

University of Missouri - Kansas City  
CS 5551 FALL 2018

# SMART POLICE

## ADVANCE SOFTWARE ENGINEERING PROJECT FINAL REPORT

Team 14:

PRANITHA SAROJ KARUMANCHI (24)

GULNOZA KHAKIMOVA (28)

SUSHMASRI SURAPANENI (48)

SAI KALYAN VYTILA (56)

# TABLE OF CONTENTS

- 1. PROJECT DEPLOYMENT
  - 1.1 OBJECTIVE
  - 1.2 MOTIVATION
  - 1.3 WORKFLOW
  - 1.4 DEVICE CONSTRAINTS
- 2. UML DIAGRAMS
  - 2.1 ARCHITECTURE DIAGRAM
  - 2.2 CLASS DIAGRAM
  - 2.3 SEQUENCE DIAGRAM
  - 2.4 USE CASE DIAGRAM
- 3. PROJECT PLAN
  - 3.1 TASKS AND ISSUES
  - 3.2 BURN DOWN CHART
- 4. INCREMENT REPORTS
  - 4.1 GITHUB LINKS
  - 4.2 INCREMENTS
  - 4.3 PRESENTATION SLIDES
  - 4.4 YOUTUBE LINKS
- 5. TESTING

# 1.PROJECT DEPLOYMENT

## 1.1 OBJECTIVE

Purpose of this project to help police and users to find stolen cars and stay safe while car is parked. A lot of cars get stolen nowadays, however it is very difficult to find them right away. Imagine if each driver had an application which will help to identify stolen car right away and report it is location so police can take action accordingly. Also if user gets notified about suspicious person in the car right away, will help to prevent crime and save time.

## 1.2 MOTIVATION

In 2012 in United States, there were an approximately 721,000 car thefts. Property losses due to motor vehicle theft in 2012 were estimated at \$4.3 billion. Our application will help to prevent and identify motor vehicle thefts right away or at least save time to take action. Police departments use various methods of recovering stolen vehicles, such as random checks of vehicles that come in front of a patrol unit, checks of all vehicles parked along a street or within a parking lot using automatic number plate recognition. However there are more drivers on the roads then police, which will make our application more efficient.

## 1.3 HOW IT WORKS

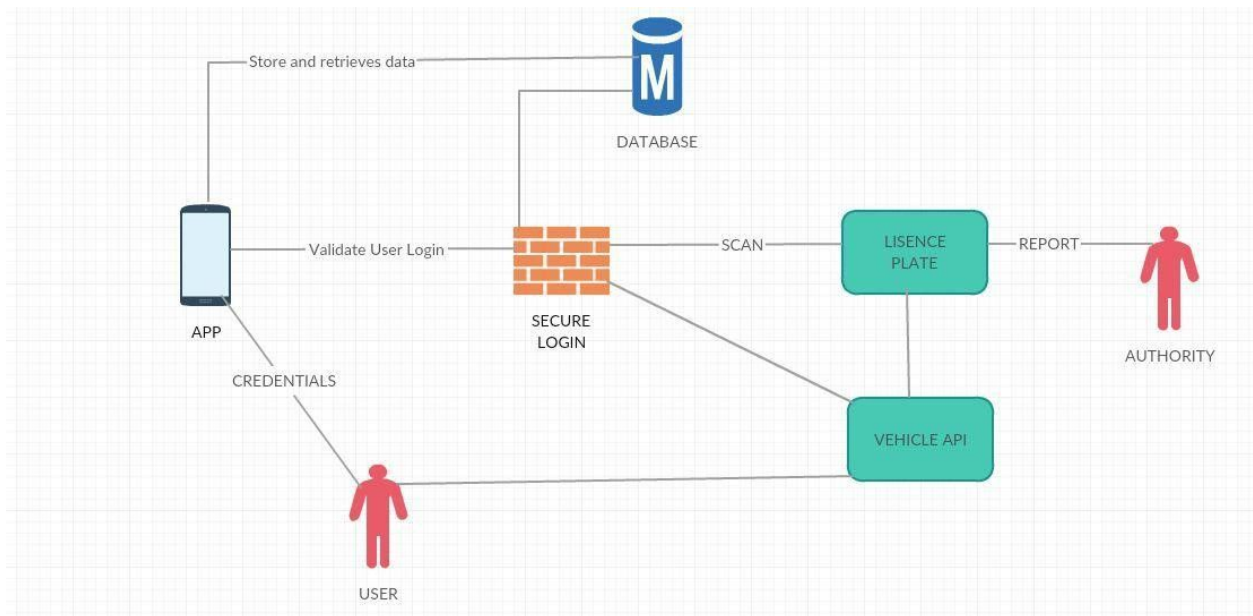
User report his/her car as a stolen on publicly available web application which will save record to our database so users can start searching for stolen car. When stolen car is noticed by users, owner of the car gets notification about location of his car. A;so user can upload his and his family member pictures who might be driving his car, so when car is parked and suspicious person gets into the car user also gets a notification regarding suspicious activity in his vehicle.

## 1.4 DEVICE CONSTRAINTS:

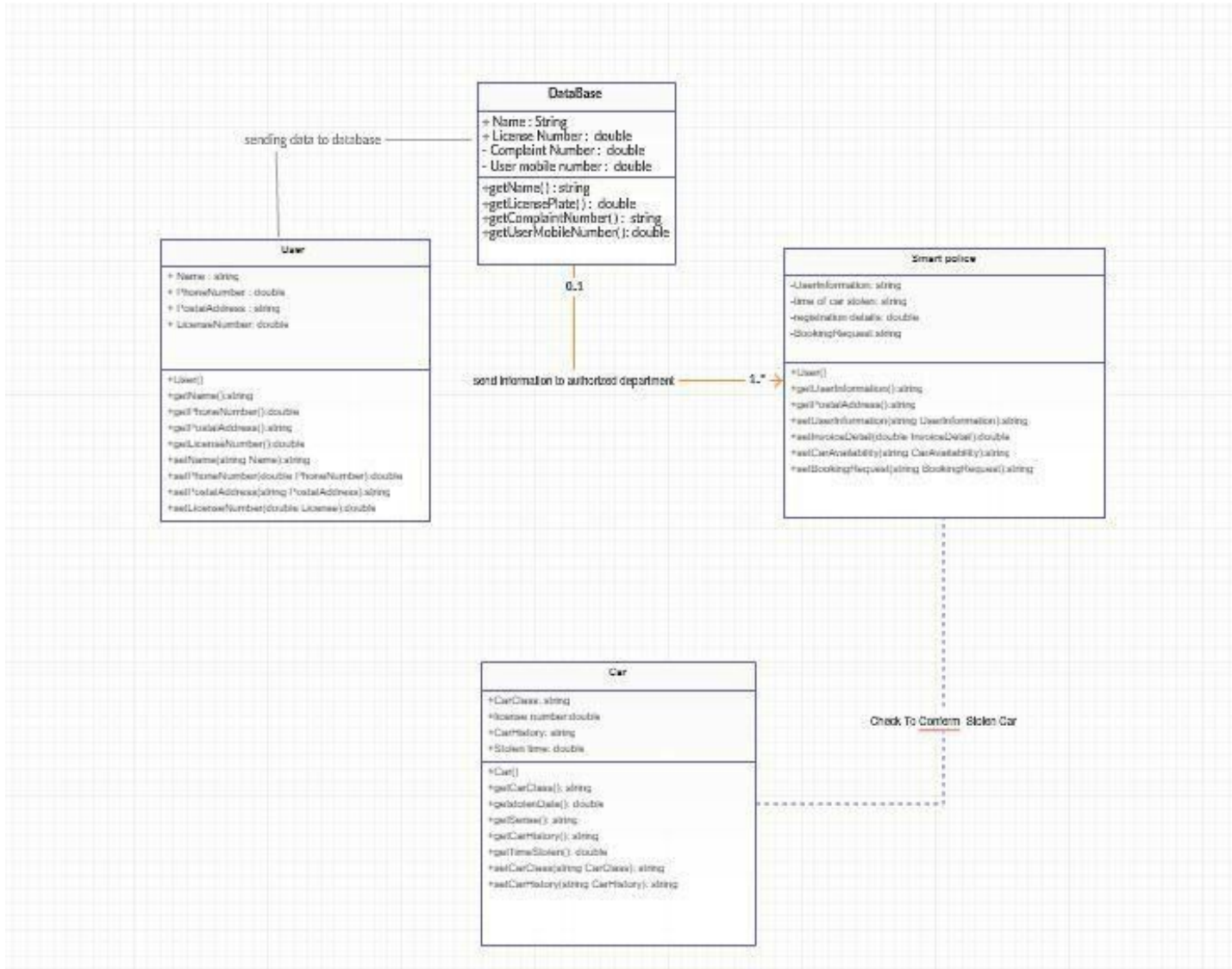
There is Web application which runs on any browser and Android Mobile application.

## 2.UML DIAGRAMS

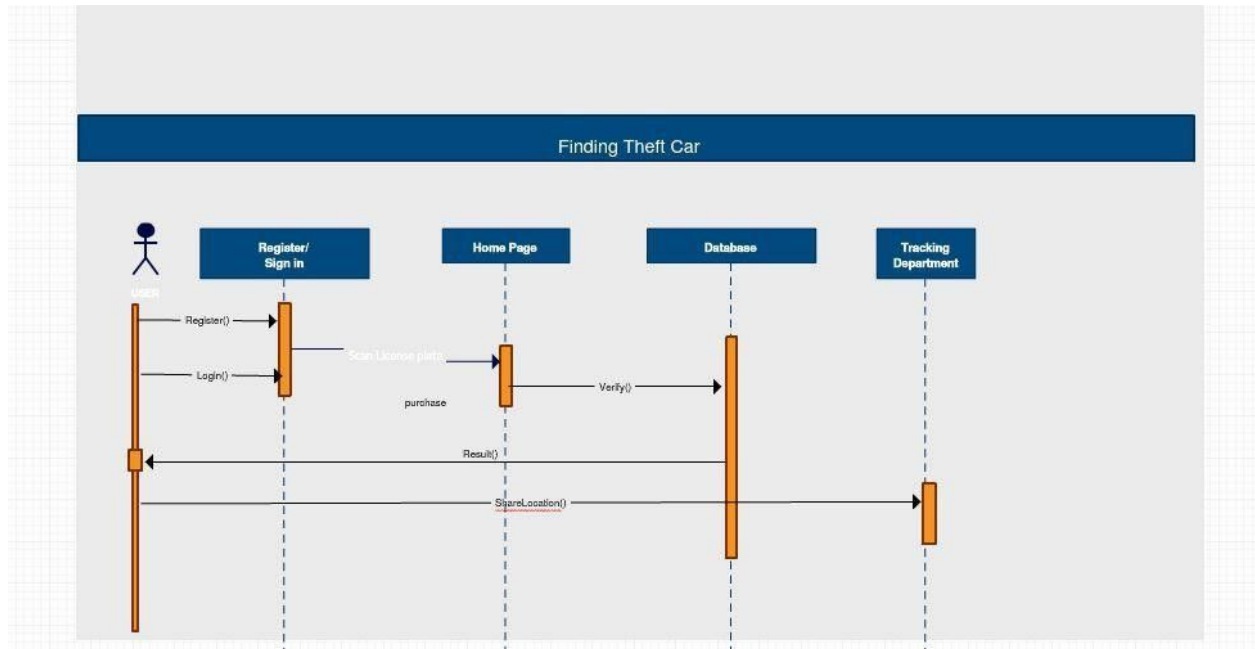
### 2.1 ARCHITECTURE DIAGRAM



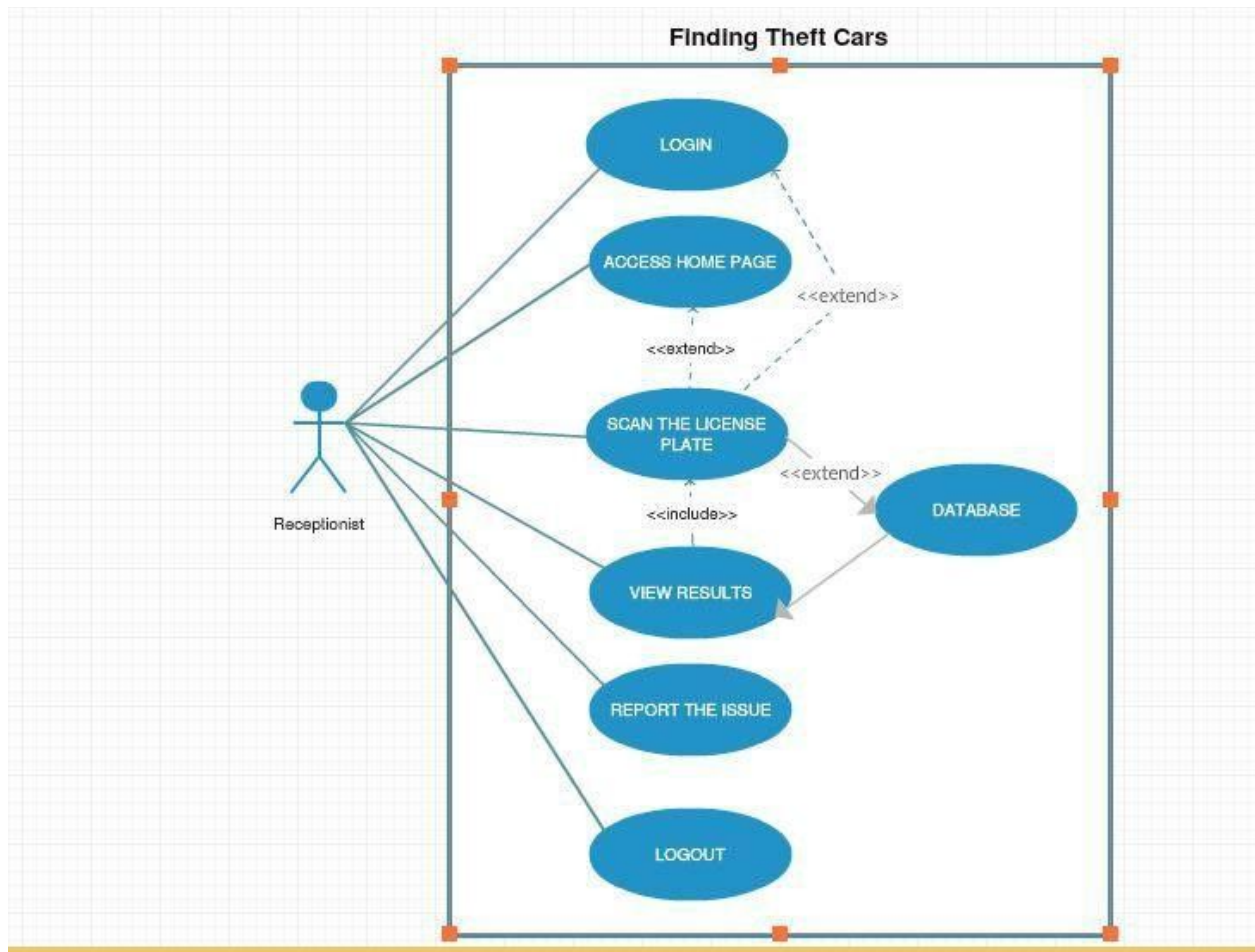
## 2.2 CLASS DIAGRAM



## 2.3 SEQUENCE DIAGRAM



## 2.4 USE CASE DIAGRAM



### 3. PROJECT PLAN

#### 3.1 TASKS AND ISSUES

- Create outline of the project
- Choose needed APIs, Databases, Cloud services and IDEs to implement application.
- Create Web application to report car as stolen, which sends data to Mongo DB.
- Create login page with authentication using Firebase database, implement social media login (Facebook Login).
- Create Sign Up page for users who does not have an account which sends records to Firebase database.
- Create server and deploy it to Heroku to be able to connect to databases and Twilio API - for message notification.
- Create license plate and vehicle recognition using OpenAL API, check if car is in Mongo DB and if vehicle is marked as stolen.
- Create Face verification using Cognitive Azure Services Face API.
- Create notification activity using Twilio API and send notification to the user by sending location of the device.
- Create user friendly UI.

#### 3.2 BURNDOWN CHART

### 4. INCREMENT REPORTS

#### 4.1 GitHub LINKS

GitHub URL:

[Smart Police Project](#)

INCREMENT-1:

[Project Increment 1](#)

### Objectives

The main goal of this application system is to provide the easy way to find the stolen car. Our app contains cameras which will scan the license plates either on the way or even in the parking slots and then it check whether it has any allegations or crime report active on that plate. Then, finally, it is reported to the police, which makes policemen job easy.

### Motivation

If a car is stolen, user will log a complaint about the lost car in the police department. Police will update the stolen license number to the database. If any of car's camera scans the license plate of the stolen car, then the user location is immediately sent to the police department if we could find



an evidence of the stole car then the required action will be taken by the department. We would like to create an android application for this showing the login and signup pages in order to access their location.

## Significance

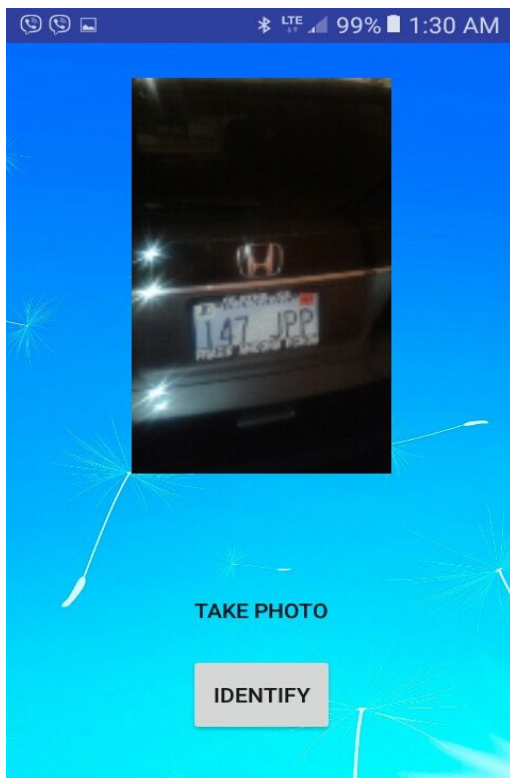
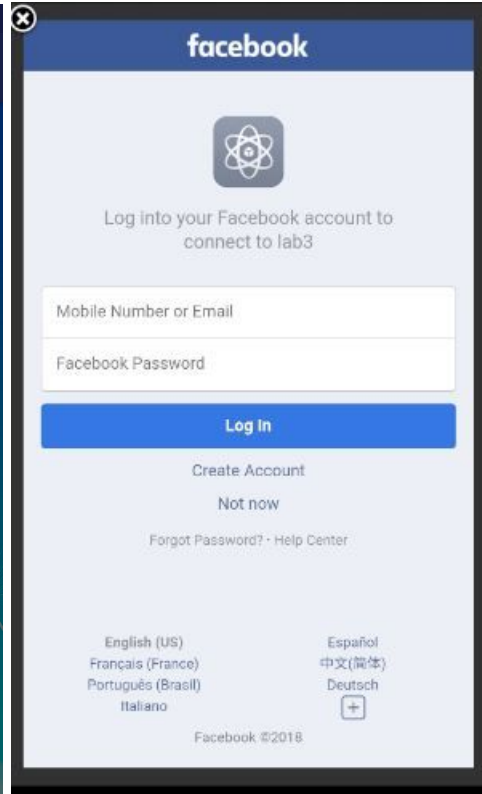
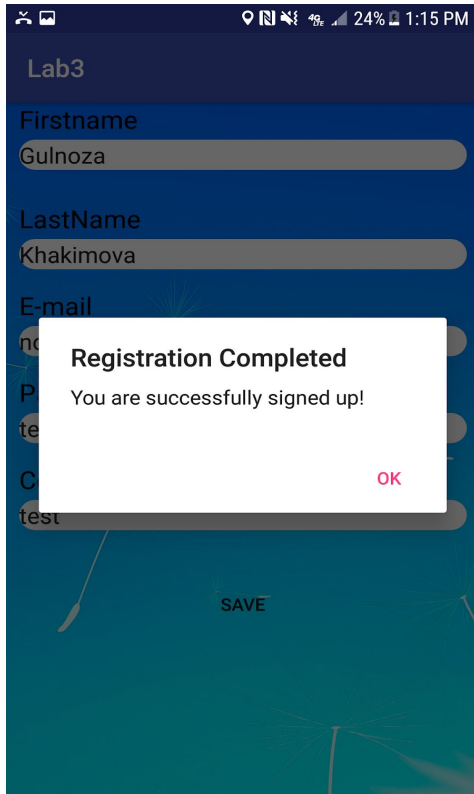
Technology is evolving every day, so creating an interactive web application by reaching our goal within the time frame is our major objective. The key thing of the application is to provide the details of the theft cars and any other related cases on that car We personally take care in building a real-time system that is user-friendly and reachable to everyone and make sure it improves the security system. This app after scanning details of that plate it gives details like is that car theft.

## System Features

In order to implement our application, we will need to work on Android Studio and use different APIs which will help us to scan the license plate. We will be testing our application on the real device with real products.

## OUTPUT

Firstname	Firstname
<input type="text"/>	Gulnoza
LastName	LastName
<input type="text"/>	Khakimova
E-mail	E-mail
<input type="text"/>	nonosha@mail.ru
Password	Password
<input type="text"/>	test
Confirm Password	Confirm Password
<input type="text"/>	test
SAVE	SAVE



## INCREMENT-2

### Project Increment 2

#### 1.INTRODUCTION

In our day to day life, safety places a major role. Car accidents, our cars been stolen these are some of the common issues nowadays. So, this application mainly focuses on the detection of the vehicle whether it is stolen or not by the license plate.

#### 2.PROJECT GOALS AND OBJECTIVES

##### OVERALL GOAL:

The main goal of this application is to provide a secure and easy way to find the stolen cars using the license plate. In this application where scanning the license plate and getting the information is the major part. For this, we call different APIs to get the information.

##### SPECIFIC OBJECTIVES:

The objective of this application is to find whether the car is stolen or whether it has any reports like crash activity happened in the past. In this application, we have a camera from which we get the input and check the image data with the database and get the result of that particular car. Therefore it would be easy to find the stolen car in a very efficient manner.

##### SPECIFIC FEATURES:

Using the camera we can upload the image and find the data easily We can also go through the records round the clock anytime anywhere We can easily identify the car if it was stolen or crashed We can notify the police by updating the data by giving car license number and whether it is crashed or stolen.

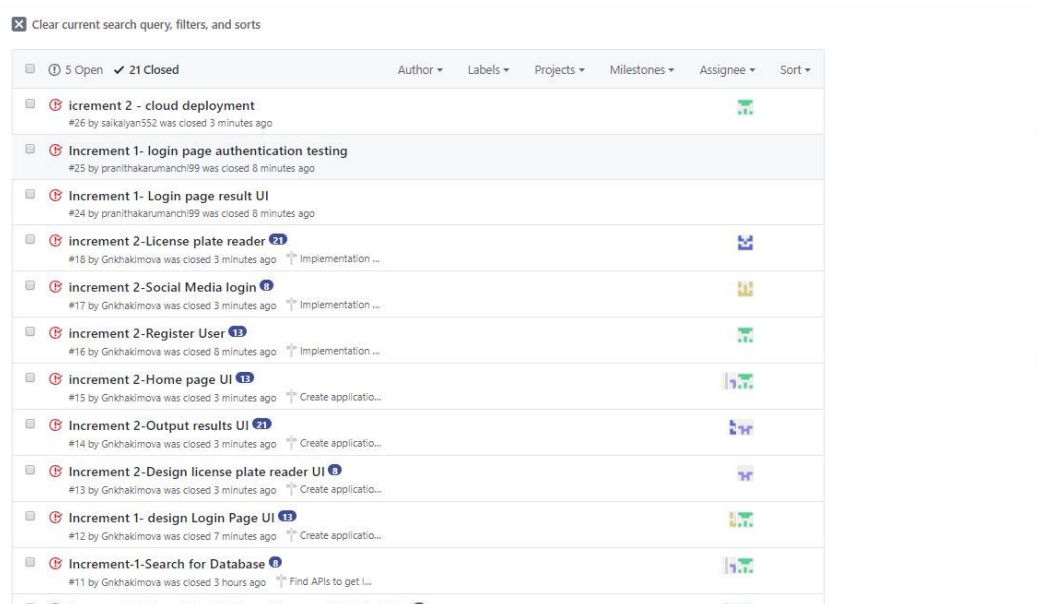
##### SIGNIFICANCE:

As there is too many application which provides you the information about the car whereas our application seemed to be different as it is mobile friendly and easy to access and get the information on a single click. Our application is also seemed to be worth of time as it processes the information and produces data about the car as it is stolen or crashed in minutes so, it would be easy to report to police.

### 3.PROJECT PLAN

#### ZEN-HUB SCREENSHOT

In the second increment, we have different issues related to social media login, license plate reader, getting details of the car. Which includes API for reading the license plate and another API to make calls to the database and get the result.



Clear current search query, filters, and sorts

	5 Open	21 Closed	Author	Labels	Projects	Milestones	Assignee	Sort
Increment 2 - cloud deployment			#26 by saikalyan552					
Increment 1- login page authentication testing			#25 by pranithakarumanchi99					
Increment 1- Login page result UI			#24 by pranithakarumanchi99					
Increment 2-License plate reader			#18 by Grikhakimova					
Increment 2-Social Media login			#17 by Grikhakimova					
Increment 2-Register User			#16 by Grikhakimova					
Increment 2-Home page UI			#15 by Grikhakimova					
Increment 2-Output results UI			#14 by Grikhakimova					
Increment 2-Design license plate reader UI			#13 by Grikhakimova					
Increment 1- design Login Page UI			#12 by Grikhakimova					
Increment-1-Search for Database			#11 by Grikhakimova					

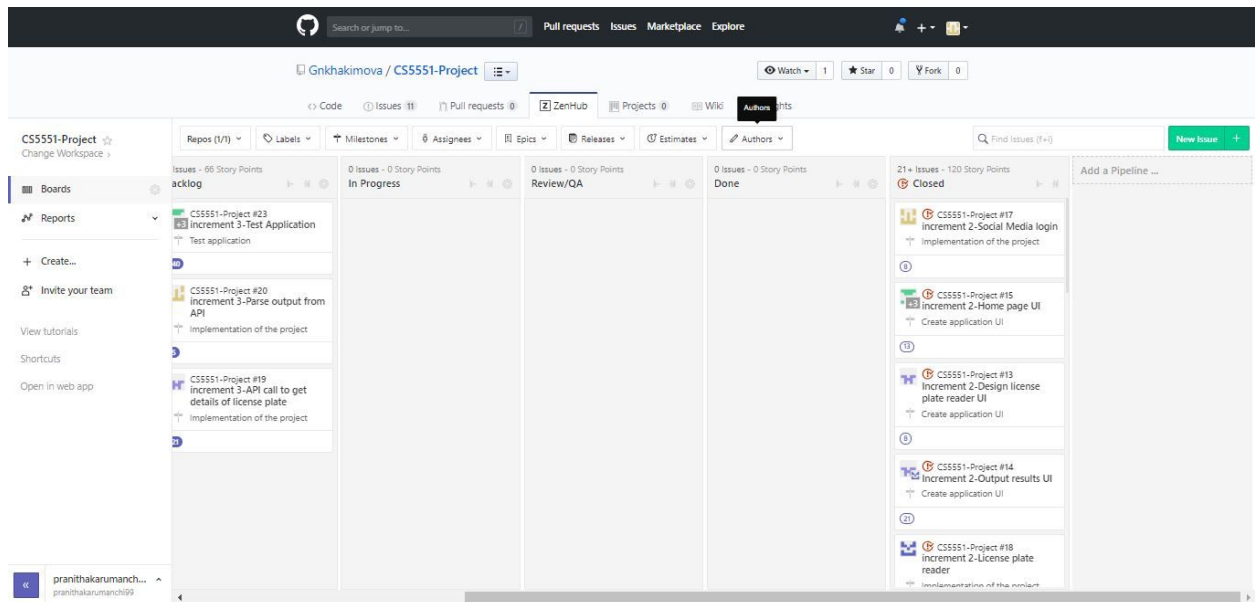
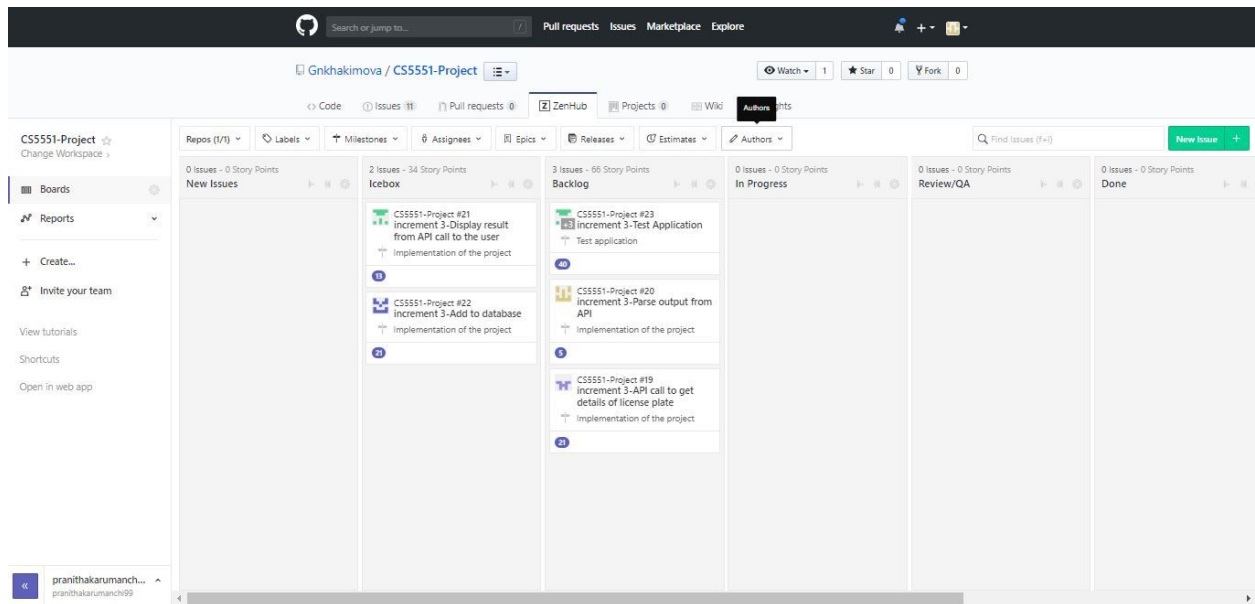
#### STORIES

- As a user, we want to login to the page
- We need to take a picture of the license plate
- It displays the result of the license plate
- The user needs to enter license plate details if needed to know whether it is stolen or not

- Now the search is done by license number and displays the result by retrieving data from the database

## PROJECT TIMELINE, MEMBERS AND TASK RESPONSIBILITY

We have created the issues according to the work. The below screenshots are the issues in their respective categorization based on the completion of the work.



## BURN-DOWN CHART

We have created the burndown chart for the issues we created and we also attached milestones for that. Below are the respective screenshots for the burndown chart.



## 4.SECOND INCREMENT REPORT

### EXISTING SERVICES/REST API's USED

**FACEBOOK API:** We gave Facebook as an OAuth login to the users for login into the application. It is the easy way to login for many of the users as it is one of the common social media.

**OpenALPR:** This API is used in the application to get the details of the car by taking the picture of the license plate, it returns Plate number, Model, Year, State and color of the vehicle.

**HEROKU:** It is a pass, it allows us to deploy our application and make calls to get the information available to our application. We create a server using Node.js and added two endpoints for adding and searching license plate. Added MongoDB dependencies to it so our server will have access to our database. We are passing plate number to GET request and getting information if the car is stolen or if it was involved in the car accident. Also, we can add plate

number into our database. Since we could not find any open and free APIs to get information about the vehicle we created our own server with example data-sets.

Clarifai API: We are using Clarifai to predict image by passing image URL. We are using the General model to perform image recognition and displaying the first three results. We tried to perform person could but is not available within Clarifai yet.

## USER STORIES

- As a user I want to login to the application so that I can access the application.
- As a user I want to use the camera so that I can click the picture.
- As a user, I want to take a picture of the license plate so that it is verified.
- As a user I want to check the result of the car so that I can notify to police as it is stolen.

## IMPLEMENTATION AND DEPLOYMENT

The image displays two screenshots of a web application interface. The left screenshot shows a login screen with a blue background. It features a 'Login' title, a 'Username/Email' input field, a 'Password' input field, and three buttons: 'LOGIN', 'SIGN UP', and 'FACEBOOK LOGIN'. The right screenshot shows a registration screen with a blue background. It features a 'First Name' input field, a 'Last Name' input field, an 'E-mail' input field, a 'Password' input field, a 'Confirm Password' input field, and a 'SAVE' button.



Firstname  
Gulnoza

LastName  
Khakimova

E-mail  
nonosha@mail.ru

Password  
test

Confirm Password  
test

SAVE

Lab3

Firstname  
Gulnoza

LastName  
Khakimova

E-mail  
nonosha@mail.ru

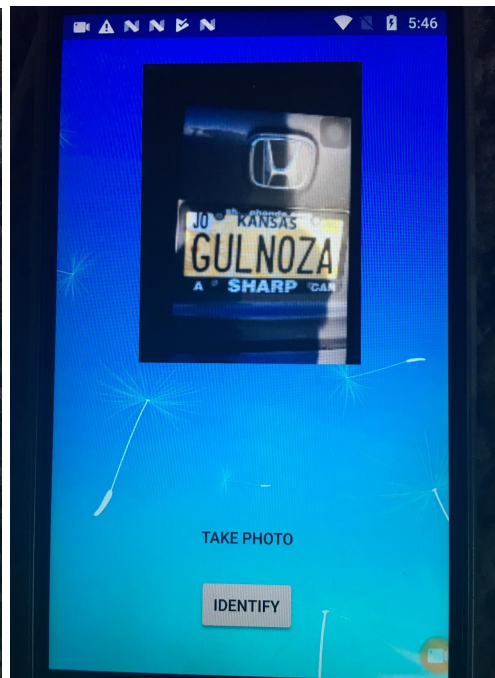
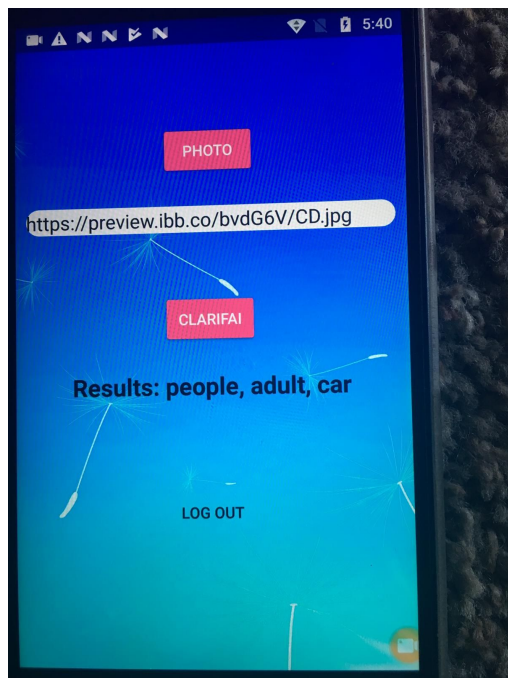
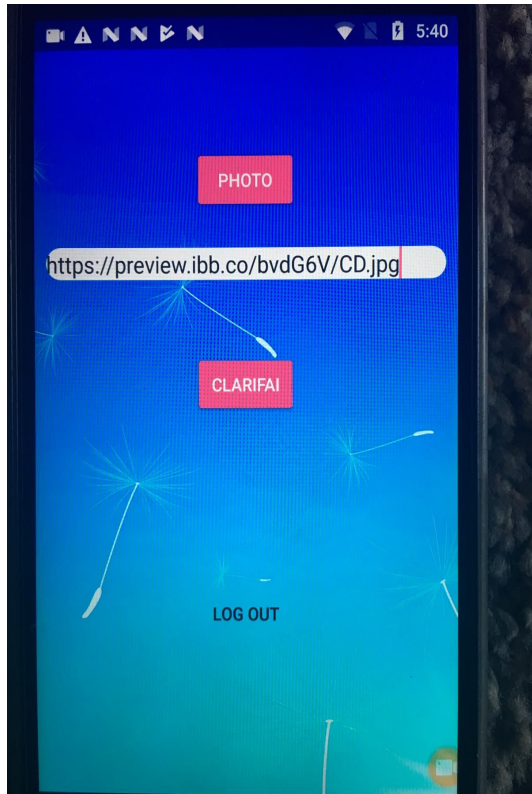
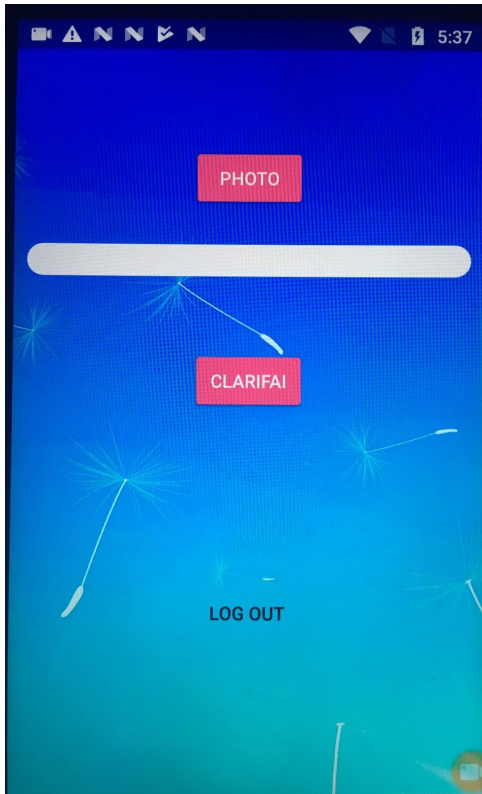
Password  
test

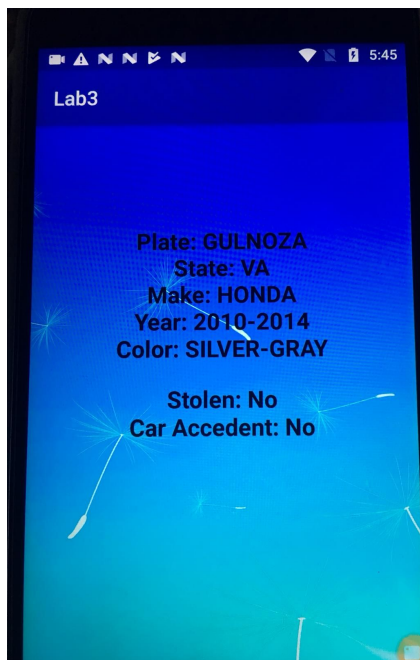
Confirm Password  
test

SAVE

**Registration Completed**  
You are successfully signed up!

OK





## PROJECT MANAGEMENT

### Work Completed

The tasks we completed in this increment

- Clarifai API used for getting information about image with passengers in the car.
- Mlab, Mongo DB and Firebase DB are used to store the database.
- Heroku to deploy our application and get access by making calls.

### INCREMENT-3

#### [Project Increment 3](#)

##### INTRODUCTION

In these days the car was stolen, cars been crashed are the common problems everyone is facing. So, our application helps the people in finding the stolen cars and it also helps in finding the crashed cars. Which makes work easy for the public and police.

##### PROJECT GOALS AND OBJECTIVES

**OVERALL GOAL** The overall goal of this application is to find the stolen car or crashed car and then getting the location of the car. Once after getting the location, it will be sent to the user as a message. For doing all this we use different APIs to get real-time data.

##### SPECIFIC OBJECTIVES

The main objectives of this application are to find whether the car is stolen or not and also is it crashed or not. It also obtains the location of the stolen car and then sends the message to the user about that particular car. A user can also enter the details of the car like it is stolen or crashed. So, that one can add information and can also get the information about the car by searching the license plate.

##### SPECIFIC FEATURES

The important features like using the camera to click the license plate and find it whether it is stolen or crashed. The location update is also one of the key features, in this application we get the location of the stolen car and is updated to the user.

## STORIES

- User will login to the application.
- On begin user use the camera to take a picture
- Using clarify user get the result
- If the result shows that car is stolen then it sends the message to an owner
- Owner gets the car location.
- If the result shows car is not stolen user goes back to home.

## 4.THIRD INCREMENT REPORT

### EXISTING SERVICES/REST API'S USED

- For this project we have used OpenAL API to get license plate.
- Using Heroku we have deployed endpoints.
- Mongoddb : store data and handling data related operations(update,delete,add)
- To enter text we have created server.
- Face verification is used to check if the owner is present in the car or not.
- Our application has two modes online and offline.
- Online while driving and scanning license plates.
- Offline to check if the owner is present or not.
- For face detection, we are using Azure Cognitive Services
- Face API - which is machine learning API - using two endpoints Detect and Verify
- Twilio - cloud communication platform used for sending text message regarding the location of stolen car.

LOGIN

EMAIL/MOBILE

PASSWORD

☐ REMEMBER ME

→

Continue with Facebook

SIGN UP

Sign Up

NAME

EMAIL/MOBILE

PASSWORD

☐ Agree to Our Terms & Conditions

→

Already have an Account

SIGN IN

SMART POLICE

ONLINE

OFFLINE

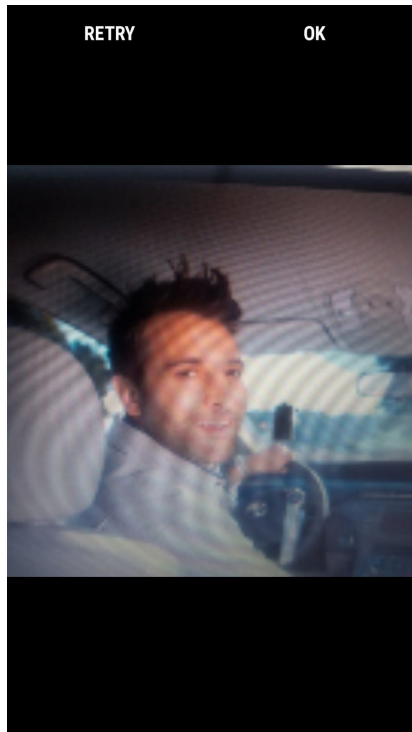
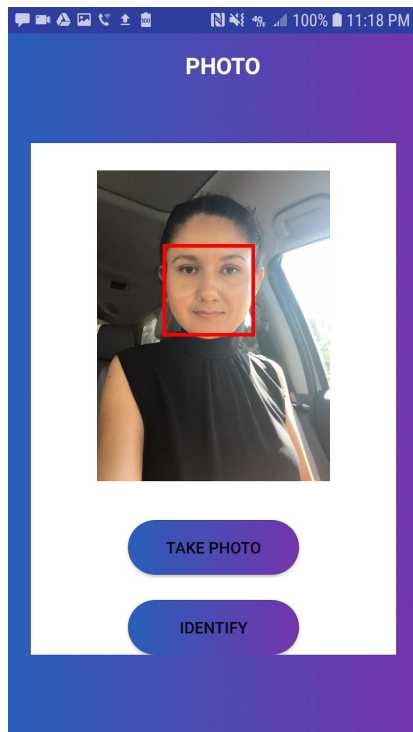
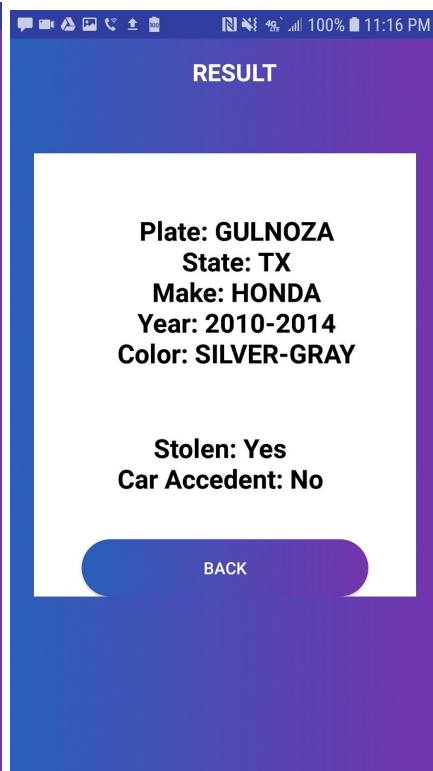
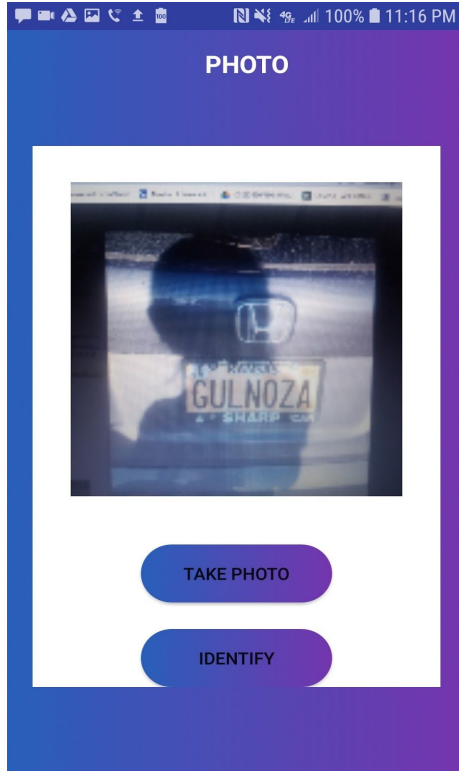
RETRY

OK

GULNOZA

SHARP





Information Page

LicensePlate

State

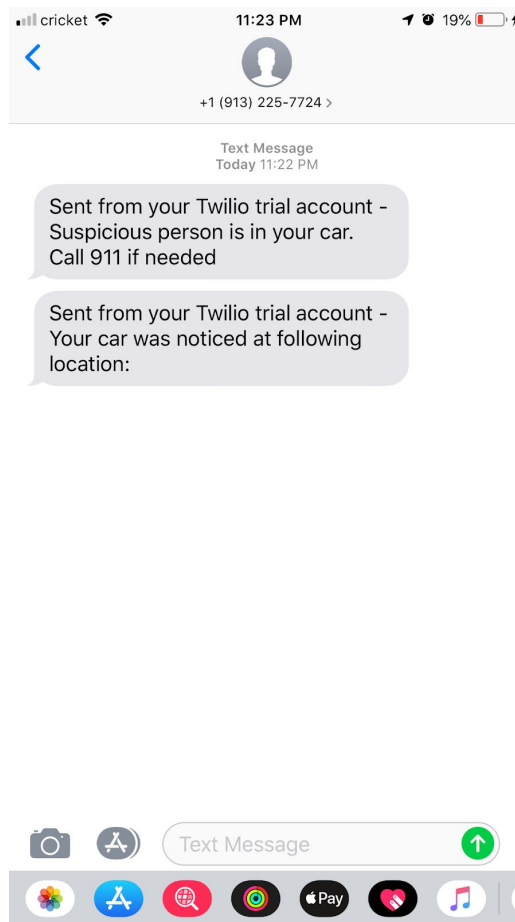
Make

Stolen

Color

Car Accident

REPORT





## PROJECT MANAGEMENT

### WORK COMPLETED

- Used OpenAL API to get license plate.
- MongoDB : store data and handling data related operations.
- Face verification is used to check if the owner is present in the car or not.
- For face detection, we are using Azure Cognitive Services

## 4.3 PRESENTATION SLIDES AND YOUTUBE VIDEO LINK

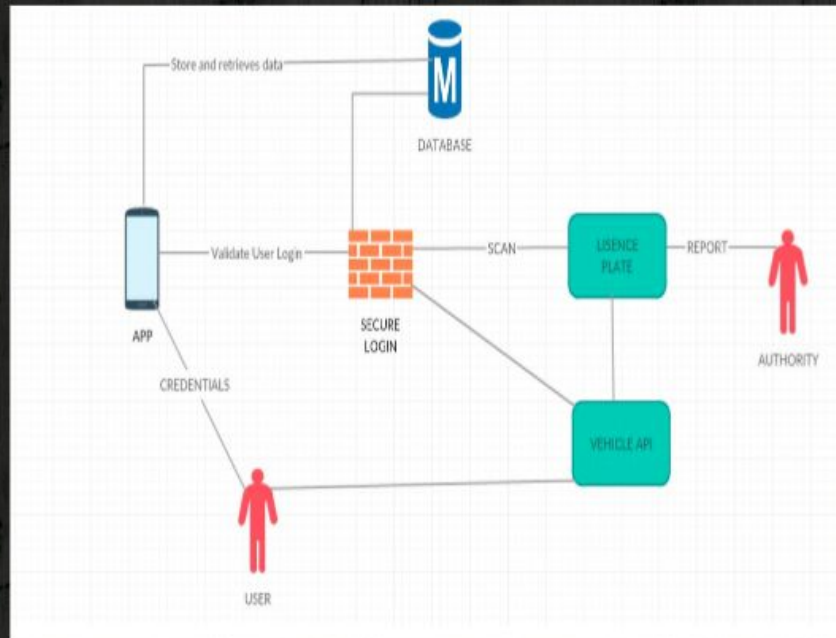
### PROJECT PRESENTATION



## Motivation

---

- The goal of this project is to create an application which will help police and owners to find stolen cars by scanning license plates.
- Applying has two modes:
  - ❖ Online – scans license plate number and return whether vehicle was stolen or not
  - ❖ Offline – camera snaps photo of the person in the car and compares it with owner of the car.
- Then, finally, it is reported to the user, which makes they live more secure.



---

## Architecture

## Application Modes

---

### Online

Snaps a photo of license plate performs scanning to get plate number, color of the vehicle, plate state, make of the vehicle and year. If stolen car is noticed, owner gets notified.

### Offline

Snaps photo of the person in the car and image gets compared against image of the owner and family member, if identity is less than 70% owner and family member gets notification.

## Technologies used

---



### Android and Web Application

Mobile application helps to find stolen cars and report if suspicious person in the car. Web application is used to report if your car has been stolen.



### OpenAL API

Performs license plate scanning to get plate number, color of the vehicle, make etc.



### Azure Cognitive Services

Face API is used to verify that person in the car is owner of the vehicle.



### Firebase, Mongo DB

Database to store data and perform authentication,



### Twilio

User gets message notification when stolen car is noticed



### Heroku

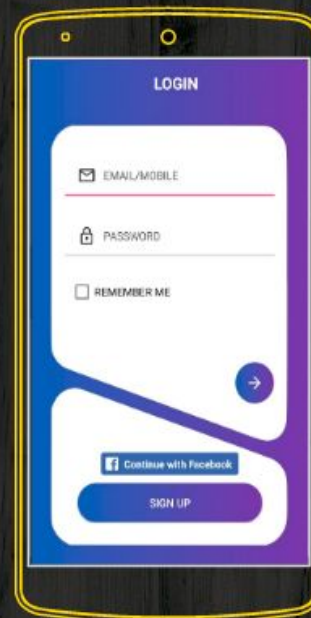
Deployed endpoints to Heroku to be able to access Databases and Twilio





## Web Application

Publicly available web application from where users can mark their cars as stolen.



## Login Page

User can sign up if he does not have an account yet, also Facebook can be used to login.

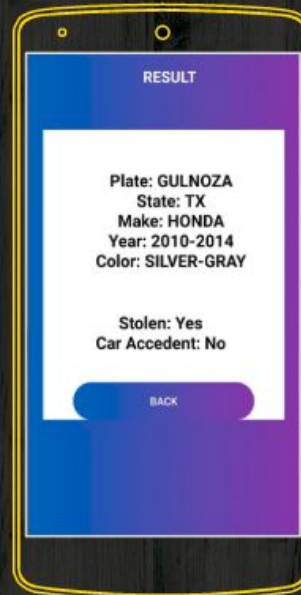
## Main Page

Application has two modes: Online and Offline



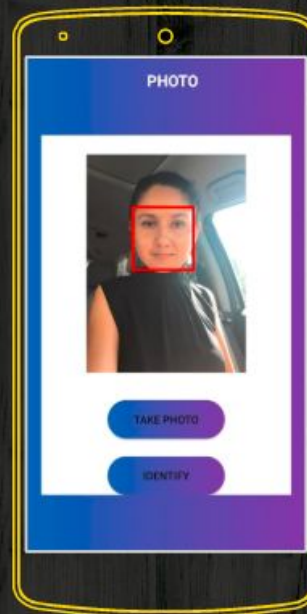
## Online Mode

Stolen car was noticed by application which also returns additional information about the car



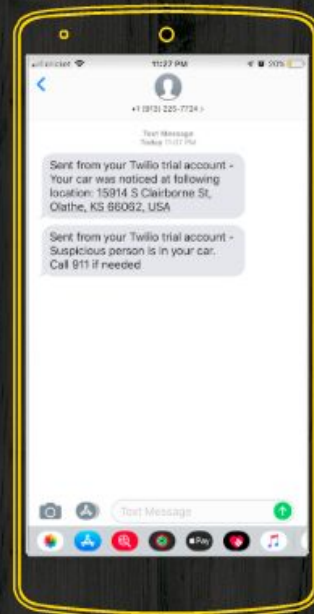
## Offline Mode

Person was noticed in the car and application performed face recognition



## Notification by message

User gets notified when his car noticed or person in the car is not owner.



### 4.4 YOUTUBE LINK

[Smart Police Demo](#)



## 5. TESTING-TEST CASES

CASE	TEST CASE DESCRIPTION	EXPECTED RESULT	ACTUAL RESULT	RESULT
LOGIN	VALID USERNAME AND VALID PASSWORD	SUCCESSFUL LOGIN	SUCCESSFUL LOGIN	PASS
SIGNUP	VALID CREDENTIALS	SUCCESSFUL REGISTRATION	SUCCESSFUL REGISTRATION	PASS
IMAGE	CLEAR IMAGE	GIVES CAR DETAILS	GIVES CAR DETAILS	PASS
URL	VALID URL	PEOPLE PRESENT IN THE CAR	PEOPLE PRESENT IN THE CAR	PASS

CASE	TEST CASE DESCRIPTION	EXPECTED RESULT	ACTUAL RESULT	RESULT
LOGIN	INVALID USERNAME AND INVALID PASSWORD	ERROR MESSAGE SAYING INVALID CREDENTIALS	ERROR MESSAGE SAYING INVALID CREDENTIALS	PASS
SIGNUP	PASSWORD MUST HAVE 8 CHARACTERS	PASSWORD NOT STRONG	PASSWORD NOT STRONG	PASS
IMAGE	IMAGE IS NOT CLEAR	POPUP SAYING RETAKE THE IMAGE	POPUP SAYING RETAKE THE IMAGE	PASS
URL	INVALID URL	POPUP SAYING PLEASE ENTER CORRECT URL ADDRESS	POPUP SAYING PLEASE ENTER CORRECT URL ADDRESS	PASS



## References

<https://www.twilio.com/docs/usage/api>

<https://docs.microsoft.com/en-us/azure/cognitive-services/face/overview>

<https://mlab.com/login/?r=%2Fdatabases%2Fproject123%2Fcollections%2Fsmart#indexes>

<https://firebase.google.com/>

## ACKNOWLEDGMENT

"The work has been completed under the guidance of Dr. Yugi Lee, Rajaram Anantharaman, and TAs (Ruthvic Punyamurtula, Bhargavi Nadendla, Sravanthi Gogadi) in CS5551 Advanced Software Engineering, University of Missouri -Kansas City), Fall2018.