# SpeedCop: A warning system for drivers

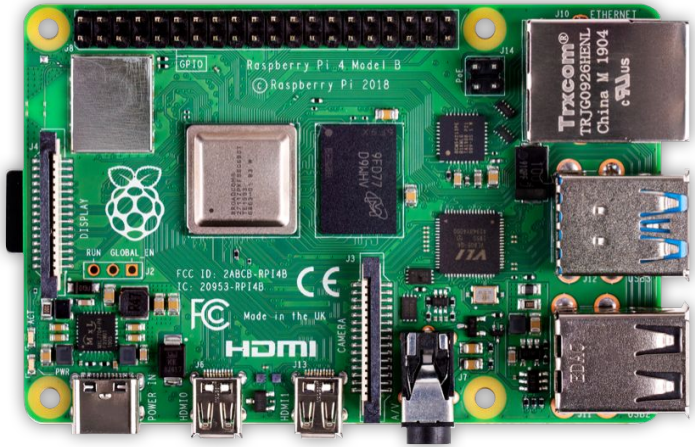
*Eyes on the road, always.*


*~By Team Pied Piper Geeks*

# How will it work?

- Raspberry Pi / Jetson Nano + Camera + Accelerometer + GPS-GSM Module
- Recommend a speed limit to the driver in real time
- The system will work on two different computer paradigms:
  1. Edge Computing (Video Recognition)
  2. Client-Server Computing (Nearby places, vehicles, accident zones)
- Color coded notifications using LCD
- Audio alerts for urgent notifications

# Hardware Components



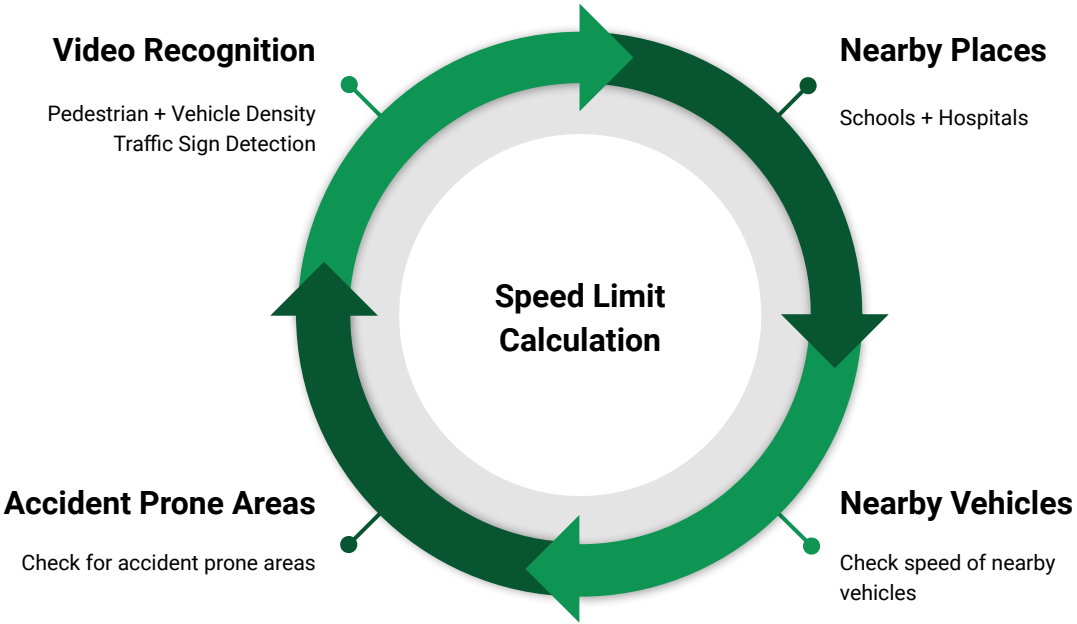

Raspberry Pi / NVIDIA Jetson Nano

Camera Module


Accelerometer

GPS GSM Module

# Speed Limit Calculation

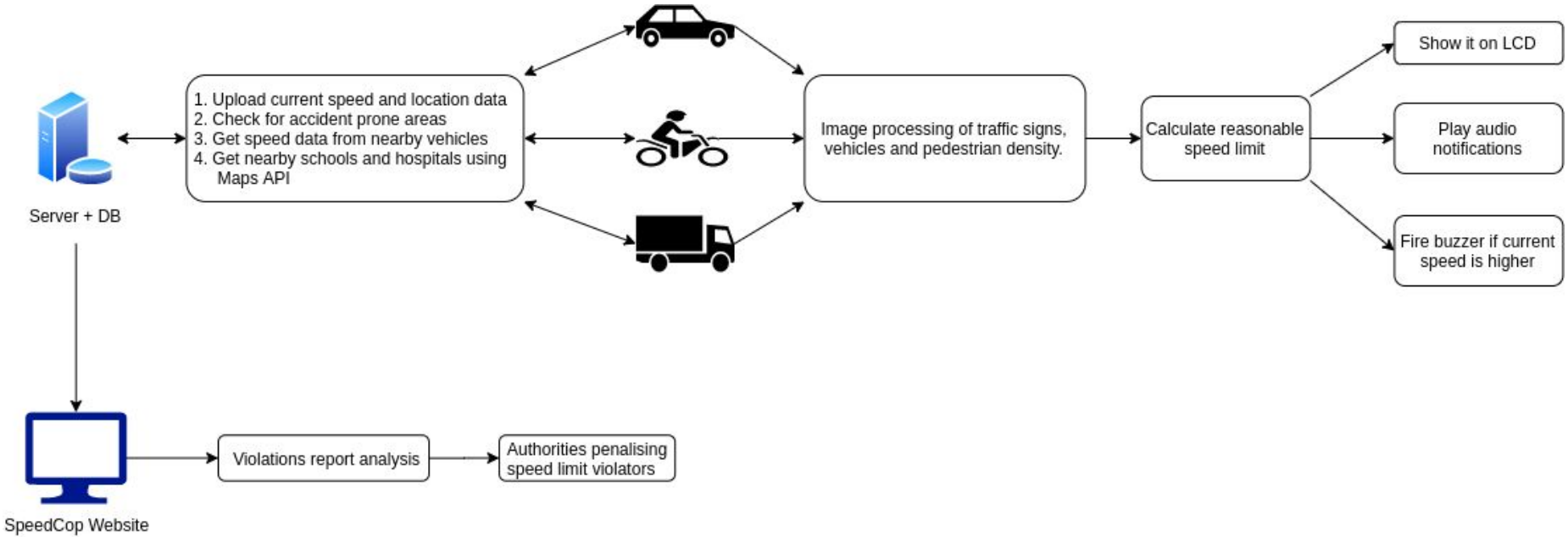


# Video Recognition

# Video Recognition

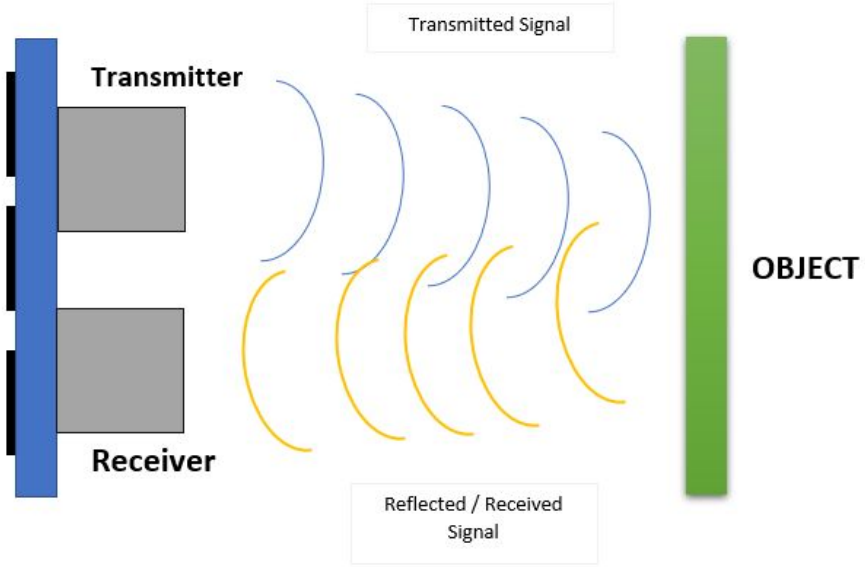
- Using Edge Computing
- SSD Lite MobileNet V2 model custom-trained on Indian Roads Dataset
- Box sizes to calculate distance
- Road signs to recognize upper bound for speed

# Flow diagram



# Night time recognition

InfraRed Camera Detection




Ultrasonic Sensor

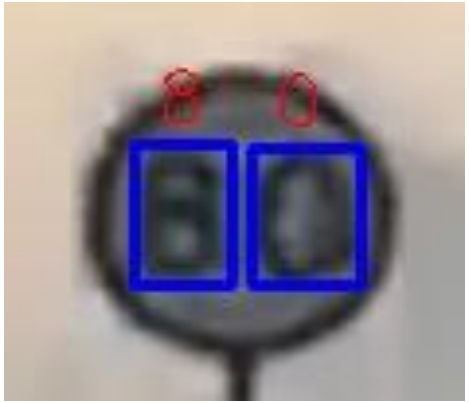
# Traffic Sign Classification

Custom trained Neural Network detects triangular shape as a **warning sign**

- 4 layer Convolutional Neural Network in Keras
- Manual data labelling

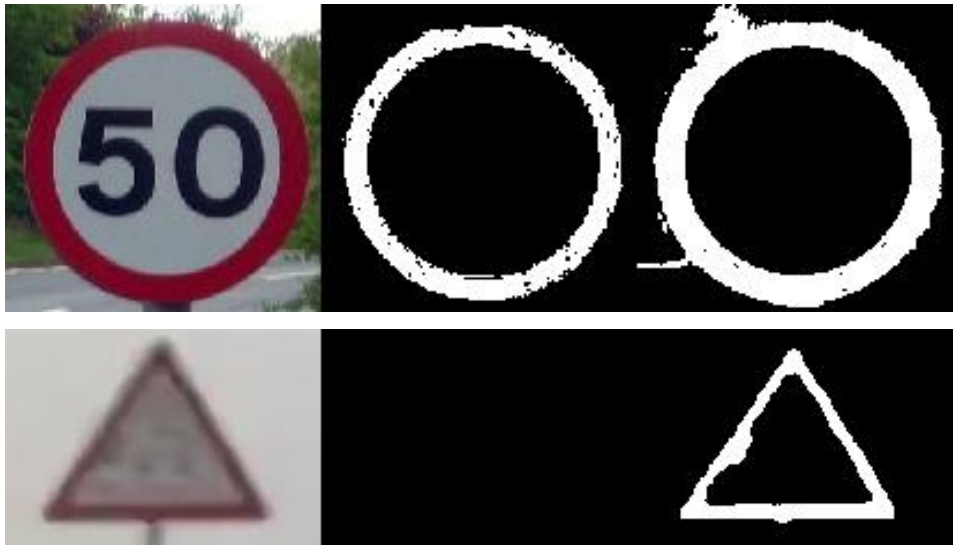
# Traffic Sign Classification






Digit Recognition Neural Net to identify speed limits

# Adapting to lighting environment

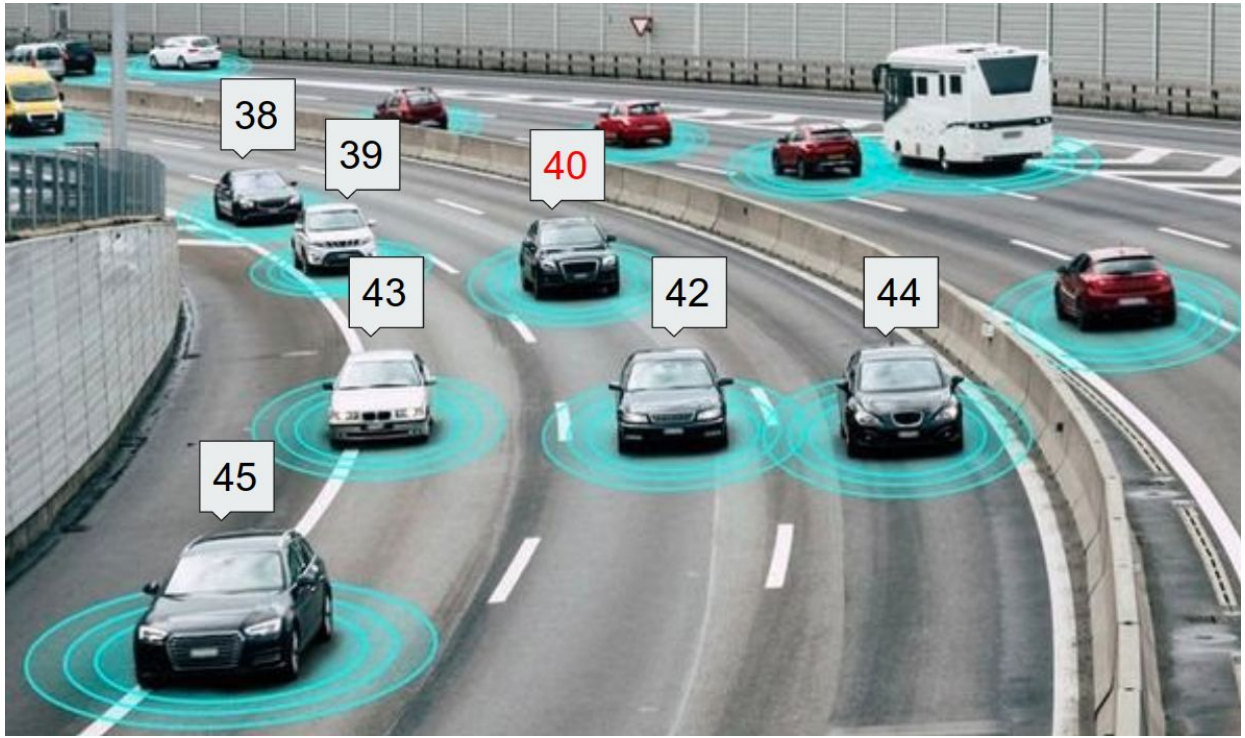



Original Image

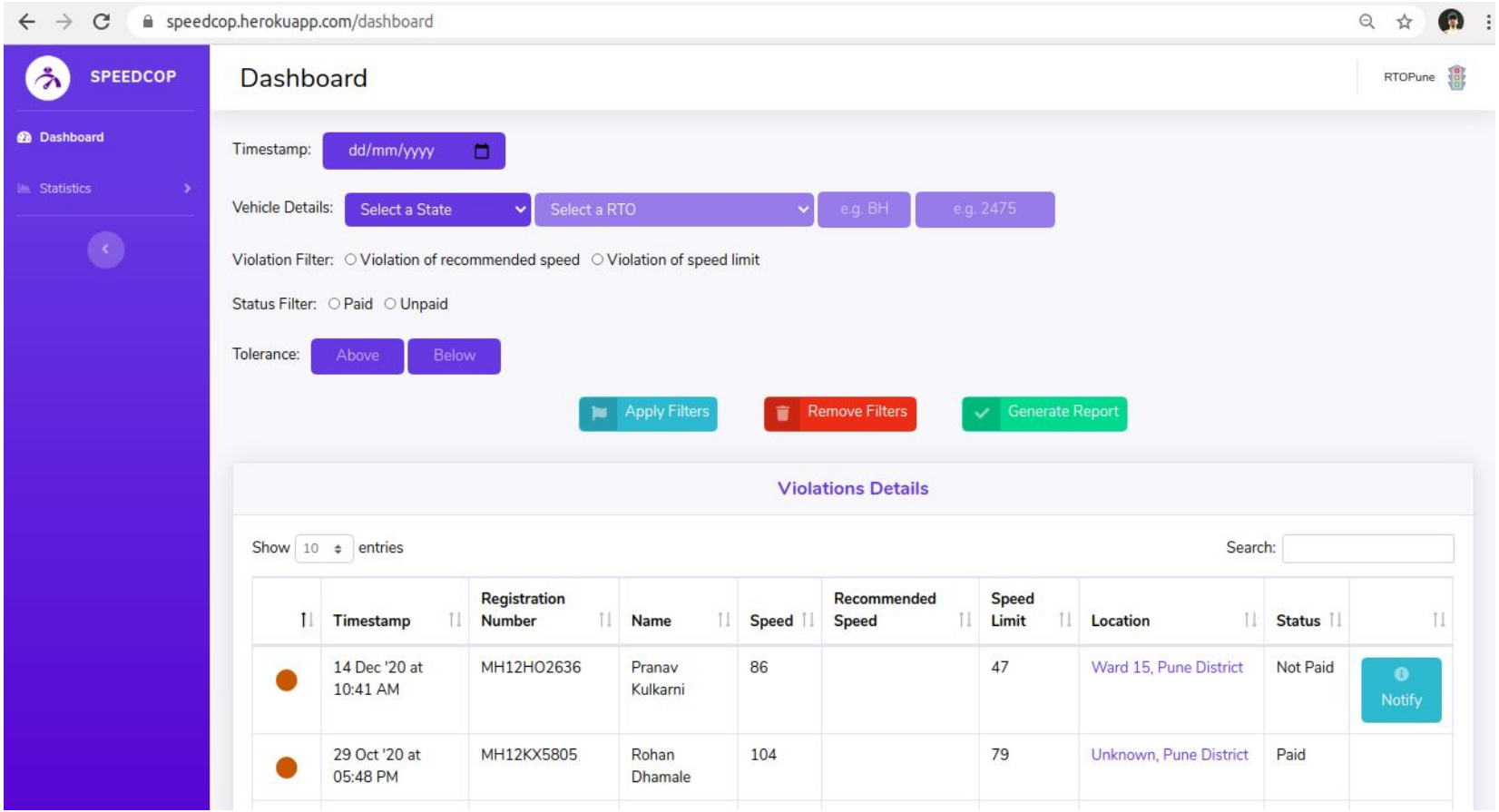
RGB Segmentation

YCrCb Segmentation

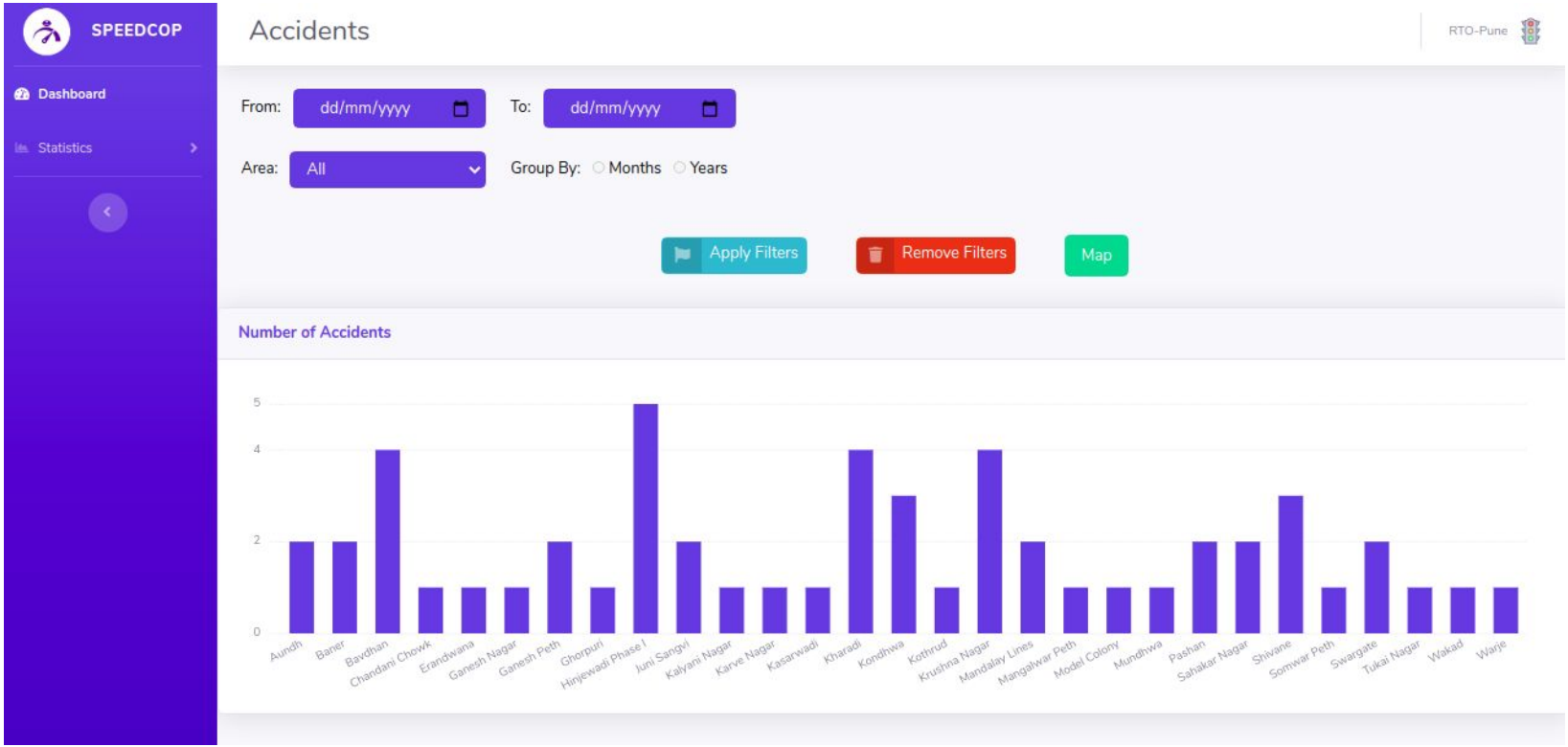
# Vehicle - Cloud - Vehicle Communication



# Website

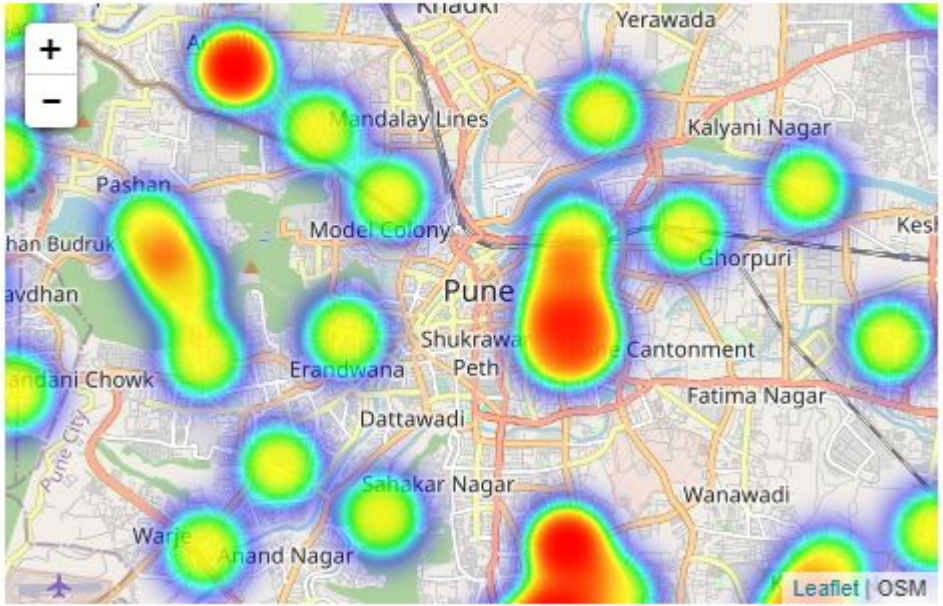

speedcop.herokuapp.com/dashboard
SPEEDCOP
Dashboard
Statistics
Dashboard
RTOPune
Timestamp:
dd/mm/yyyy
Vehicle Details:
Select a State
Select a RTO
e.g. BH
e.g. 2475
Violation Filter:
Violation of recommended speed
Violation of speed limit
Status Filter:
Paid
Unpaid
Tolerance:
Above
Below
Apply Filters
Remove Filters
Generate Report
Violations Details
Show 10 entries
Search:
Timestamp
Registration Number
Name
Speed
Recommended Speed
Speed Limit
Location
Status
14 Dec '20 at 10:41 AM
MH12HO2636
Pranav Kulkarni
86
47
Ward 15, Pune District
Not Paid
Notify
29 Oct '20 at 05:48 PM
MH12KX5805
Rohan Dhamale
104
79
Unknown, Pune District
Paid

# Accidents Visualisation



# Violations Heatmap

×Map



# Violations PDF Report

SPEEDCOP

## Violations List

02 Aug 2020

| Name | Vehicle Number | Speed | Speed Limit | Timestamp | Area | Paid |
|---|---|---|---|---|---|---|
| Pranav Kulkarni | MH12HO2636 | 86 | 47 | 10:41 AM | Ward 15 | False |
| Rohan Dhamale | MH12KX5805 | 104 | 79 | 05:48 PM | Unknown | True |
| Pranav Kulkarni | MH12HO2636 | 67 | 23 | 11:14 AM | Unknown | True |
| Rohan Dhamale | MH12KX5805 | 115 | 100 | 01:09 AM | Unknown | False |
| Yogiraj Bhoomkar | MH12BL3613 | 89 | 60 | 12:21 AM | Bavdhan | False |
| Prutha Joshi | MH12YL5424 | 65 | 29 | 08:51 PM | Unknown | True |
| Pranav Kulkarni | MH12HO2636 | 102 | 43 | 03:09 PM | Unknown | False |
| Aashay Zanpure | MH12DC9610 | 56 | 24 | 11:12 AM | Ward 1 | False |
| Pranav Kulkarni | MH12HO2636 | 101 | 54 | 10:52 PM | Unknown | False |
| Prutha Joshi | MH12YL5424 | 130 | 82 | 02:25 AM | Hinjewadi Phase I | False |
| Aashay Zanpure | MH12DC9610 | 109 | 56 | 06:14 PM | Kasarwadi | False |
| Adwait Bhope | MH12KK2900 | 96 | 85 | 04:21 AM | Kharadi | False |
| Prutha Joshi | MH12YL5424 | 46 | -10 | 04:45 PM | Juni Sangvi | True |
| Prashant Bhandari | MH12DH4508 | 111 | 78 | 12:36 AM | Unknown | False |
| Vinod Kamat | MH14ZU3083 | 91 | 48 | 03:46 PM | Ward 16 | False |
| Yogiraj Bhoomkar | MH12BL3613 | 117 | 93 | 02:39 PM | Fatima Nagar | True |
| Arya Kulkarni | MH12AT9122 | 125 | 83 | 01:51 PM | Unknown | True |
| Vinod Kamat | MH14ZU3083 | 77 | 39 | 08:52 PM | Kasarwadi | False |

# Technology Stack

| | | |
|---|---|---|
| 01 | **Hardware Module** | • Tensorflow + Keras + OpenCV<br>• Accelerometer + Gyro + GPS/GPRS/GSM<br>• Raspberry Pi / Jetson Nano + Camera |
| 02 | **Server** | • Django<br>• Nominatim API (Places, Roads)<br>• MongoDB (Atlas) |
| 03 | **Website** | • Django + Bootstrap + HTML/CSS<br>• MongoDB + PostgreSQL<br>• Hosting on Heroku |

# Advantages

- Zero user interaction
- Dedicated hardware and its advantages over mobile solution
- Better performance with Edge Computing
- Data from all vehicles is used, so system will perform better as the number of users grow
- Can be used with 2 wheelers and heavy vehicles as well

# Experiences, Learnings and Challenges that we've overcome!

- Night scenarios: Using IR camera module
- Bad internet: Using edge Computing
- Relying on other factors when one fails
- And of course technical errors!

# Business Plan:

- We can sell directly to car manufacturers (**B2B Model**), they can incorporate it in their vehicles
- As car manufacturers will be our target audience, we could earn just by efficient sales
- Built-in GPS, accelerometer can be used in case of newer vehicles
- Can be retrofitted to existing vehicles

# How big could we grow?

- Around 30 lakh vehicles are manufactured every year.
- As the system is first of its kind, this leaves us with a complete open market to conquer.
- In India, approximately 17 road mishaps take place every hour. Our nation is in dire need of such a system. Any driver could be a user to this system.

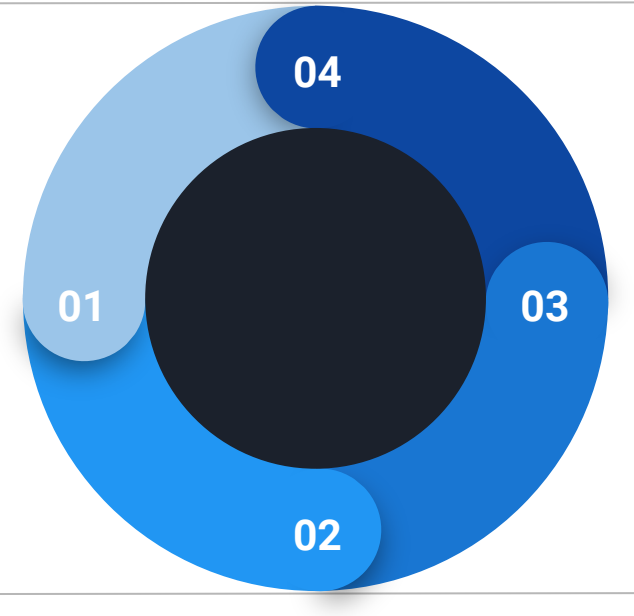
# Business Challenges

- Approval from ARAI
- Conforming to international manufacturer’s norms who sell vehicles in India

# Stakeholders

Drivers

Pedestrians




Manufacturers

Authorities (RTO)

# Expenses:

- Total cost: **₹4000** which is around 0.5% of average vehicle price in India
- Raspberry Pi: **₹2000** or Jetson Nano: **₹6000**
- Camera module: **₹400**
- Accelerometer + gyro: **₹50** (optional)
- GPS + GSM module: **₹1500** (optional)

# Thank you!

# Questions?