

# ROAD TRAFFIC PREDICTION FOR INTELLIGENT TRANSPORTATION SYSTEM

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# ROAD TRAFFIC PREDICTION FOR INTELLIGENT TRANSPORTATION SYSTEM

- A human-based road damage monitoring system could be the first answer but not a perfect solution because it is affected by a different condition such as weather, speed of the vehicle, the complexity of the road, and the difference of criteria from the individual inspection. Deep learning-based technology is a good key to unlock the object detection tasks in our real world. By using deep neural networks, we could break a problem that is dangerous and very time-consuming but has to be done every day like detecting the road state. This paper describes the solution using YOLO to detect the various types of road damage in the IEEE Big Data Cup Challenge 2020.
- This also aims to develop a tool for predicting accurate and timely traffic flow Information and an accident detection mechanism. Traffic Environment involves everything that can affect the traffic flowing on the road, whether it's traffic signals, accidents, rallies, even repairing of roads that can cause a jam. If we have prior information which is very near approximate about all the above and many more daily life situations which can affect traffic then, a driver or rider can make an informed decision.
- The accident detection mechanism aims to detect the accident occurs while travelling and inform it to the neighbours. So that neighbours can easily get the information and take necessary actions.

# METHODOLOGY

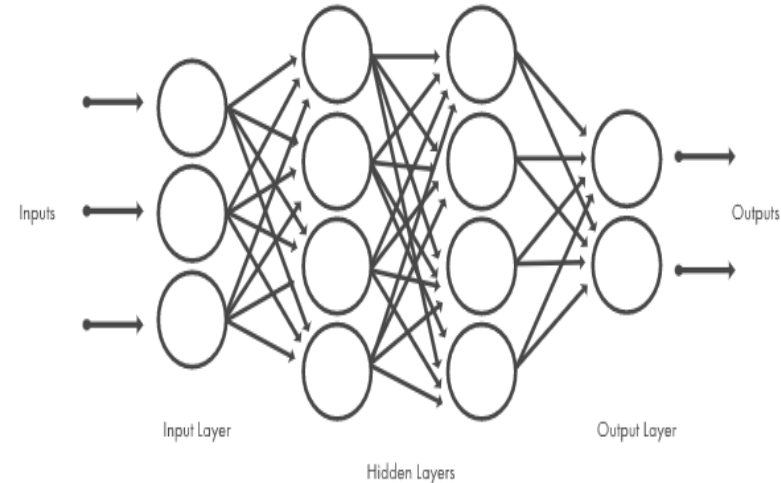
## DEEP LEARNING

- A main point is that object detection could be a combination of classification and localization, thus many approaches have developed to solve object detection tasks using deep learning-based technology. The detection model is trained with the image dataset which contains the bounding-boxes and the labels to detect an object. From the perspective of region proposal-based methods, they propose a region that may include the object, classify the object, refine and get rid of overlapped bounding boxes, and score them based on other objects in the input image. And there are representative region-based models such as R-CNN , Fast R-CNN , and Faster R-CNN , and they also called by two-stage object detectors.

# METHODOLOGY

## DEEP LEARNING

- Deep learning is a machine learning technique that teaches computers to do what comes naturally to humans.
- Deep learning models are trained by using large sets of labeled data and neural network architectures that learn features directly from the data without the need for manual feature extraction.
- Nowadays, deep learning has an important role in image classification. It extracts the feature maps from an input image using a neural network with hidden layers, and several deep learning networks based on Convolutional Neural Networks (CNNs), such as AlexNet , VGGNet , ResNet , etc, achieved a successful performance in the ImageNet Large Scale Visual Recognition Challenge (ILSVRC).



# METHODOLOGY

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- The project is been executed to accomplish the results by:
  - Road damage detection
  - Traffic prediction
  - Accident detection

# METHODOLOGY

## **ROAD DAMAGE DETECTION:-**

- Nowadays, deep learning has an important role in image classification. while starting our journey both camera and GPS are turned on.
- It extracts the feature maps from an input image using a neural network with hidden layers, and several deep learning networks based on YOLO algorithm.
- The detection model is trained with the image dataset which contains the bounding-boxes and the labels to detect an image which having cracks.
- If the image containing crack then provide an voice alert to the user.

# ROAD DAMAGE DETECTION

## YOLO ALGORITHM

- YOLO(You Only Look Once) has a single neural network architecture, predicts a set of bounding boxes and class probabilities at a sitting for every test image.
- First of all, it divides the full image by several a grid with a specific size, and anchor boxes are generated in every grid of input image by predefined scale and size. Each anchor box predicts the objectness score, box center offset x, box center offset y, box width, box height, and class scores at one time in contrast to a two stage detector.
- Thus, YOLO is an extremely fast end-to-end algorithm to detect the objects, and it is called a one stage object detector. Also, the performance of YOLO has improved over the development of deep learning technology, so there are updated versions for improving the light-weight, inference speed, and accuracy.



S X S grid on input



final detections



# METHODOLOGY

## **TRAFFIC PREDICTION:-**

- This predicts accurate traffic flow information. This module divided into two sub modules:
  1. Data collection
  2. Data processing

# TRAFFIC PREDICTION

## Data collection

This module for identify the congested situations, Collect the traffic data in every 5 min with features: Location (Measured with GPS). Then Group every 5 min interval with their corresponding data and calculate the distance between each vehicle with all other vehicles within specified junction. If the distance is less than the specific threshold between two vehicles then those vehicles are considered to be the neighborhood vehicles else not considered as Neighbour vehicles.

## Data processing

This module for classify the congested situations. Give the collected data to a matrix. Compare it with threshold value and identify the neighborhood vehicles. Repeat above steps in every 5 min for 45 min and plot the graph between neighborhood vehicles and time interval. If the neighborhood vehicles show an increasing graph, then the traffic congestion is identified else No traffic.

# TRAFFIC PREDICTION

## PROCESS OF TRAFFIC PREDICTION

1. Created the application which can provide us the GPS coordinates.
2. Perform the decision tree algorithm
3. Evaluate the matrix for the dataset
4. Divide the the dataset into training and testing.
5. Predict the 45 min interval parameters through machine learning algorithm
6. Conclude about the traffic congestion

# METHODOLOGY

## ACCIDENT DETECTION:-

- The accident is detected based on the intensity of shake occurred while travelling. And the classification of intensity of shake is done based on the dataset is taken from kaggle .
- The dataset is divided into train and test dataset. Each of these contains set of values which is less than the limited intensity and greater than the limited intensity.
- The features including in dataset are accelerometer and gyroscope. The inputs taken are compared with the dataset values and if it is greater than the limited intensity then send a message that an accident occurred to the emergency contacts with the location.

# METHODOLOGY

## DECISION TREE ALGORITHM

- The goal of this algorithm is to predict the value of the target variables. Decision tree learning represents a function that takes as input a vector of attributes value and return a "Decision " a single output value. It falls under the category of supervised learning algorithm. It can be used to solve both regression and classification problem. DT identify its results by performing a set of tests on the training dataset .

# METHODOLOGY

## STEPS INVOLVED IN DECISION TREE

- **Step-1:** Begin the tree with the root node, says  $S$ , which contains the complete dataset.
- **Step-2:** Find the best attribute in the dataset using **Attribute Selection Measure (ASM)**.
- **Step-3:** Divide the  $S$  into subsets that contains possible values for the best attributes.
- **Step-4:** Generate the decision tree node, which contains the best attribute.
- **Step-5:** Recursively make new decision trees using the subsets of the dataset created in step -3. Continue this process until a stage is reached where you cannot further classify the nodes and called the final node as a leaf node.

# METHODOLOGY

## Attribute Selection Measures

- While implementing a Decision tree, the main issue arises that how to select the best attribute for the root node and for sub-nodes. So, to solve such problems there is a technique which is called as **Attribute selection measure or ASM**.
- Here we use **Gini Index** as the ASM.
- Gini index is a measure of impurity or purity used while creating a decision tree in the CART(Classification and Regression Tree) algorithm.
- An attribute with the low Gini index should be preferred as compared to the high Gini index.
- It only creates binary splits, and the CART algorithm uses the Gini index to create binary splits.
- Gini index can be calculated using the below formula:

$$\text{Gini Index} = 1 - \sum_j P_j^2$$

# MODULES

## 1. Admin

- Login
- View users details
- Add notification
- View feedback
- Track user
- Add and manage routs
- Add and manage police

## 2. User

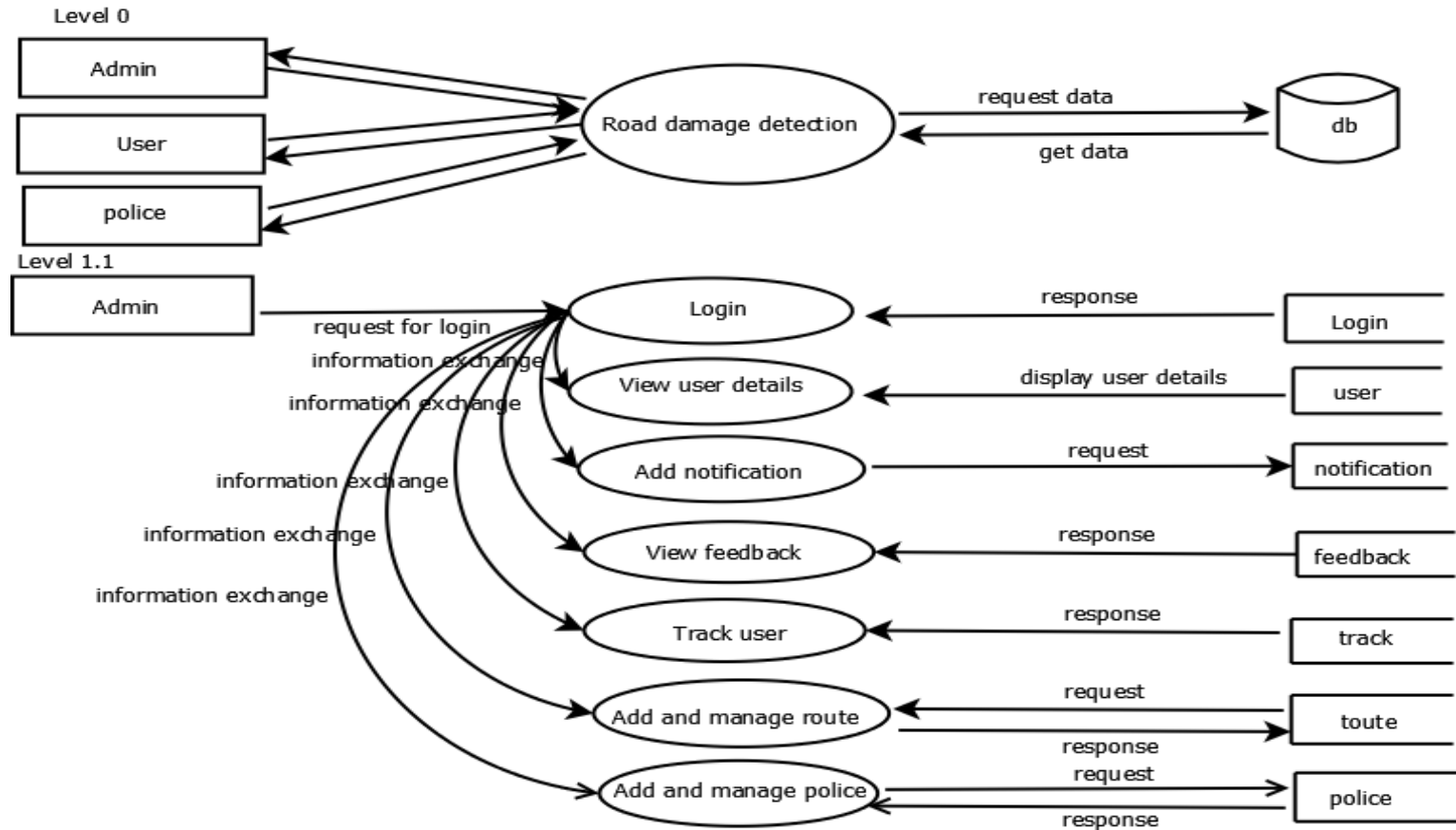
- Register
- Login
- View profile
- Road quality alert
- feedback
- View rout
- Set emergency number
- Block notification
- Send accident alert

## 3. Police

- Login
- View notification
- View Accident alert

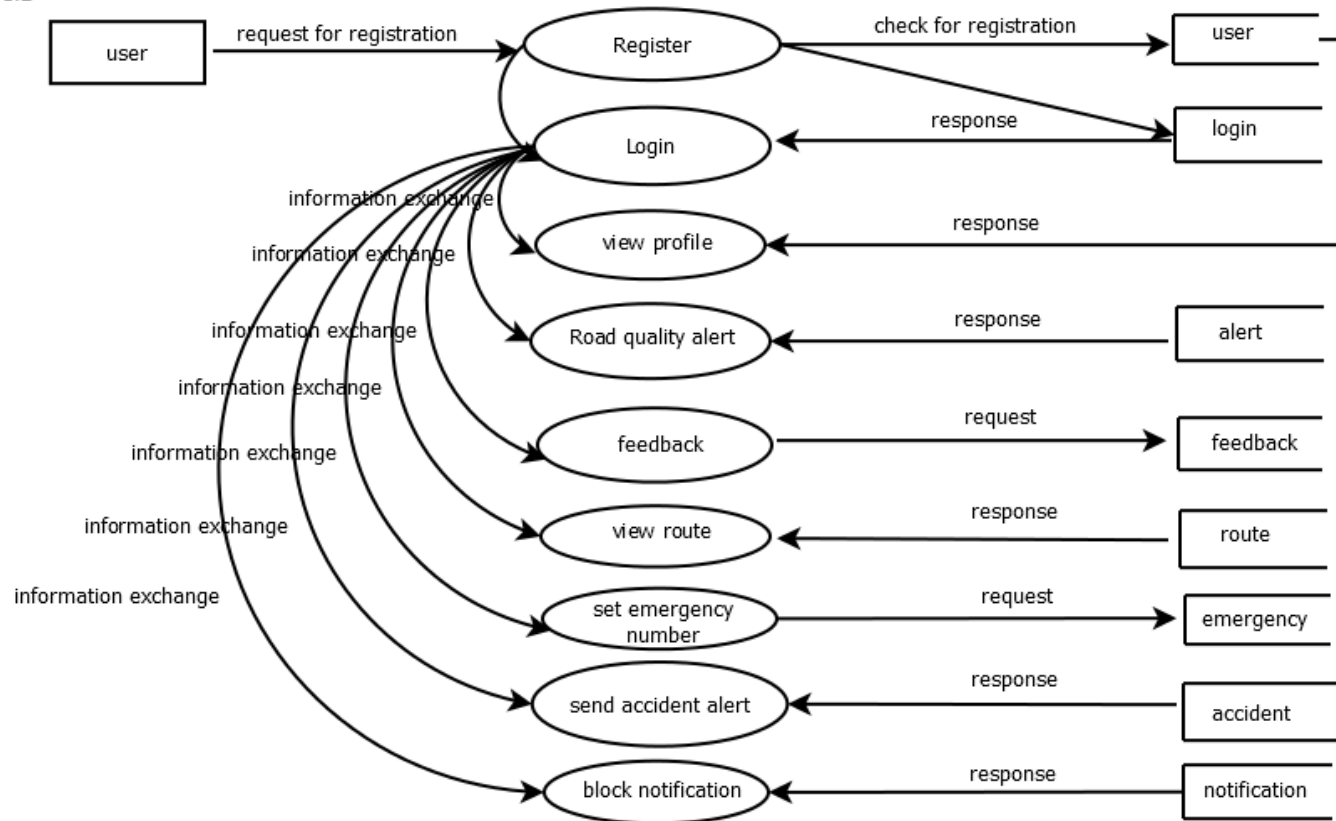


# DATA FLOW DIAGRAM



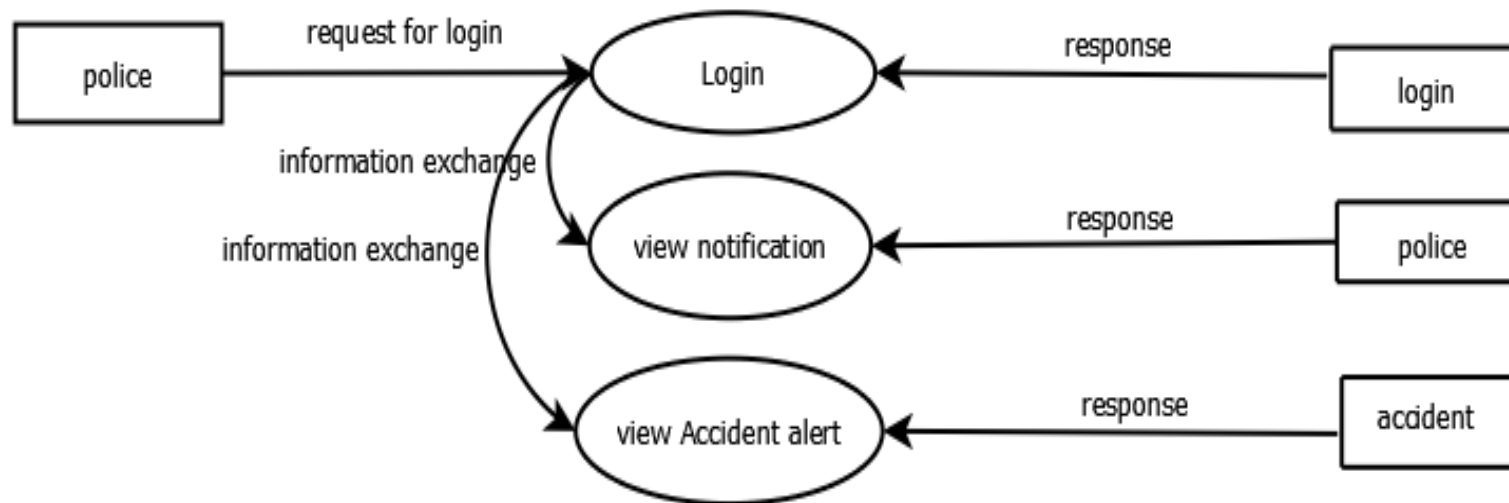
# DATA FLOW DIAGRAM

Level 1.2



# DATA FLOW DIAGRAM

Level 1.3



# TABLE DESIGN

login

[illegible]

**user**

|   | Field Name | Datatype | Len | Default | PK?                                 | Not Null?                           | Unsigned?                | Auto Incr?                          | Zerofill?                | Charset | Collation          | Comment |
|---|------------|----------|-----|---------|-------------------------------------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|---------|--------------------|---------|
| * | uid        | int      | 11  |         | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | utf8mb4 | utf8mb4_swedish_ci |         |
|   | user_id    | int      | 11  |         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | utf8mb4 | utf8mb4_swedish_ci |         |
|   | fname      | varchar  | 55  |         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | latin1  | latin1_swedish_ci  |         |
|   | lname      | varchar  | 33  |         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | latin1  | latin1_swedish_ci  |         |
|   | place      | varchar  | 44  |         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | latin1  | latin1_swedish_ci  |         |
|   | phone      | varchar  | 45  |         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | latin1  | latin1_swedish_ci  |         |
|   | email      | varchar  | 45  |         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | latin1  | latin1_swedish_ci  |         |
|   |            |          |     |         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | utf8mb4 | utf8mb4_swedish_ci |         |

# TABLE DESIGN

**alert**

[illegible]

## track

[illegible]

# TABLE DESIGN

## route

[illegible]

## feedback

[illegible]

## notification

[illegible]

# TABLE DESIGN

# Accident

[illegible]

## Emergency

[illegible]

## Location

[illegible]

# DEVELOPING ENVIRONMENT

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- OPERATING SYSTEM : WINDOWS 10
- FRONT END : HTML, CSS, JAVASCRIPT
- BACK END : Mysql
- SOFTWARES USED : JetBrains Pycharm , Android Studio
- TECHNOLOGY USED : python,java
- FRAME WORK USED : Flask



# FUTURE ENHANCEMENT

- Provides alert to PWD for repair roads.
- The proposed system deals with the detection of the accidents.  
But this can be extended by providing medication to the victims at the accident spot.

# USER STORY

| User Story ID | As a type of User | I want to<br><perform some task> | So that I can<br>< Achieve Some Goal>                         |
|---------------|-------------------|----------------------------------|---|
| 1             | Admin             | Login                            | login successful with correct username and password           |
| 2             | Admin             | View User details                | Can view registered users                                     |
| 3             | Admin             | Add& manage notification         | Insert ,view & remove notification                            |
| 4             | Admin             | View feedback                    | Can view feedbacks from user                                  |
| 5             | Admin             | Track user                       | Track users who are travelling                                |
| 6             | Admin             | Add and manage route             | Can add and manage route                                      |
| 7             | Admin             | Add and manage police            | Can add and manage police                                     |
| 8             | User              | Register                         | Can users register  |
| 9             | User              | Login                            | Registered users can login with correct username and password |
| 10            | User              | View profile                     | View users profile in application                             |
| 11            | User              | Road quality alert               | Can get alert while travelling                                |
| 12            | User              | Feedback                         | Can provide feedback  |
| 13            | User              | View route                       | Can view route in application                                 |
| 14            | user              | Set Emergency number             | Can set emergency number                                      |
| 15            | user              | Block notification               | Can get notification even if a block occur                    |
| 16            | user              | Send accident alert              | Send alert to emergency number                                |
| 17            | police            | Login                            | Police can login  |
| 18            | police            | View notification                | Can view the notification from admin                          |
| 19            | police            | View accident alert              | Can view the accident alert                                   |

# PROJECT PLAN

| User Story ID | Task Name | Start Date | End Date   | Hours | Status    |
|---------------|-----------|------------|------------|-------|-----------|
| 7             | Sprint 1  | 20/04/2022 | 25/04/2022 | 10    | completed |
| 14            |           | 27/04/2022 | 07/05/2022 |       | completed |
| 16            | Sprint 2  | 08/05/2022 | 20/05/2022 | 8     | Completed |
| 17            | Sprint 3  | 21/05/2022 | 23/05/2022 | 17    | Completed |
| 18            |           | 24/05/2022 | 28/05/2022 |       | Completed |
| 19            |           | 30/05/2022 | 05/06/2022 |       | completed |
| 19            | Sprint 4  | 20/06/2022 | 24/06/2022 | 10    | completed |
| 15            |           | 25/06/2022 | 27/06/2022 |       | completed |

# PRODUCT BACKLOG

| User Story ID | Priority<br><High/Medium/Low> | Size<br>(Hours) | Sprint<br><#> | Status<br><Planned/In<br>progress/Completed> | Release<br>Date | Release Goal                                       |
|---------------|-------------------------------|-----------------|---------------|--|-----------------|--|
| 1             | Medium                        | 5               | 1             | Completed                                    | 25/04/2022      | Form design  |
| 2             | High                          | 5               |               | Completed                                    | 07/05/2022      | coding   |
| 3             | High                          | 8               | 2             | Completed                                    | 20/05/2022      | Dataset<br>creation,preprocessin<br>g and training |
| 5             | High                          | 6               | 3             | Completed                                    | 23/05/2022      | Sensor value<br>collection                         |
| 6             | medium                        | 6               |               | Completed                                    | 28/05/2022      | Server<br>communication                            |
| 7             | High                          | 5               |               | completed                                    | 05/06/2022      | Prediction and send<br>sms                         |
| 7             | Medium                        | 5               | 4             | completed                                    | 24/06/2022      | Traffic prediction                                 |
| 8             | High                          | 5               |               | completed                                    | 27/06/2022      | Output generation                                  |

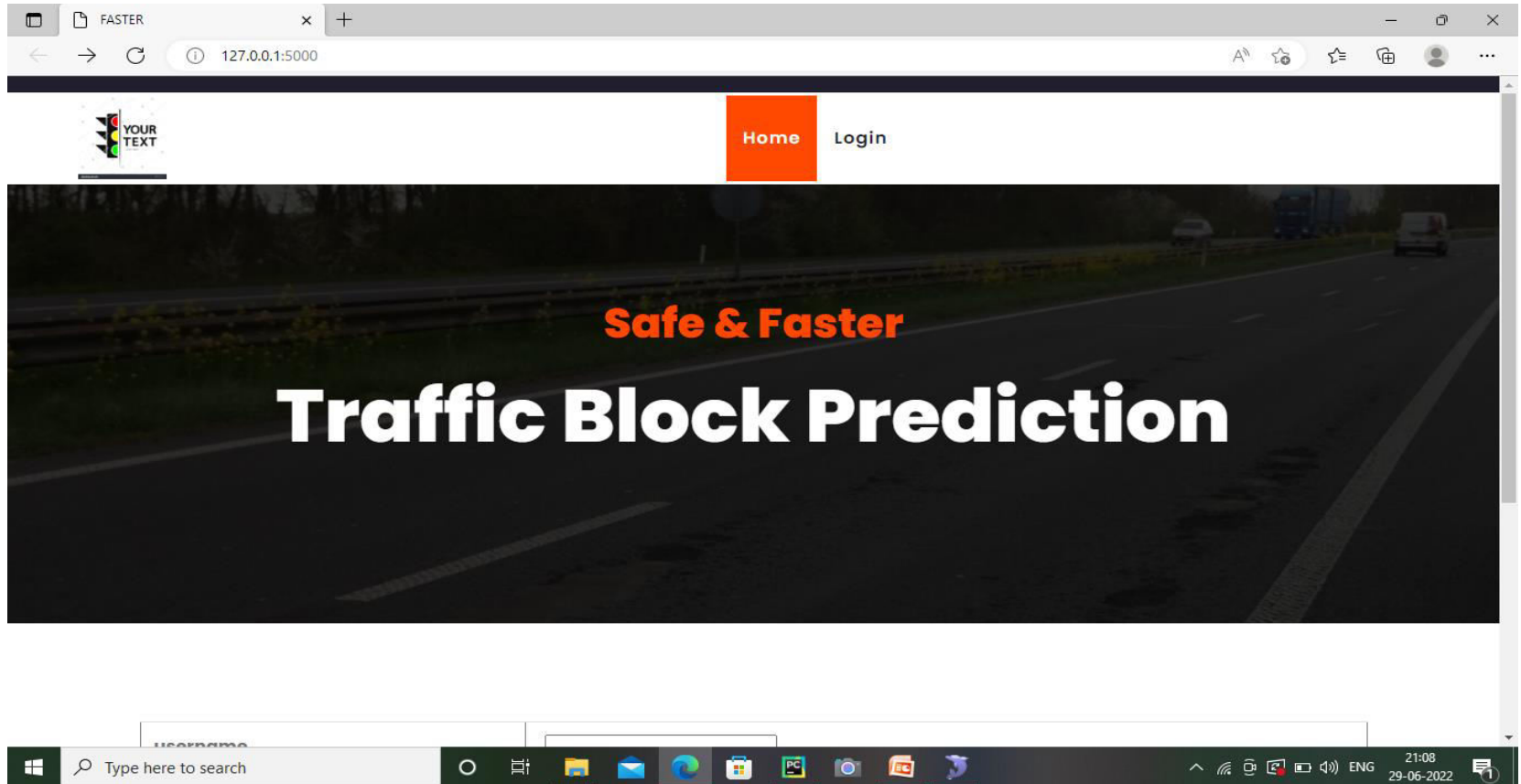
# SPRINT BACKLOG

| Backlog Item            | Status And Completion Date | Original Estimation in Hours | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Day 8 | Day 9 | Day 10 | Day 11 | Day 12 | Day 13 | Day 14 |
|-------------------------|----------------------------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|
| UserStory#1,#2,#3       |                            |                              | hrs   | hrs   | hrs   | hrs   | hrs   | hrs   | hrs   | hrs   | hrs   | hrs    | hrs    | hrs    | hrs    | hrs    |
| Form Designing          | 25/04/2022                 | 5                            | 0     | 0     | 1     | 1     | 1     | 0     | 0     | 0     | 1     | 0      | 0      | 1      | 0      | 0      |
| Coding                  | 07/05/2022                 | 5                            | 0     | 0     | 0     | 0     | 0     | 1     | 1     | 1     | 1     | 1      | 0      | 0      | 0      | 0      |
| UserStory#4, #5         |                            |                              |       |       |       |       |       |       |       |       |       |        |        |        |        |        |
| Dataset creation        | 20/05/2022                 | 8                            | 0     | 0     | 1     | 0     | 0     | 1     | 0     | 1     | 1     | 1      | 1      | 1      | 1      | 0      |
| UserStory#6,#7          |                            |                              |       |       |       |       |       |       |       |       |       |        |        |        |        |        |
| Sensor value collection | 23/05/2022                 | 6                            | 1     | 1     | 1     | 0     | 1     | 1     | 1     | 0     | 0     | 0      | 0      | 0      | 0      | 0      |
| Server communication    | 28/05/2022                 | 6                            | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 1     | 1     | 1      | 1      | 1      | 0      | 0      |
| SMS alert               | 05/06/2022                 | 5                            | 0     | 0     | 0     | 0     | 1     | 1     | 0     | 1     | 0     | 1      | 1      | 0      | 0      | 0      |
| UserStory#8,#9          |                            |                              |       |       |       |       |       |       |       |       |       |        |        |        |        |        |
| Traffic prediction      | 24/06/2022                 | 5                            | 0     | 0     | 1     | 1     | 0     | 0     | 0     | 0     | 1     | 1      | 1      | 0      | 0      | 0      |
| OutputGenaration        | 27/06/2022                 | 5                            | 1     | 0     | 0     | 0     | 1     | 1     | 0     | 1     | 0     | 0      | 0      | 1      | 0      | 0      |
| Total                   |                            | 45                           | 2     | 1     | 4     | 2     | 4     | 5     | 3     | 5     | 5     | 5      | 4      | 4      | 1      | 0      |

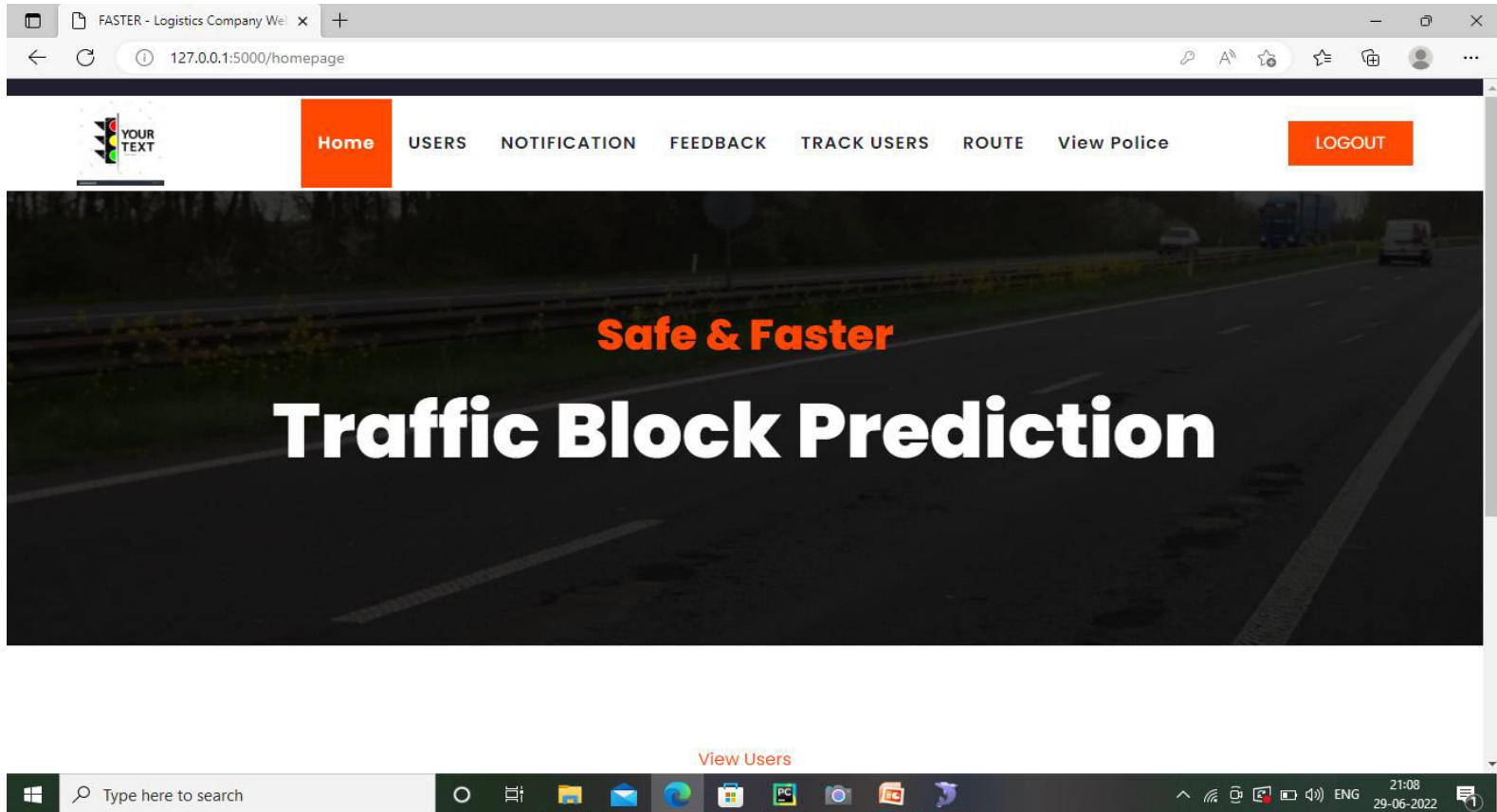
# ACTUAL SPRINT

| Backlog Item            | Status And Completion Date | Original Estimation in Hours | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Day 8 | Day 9 | Day 10 | Day 11 | Day 12 | Day 13 | Day 14 |
|-------------------------|----------------------------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|
| UserStory#1,#2,#3       |                            |                              | hrs   | hrs   | hrs   | hrs   | hrs   | hrs   | hrs   | hrs   | hrs   | hrs    | hrs    | hrs    | hrs    | hrs    |
| Form Designing          | 25/04/2022                 | 5                            | 0     | 0     | 1     | 1     | 1     | 0     | 0     | 0     | 1     | 0      | 0      | 1      | 0      | 0      |
| Coding                  | 07/05/2022                 | 5                            | 0     | 0     | 0     | 0     | 0     | 1     | 1     | 1     | 1     | 1      | 0      | 0      | 0      | 0      |
| UserStory#4, #5         |                            |                              |       |       |       |       |       |       |       |       |       |        |        |        |        |        |
| Dataset creation        | 20/05/2022                 | 8                            | 0     | 0     | 1     | 0     | 0     | 1     | 0     | 1     | 1     | 1      | 1      | 1      | 1      | 0      |
| UserStory#6,#7          |                            |                              |       |       |       |       |       |       |       |       |       |        |        |        |        |        |
| Sensor value collection | 23/05/2022                 | 6                            | 1     | 1     | 1     | 0     | 1     | 1     | 1     | 0     | 0     | 0      | 0      | 0      | 0      | 0      |
| Server communication    | 28/05/2022                 | 6                            | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 1     | 1     | 1      | 1      | 1      | 0      | 0      |
| SMS alert               | 05/06/2022                 | 5                            | 0     | 0     | 0     | 0     | 1     | 1     | 0     | 1     | 0     | 1      | 1      | 0      | 0      | 0      |
| UserStory#8,#9          |                            |                              |       |       |       |       |       |       |       |       |       |        |        |        |        |        |
| Traffic prediction      | 24/06/2022                 | 5                            | 0     | 0     | 1     | 1     | 0     | 0     | 0     | 0     | 1     | 1      | 1      | 0      | 0      | 0      |
| OutputGeneration        | 27/06/2022                 | 5                            | 1     | 0     | 0     | 0     | 1     | 1     | 0     | 1     | 0     | 0      | 0      | 1      | 0      | 0      |
| Total                   |                            | 45                           | 2     | 1     | 4     | 2     | 4     | 5     | 3     | 5     | 5     | 5      | 4      | 4      | 1      | 0      |

# SCREENSHOTS



# SCREENSHOTS





# SCREENSHOTS

FASTER - Logistics Company We x

127.0.0.1:5000/notification#abt

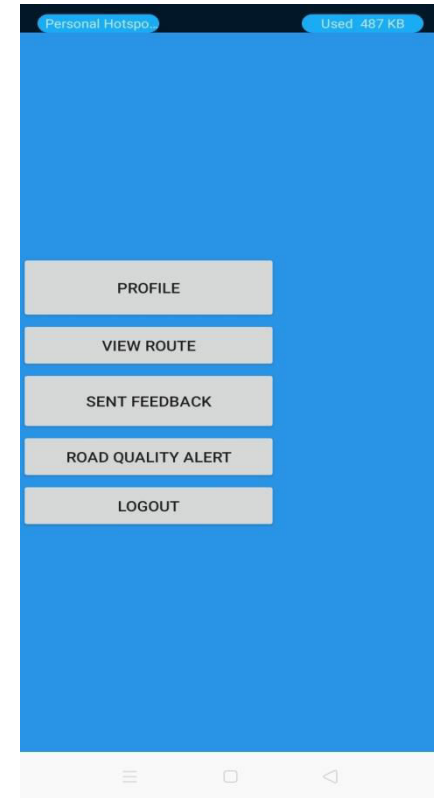
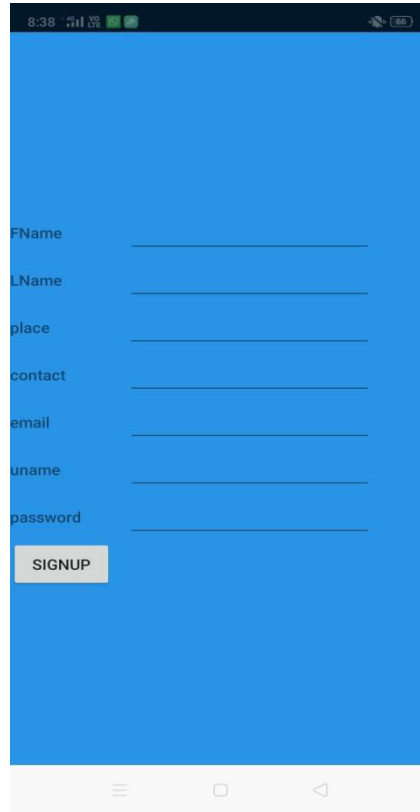
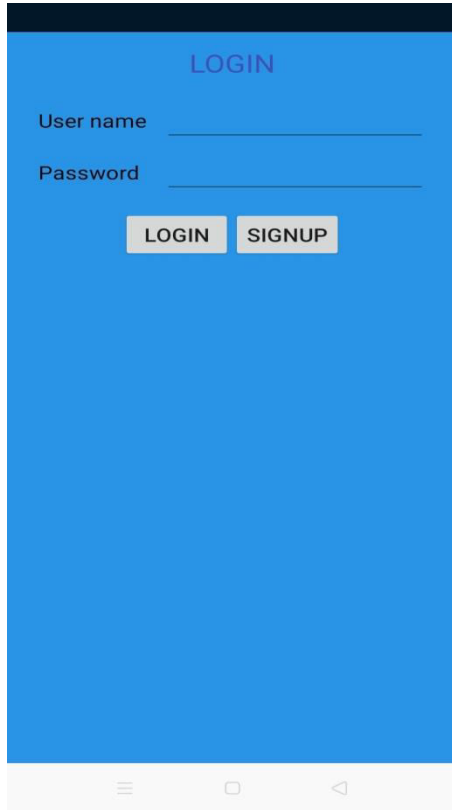
Notification

Send

| Date       | Notification |        |
|------------|--------------|--------|
| 2022-06-27 | damaged      | remove |
| 2022-06-02 | hi           | remove |
| 2022-01-05 | meeting      | remove |

21:09  
29-06-2022

# SCREENSHOTS



Thank  
you

A golden quill pen is positioned to the right of the word 'you', with its nib pointing towards the end of the word. The quill has a detailed, feathered texture and a sharp, metallic-looking tip.