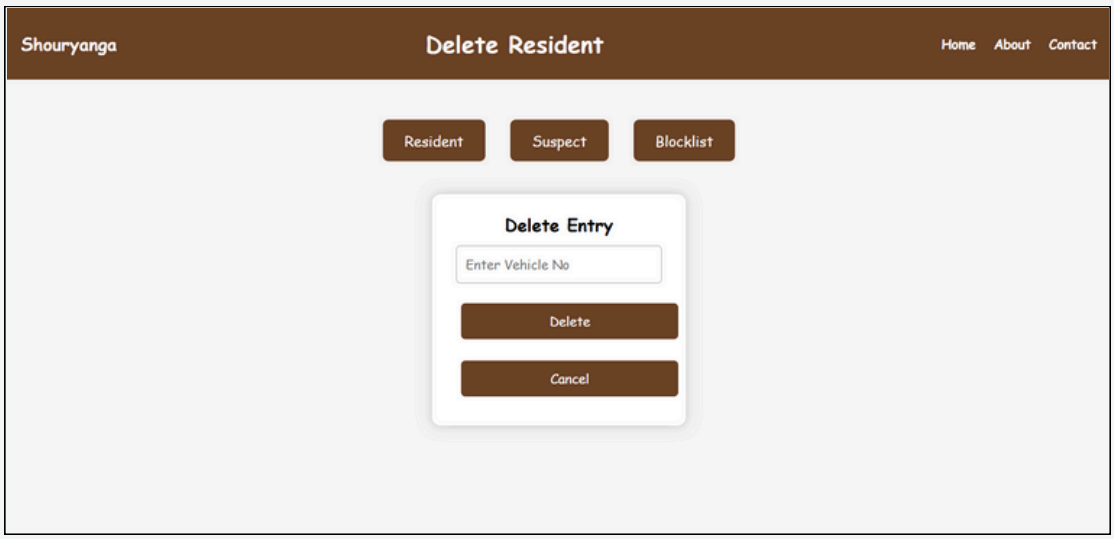


Block list



To add new residents



To delete residents vehicle no from desired list

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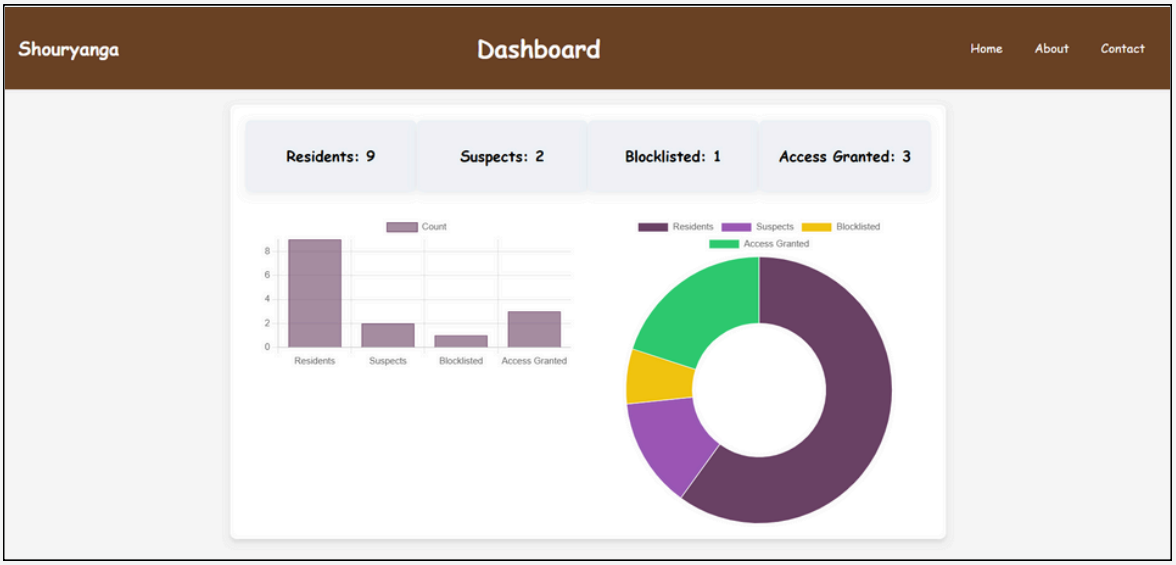

Displays the statics of vehicle entries in a community

SKILL SET USED:

- **FLASK**
- **PYTHON**
- **DEEP LEARNING**
- **HTML**
- **CSS**
- **JAVA SCRIPT**

CONCLUSION:

I have done my project this way , in the journey of future advancements I want to integrate a Wifi camera which will auto clicks images , the procedure will be done by admin and access granted and denied pop ups will be connected to doors of community using Aurdino code to achieve this on fuller level.

In this regard I want to thank my faculty for helping me out in things and teaching me few logics and referred few online resources for better understanding of concepts and implementing few logics. I particularly didn't remember the names of websites to give credits. I used them for better understanding and I delivered this project.