

Traffic Analysis and Management System

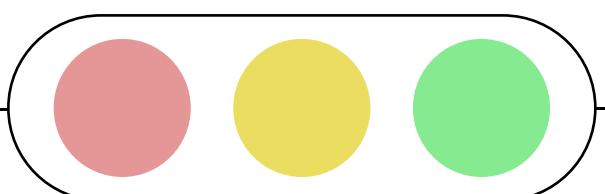


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Group No.: 1

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Introduction

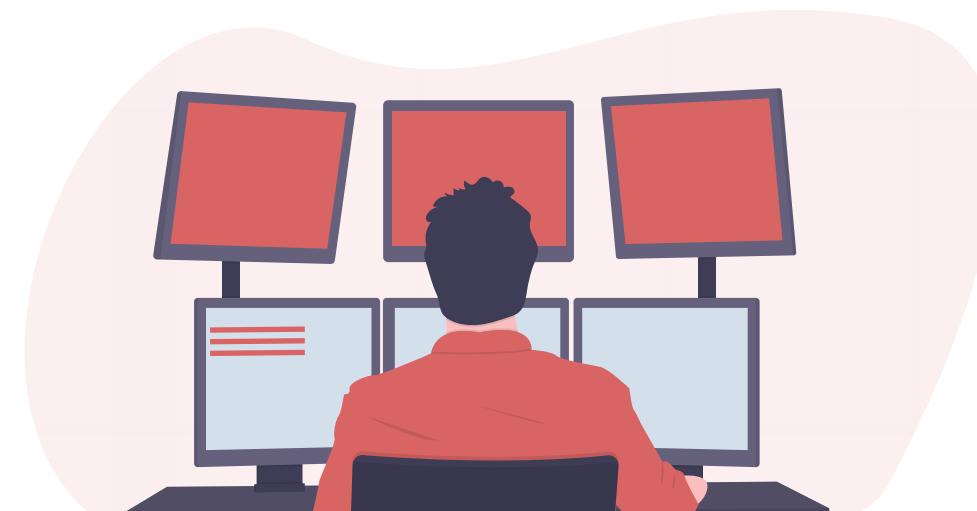


Traffic Analysis and Management System (TAMS)

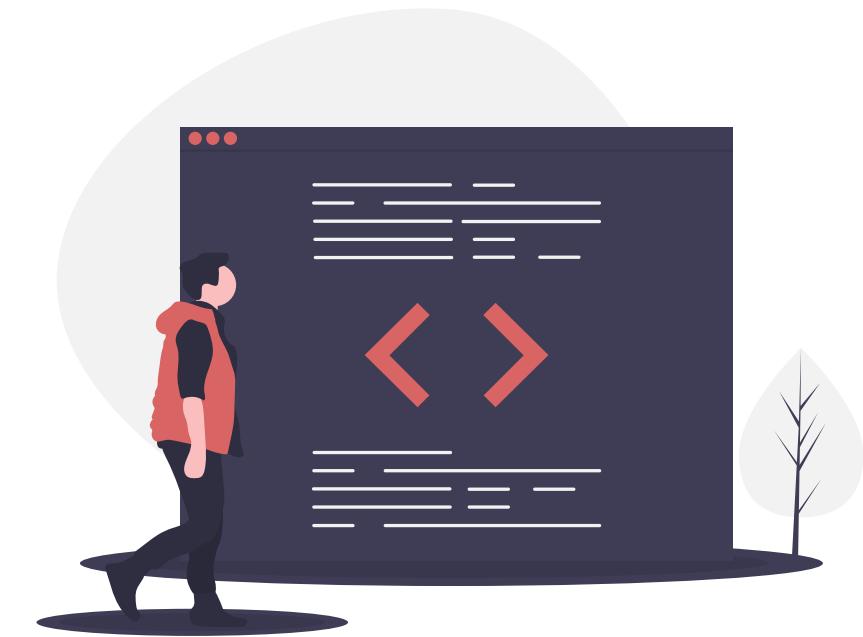
Reduced Traffic Hours



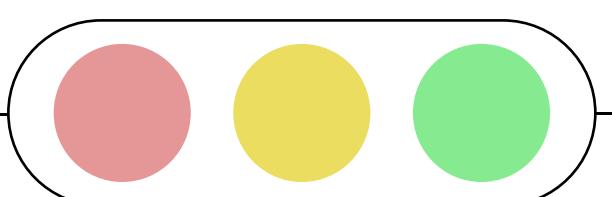
Real Time Monitoring



Feasible Implementation



Motivation



Rising number of vehicles on road



Exacerbating traffic congestion problem

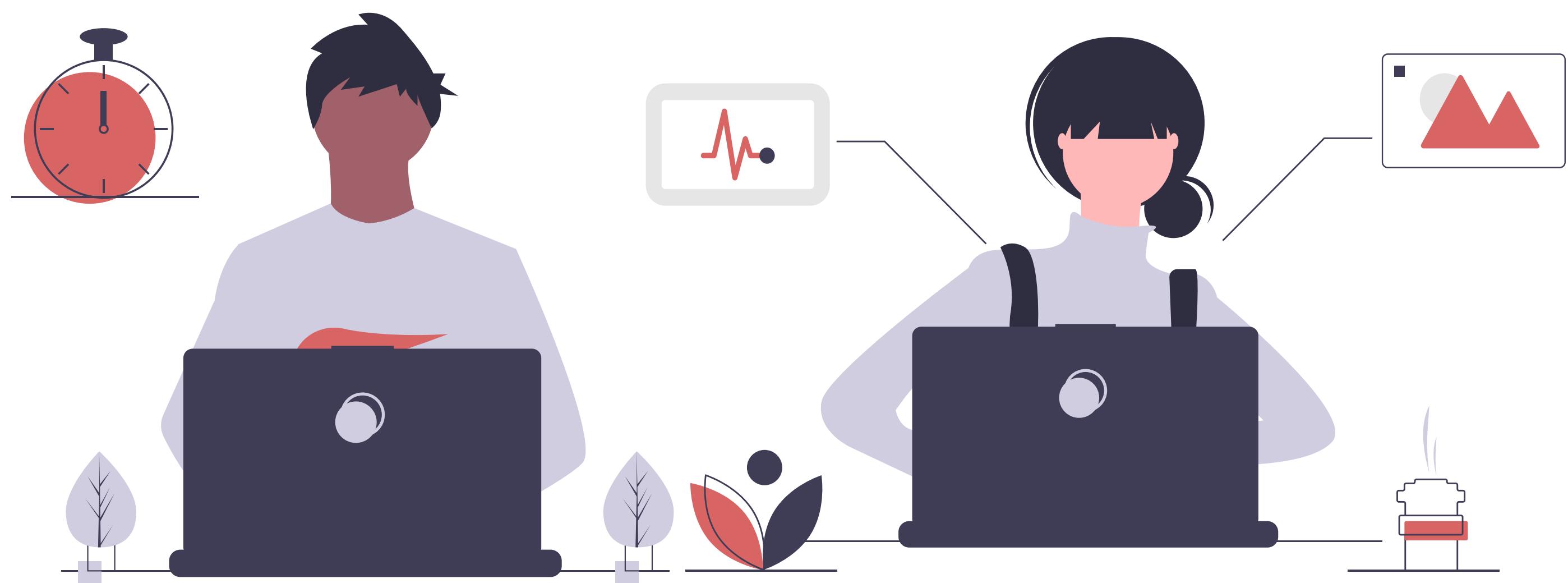
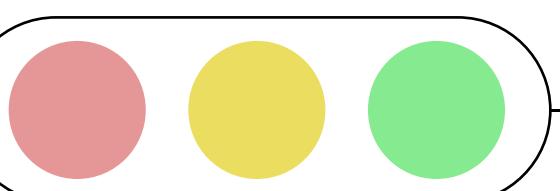


Spending 1.5x more time on daily commute



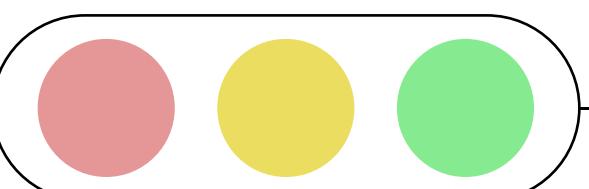
Losing \$22 Billion annually to Traffic Congestion

Aim



To create fast and efficient method to handle traffic congestion problem

Literature Survey

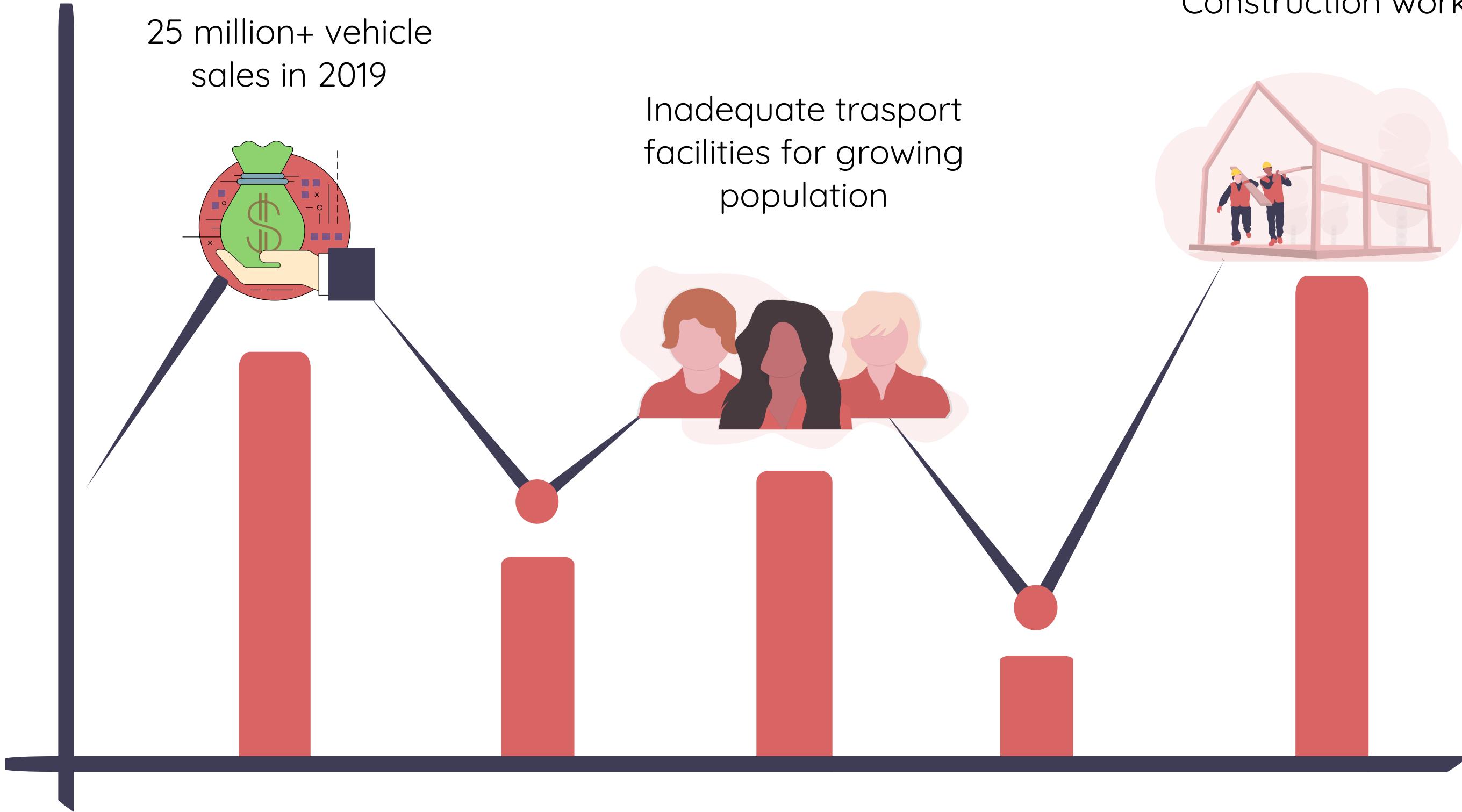


25 million+ vehicle sales in 2019

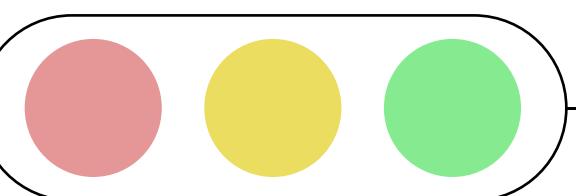


Inadequate transport facilities for growing population

Prolonged Construction work



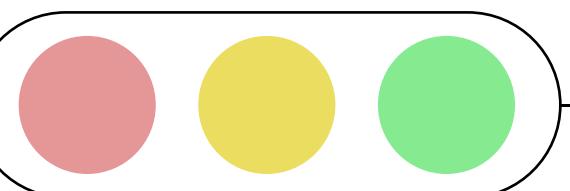
Review of Literature



<p>Application of data mining techniques for traffic density estimation and prediction (k-nearest neighbour)</p>	<p>Sensor based monitoring, Multi factor consideration, Realtime Estimation.</p>	<p>Unable to compute parallel traffic Low precision algorithm Unable to give exact numbers</p>
<p>Application of Image Processing and Data Mining Techniques for Traffic Density Estimation and Prediction.</p>	<p>Traffic Density Estimation, Vehicle count based calculation, ANN based prediction model.</p>	<p>Not a practical approach for narrow roads or packed junctions.</p>
<p>Still Image Processing Techniques for Intelligent Traffic Monitoring</p>	<p>Fast and accurate results, Image comparisoshn using Temporal Variance method.</p>	<p>Can not be implemented for real-time traffic monitoring, Only used in monitoring</p>
<p>Real-time Area Based Traffic Density Estimation by Image Processing for Traffic Signal Control System</p>	<p>Implemented efficient Image processing algorithms and Image enhancement techniques</p>	<p>Compared two images for vehicle detection, can not identify type of vehicle</p>



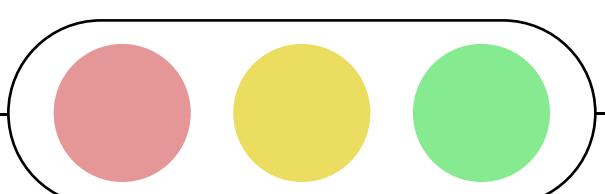
Review of Literature



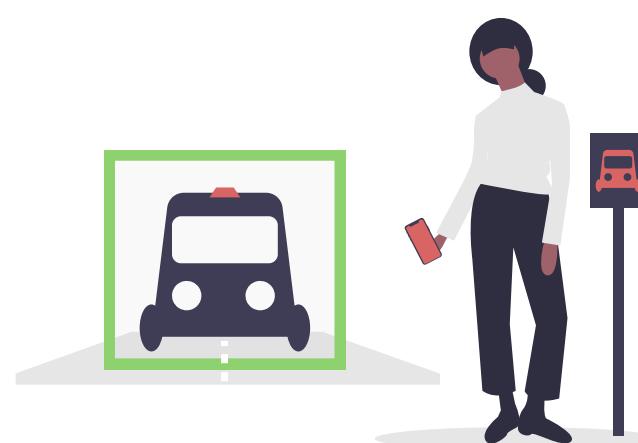
A Deep Learning RCNN Approach for Vehicle Recognition in Traffic Surveillance System	Uses frame extraction followed by box filter based background estimation for object detection	Due to multiple overlapping layers the live performance has some noise due to which performance may degrade
Density Based Traffic Control System Using Image Processing	Calculates the total car occupied area and makes a reasonable prediction	Does not consider type of vehicle or mobility of vehicle into account.
Traffic surveillance by using image processing	Proposed the use of CCTV camera for monitoring purpose and compares results of different algorithms	Capable only of detecting traffic jams and plotting rush-hour vs regular-hour traffic
Smart Control of Traffic Light System using Image Processing	Uses adequate algorithms for congestion and provides reasonable solution for it.	The algorithmn is not adaptive and hence can't give accurate results each time.



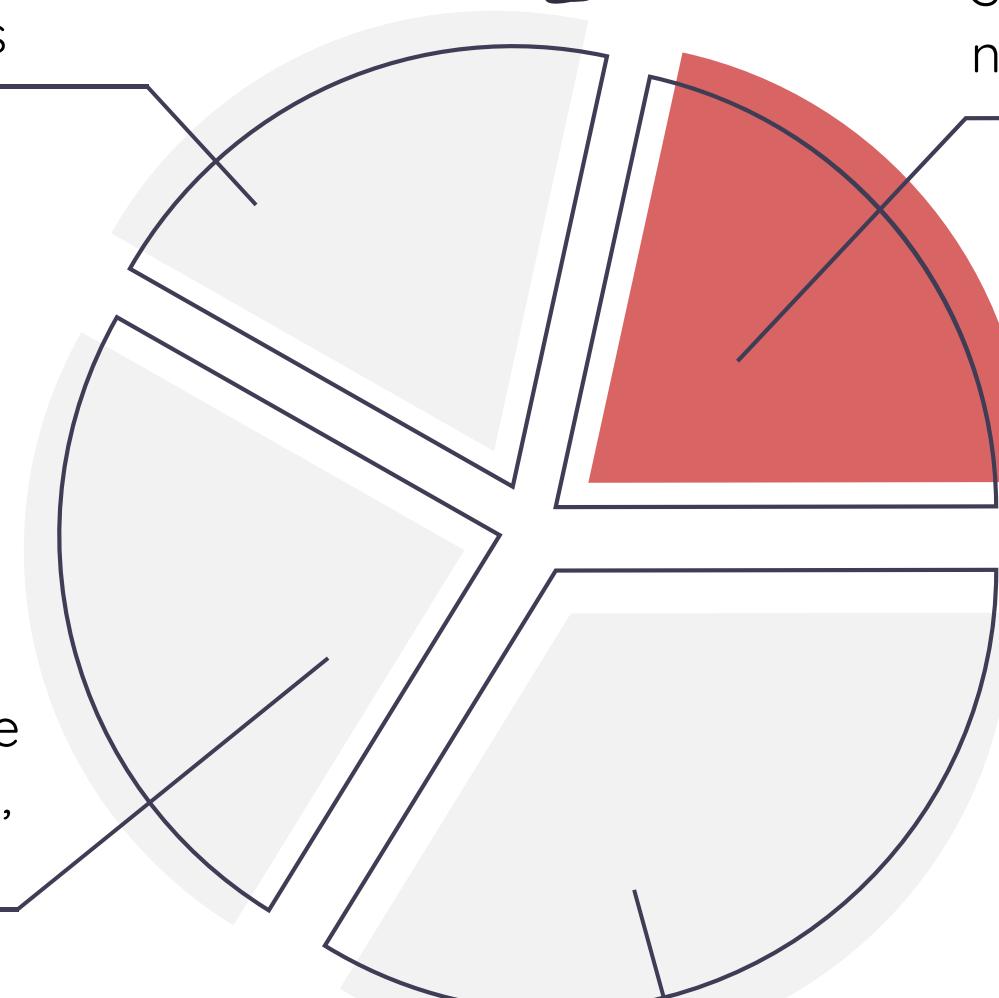
Research Gaps



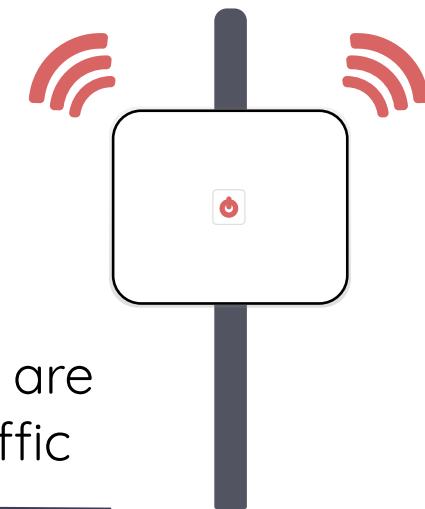
Real time object detection techniques were not implemented due to technical restrictions



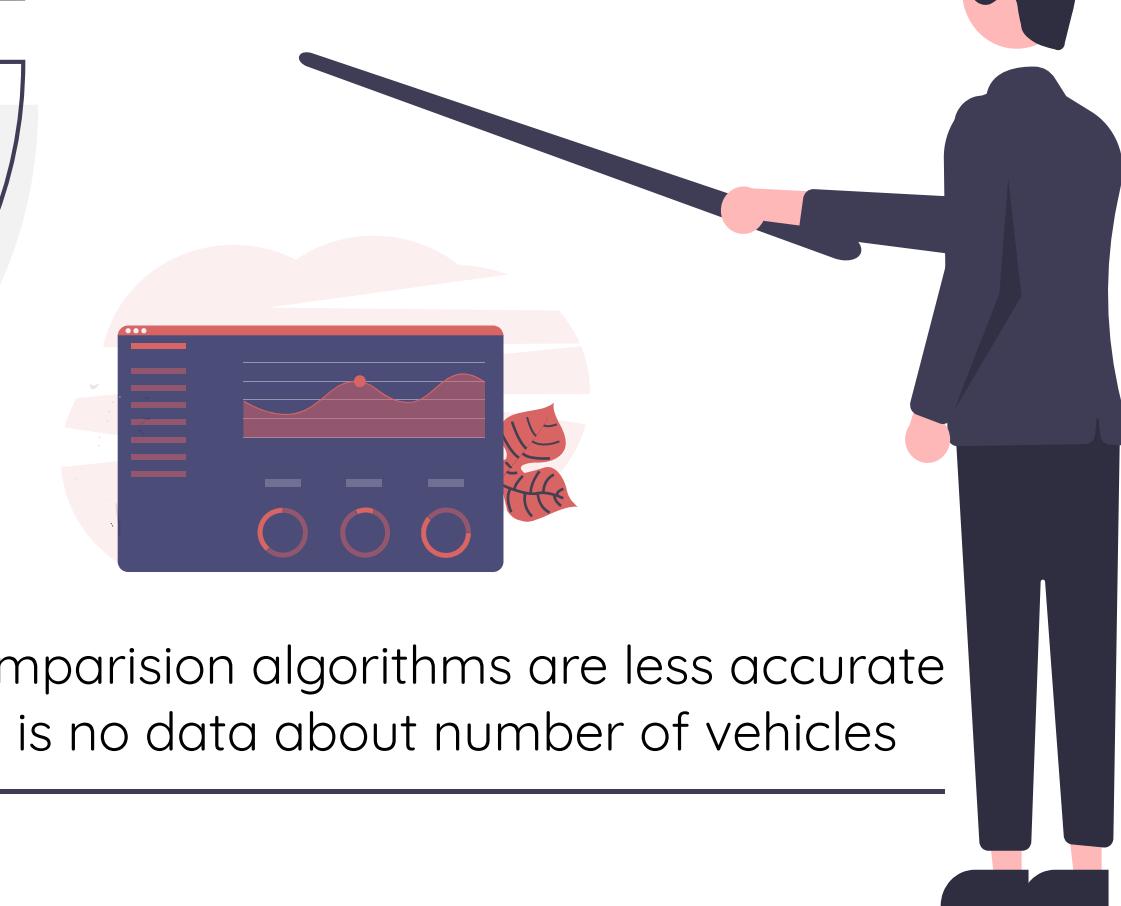
Important factors like vehicle type and mobility were not considered, which can alter end results



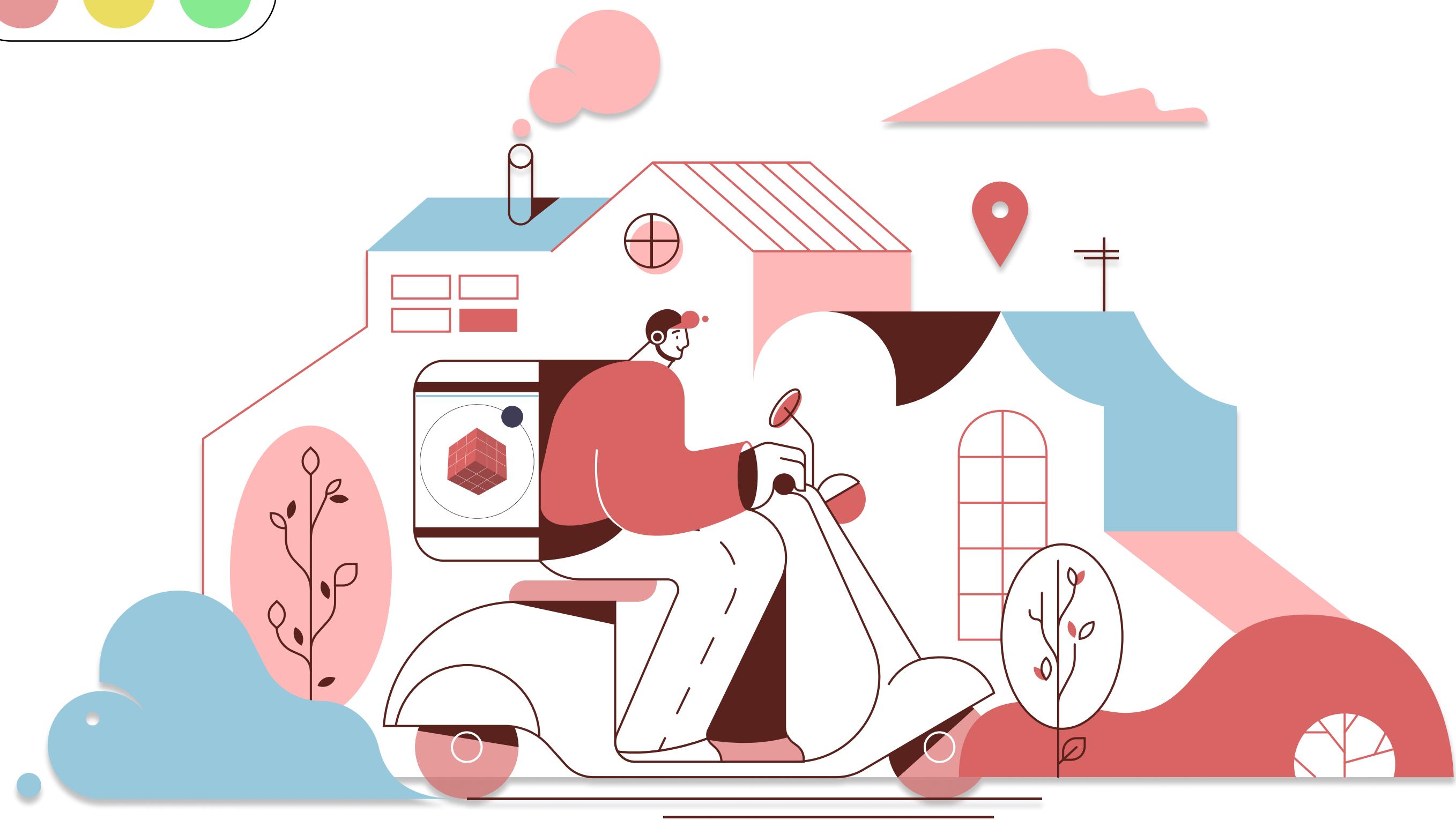
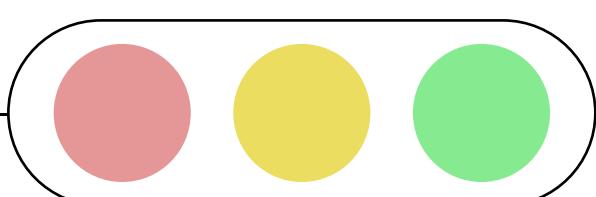
Sensor based systems are not useful in dense traffic



Area comparision algorithms are less accurate as there is no data about number of vehicles



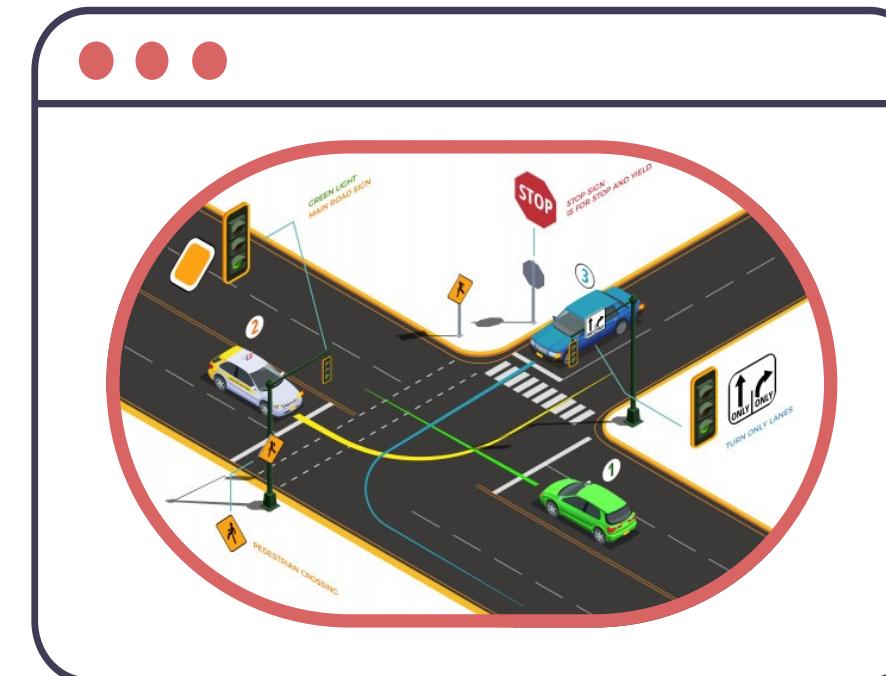
Problem Definition



The relentless growth in the number of vehicles has resulted in the **traffic congestion problem**. The situation is aggravated during peak hours, especially on multi-lane cross-junctions. The current traffic management system is **not capable** of handling the overload effectively, and hence the commuters have to **spend more and more time** in long traffic queues. As the existing system allows a static waiting time for each traffic signal, it is not adaptive to the present traffic condition. The situation **demands** an advanced solution capable of producing efficacious results.

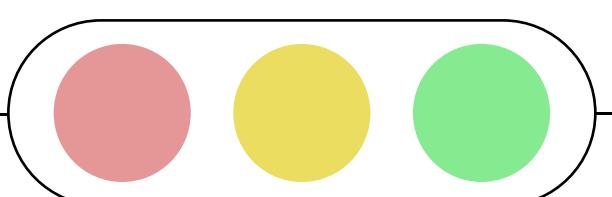
What is the Solution?

- Using camera to identify the approximate number of vehicles at a traffic signal.
- Dynamically assign waiting period based on density to achieve maximum flow.

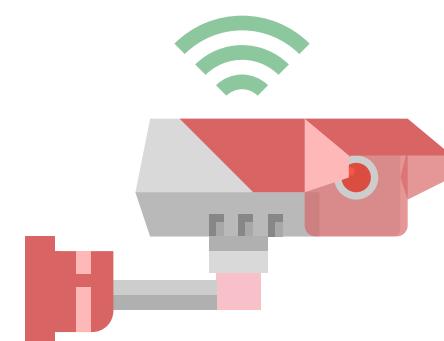


- Prioritise special vehicles such as Ambulance and Fire Brigade.
- Collect data from all sources to perform analysis and identify common trends and help system achieve better results.

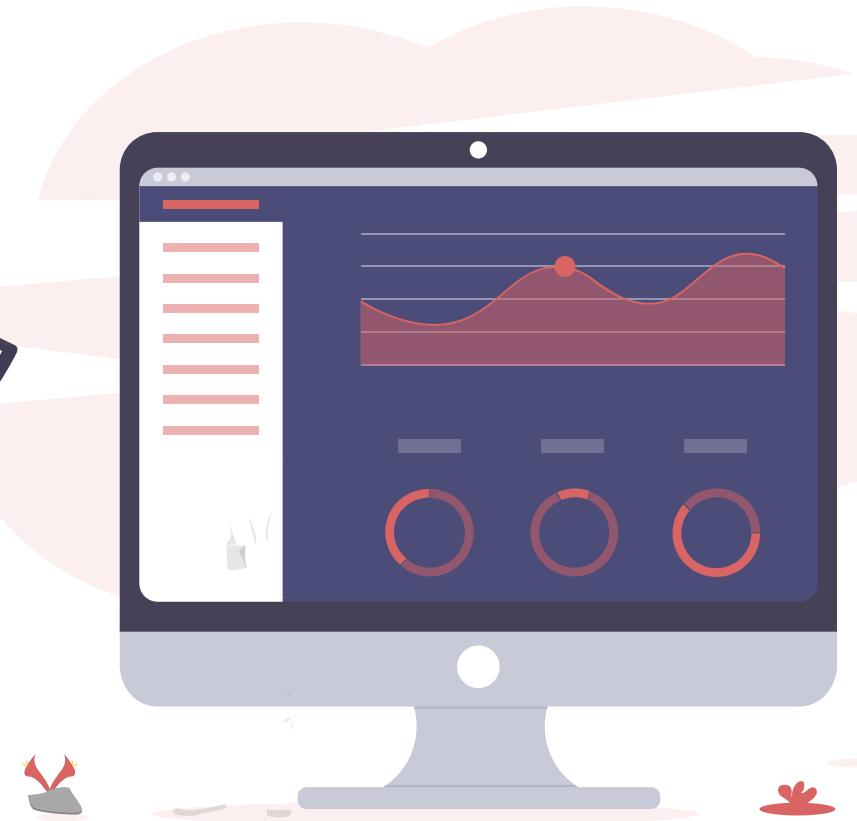
How the System Works?



Captures images and provide real-time surveillance



Store data to perform analysis



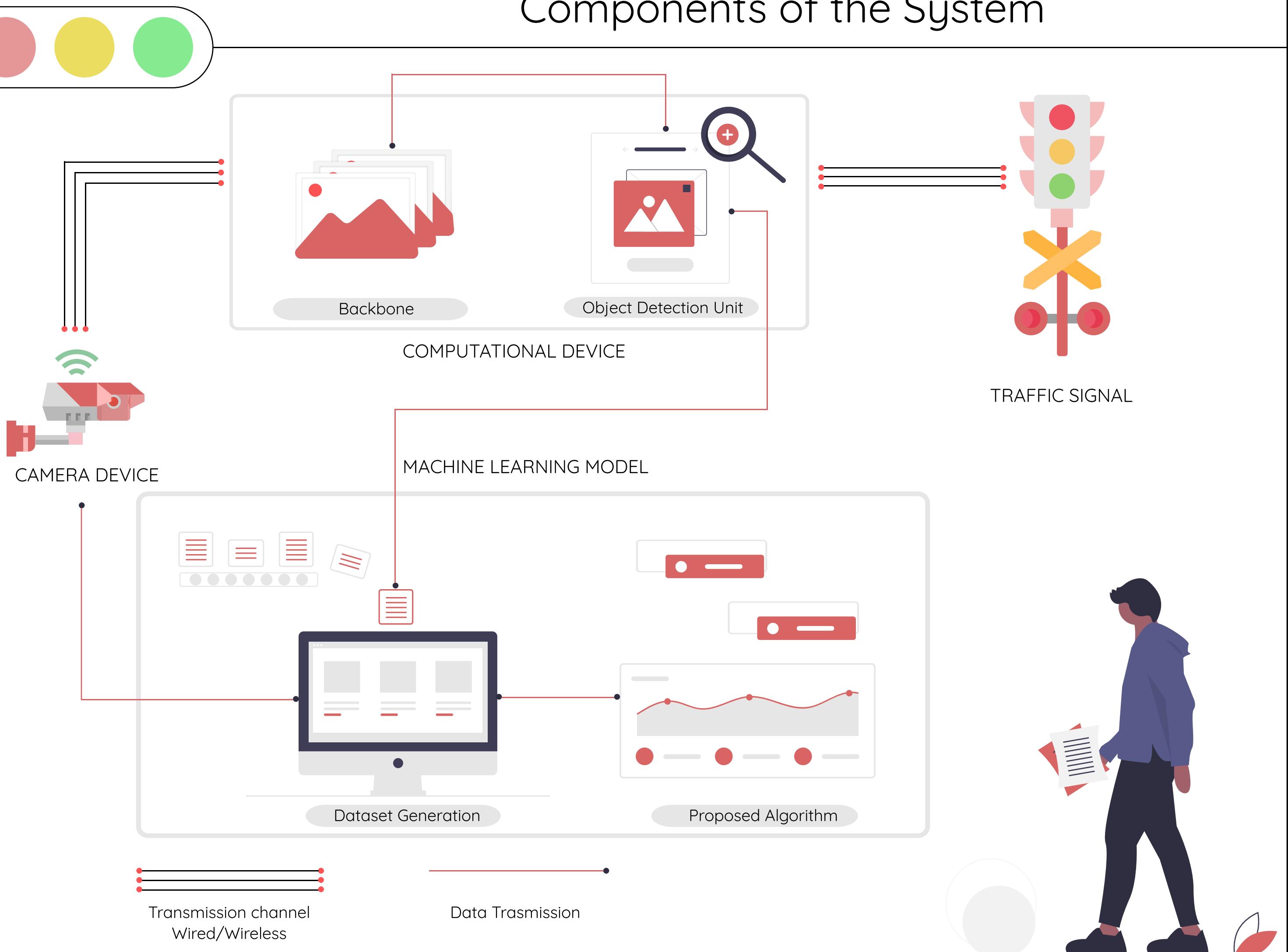
Find patterns and update algorithm



Send appropriate waiting time to all traffic signals

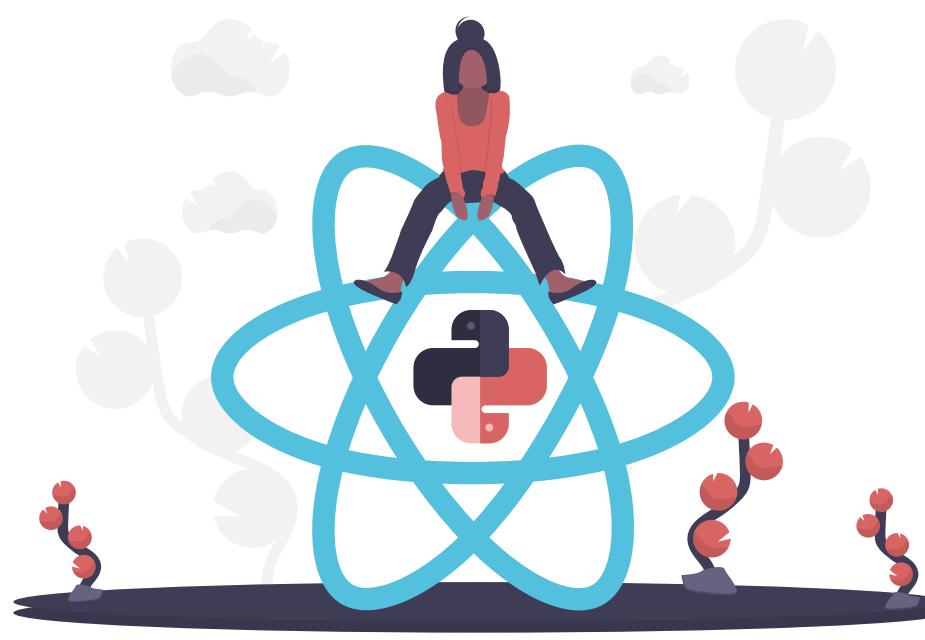


Components of the System

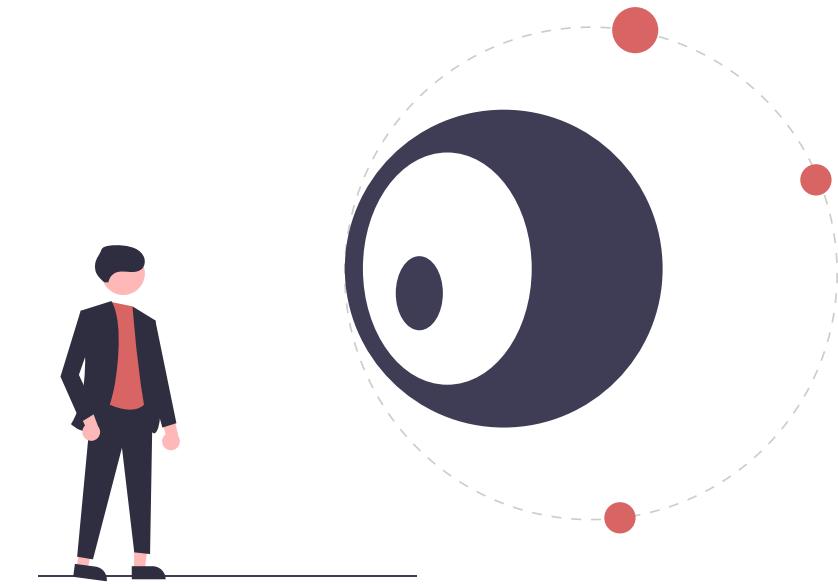


Is it Actually Possible?

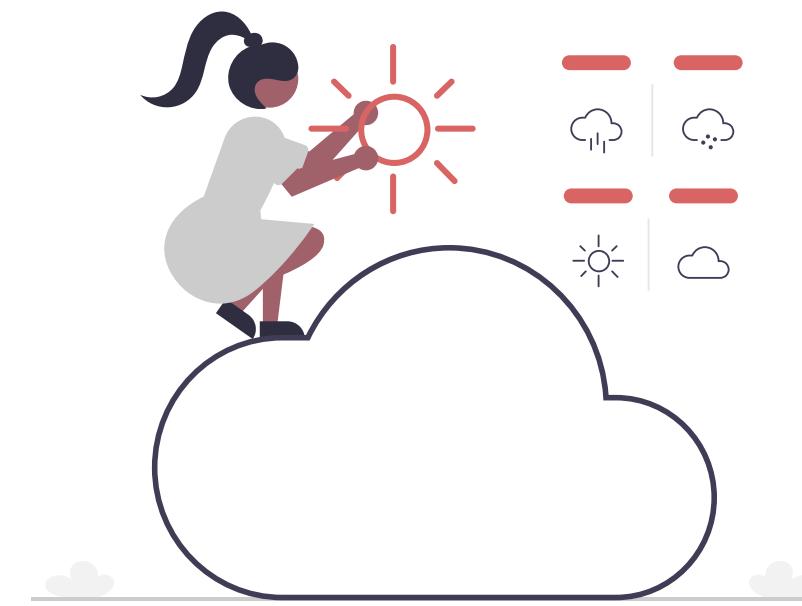
- Major cities like Mumbai, Delhi and Bangalore are equipped with Hi-tech CCTV surveillance cameras at almost all major junctions.



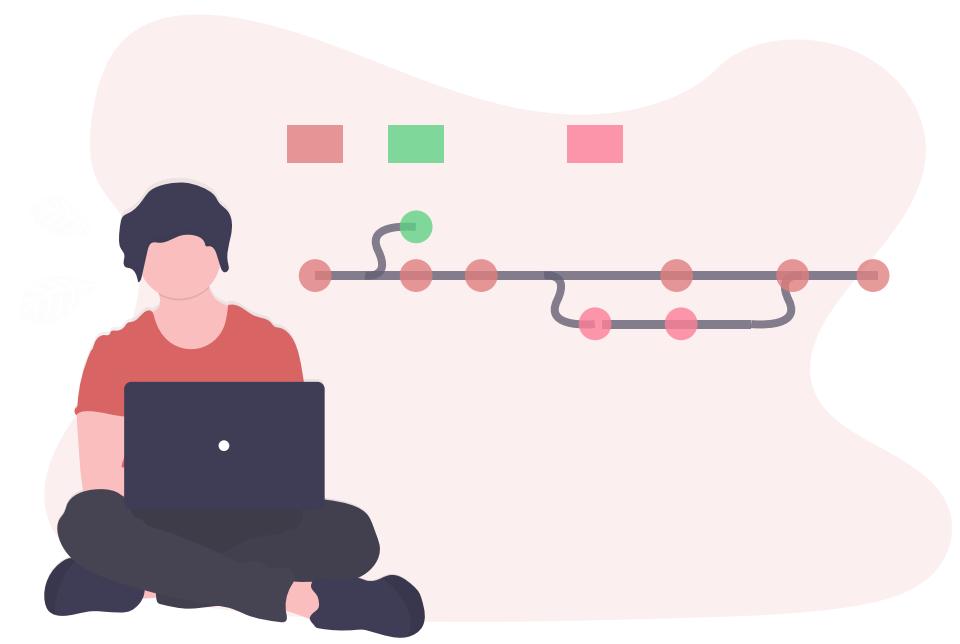
- Python provides a number of open source libraries for Image processing and object detection.



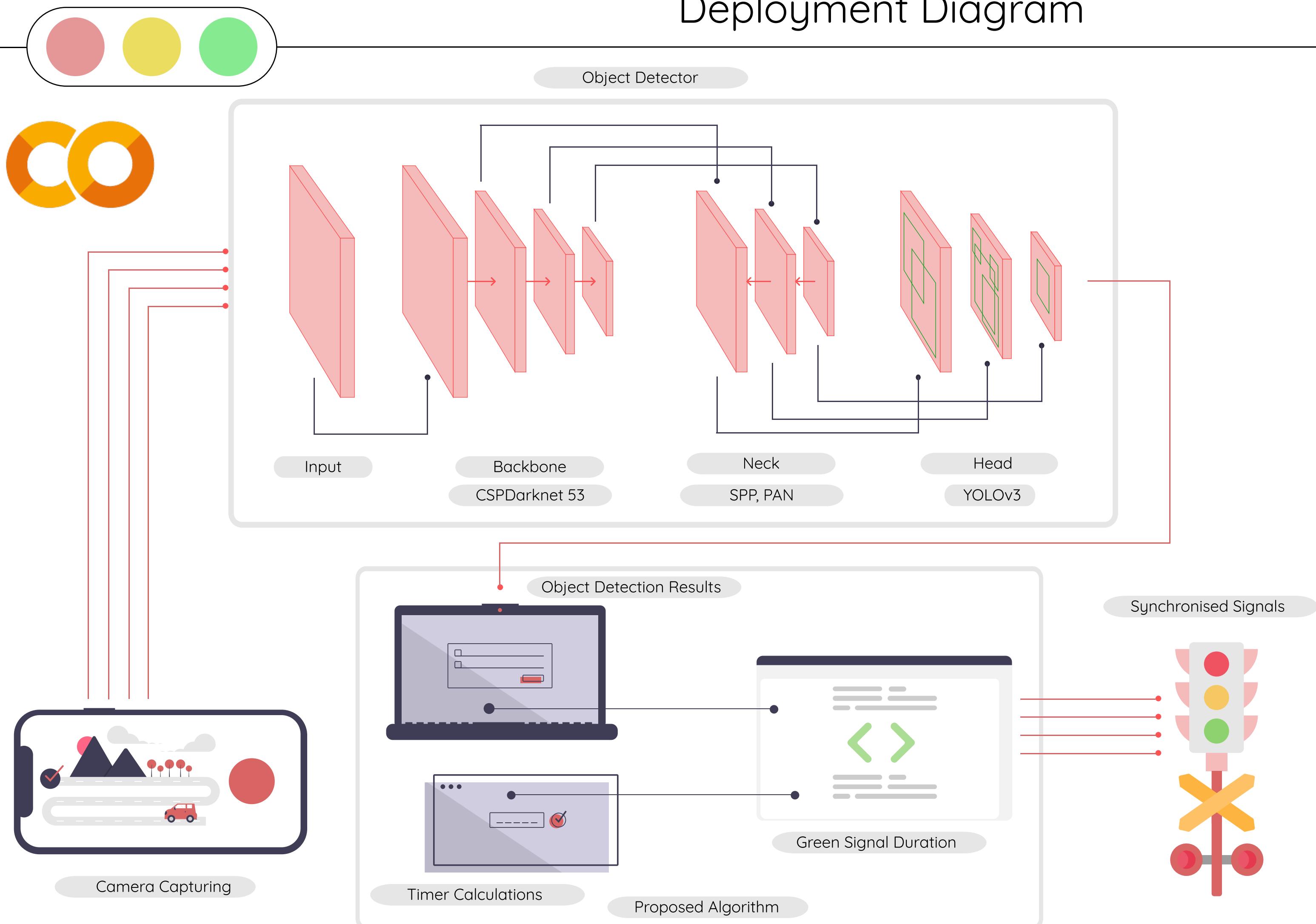
- An efficient algorithm can be developed to ensure expected results.



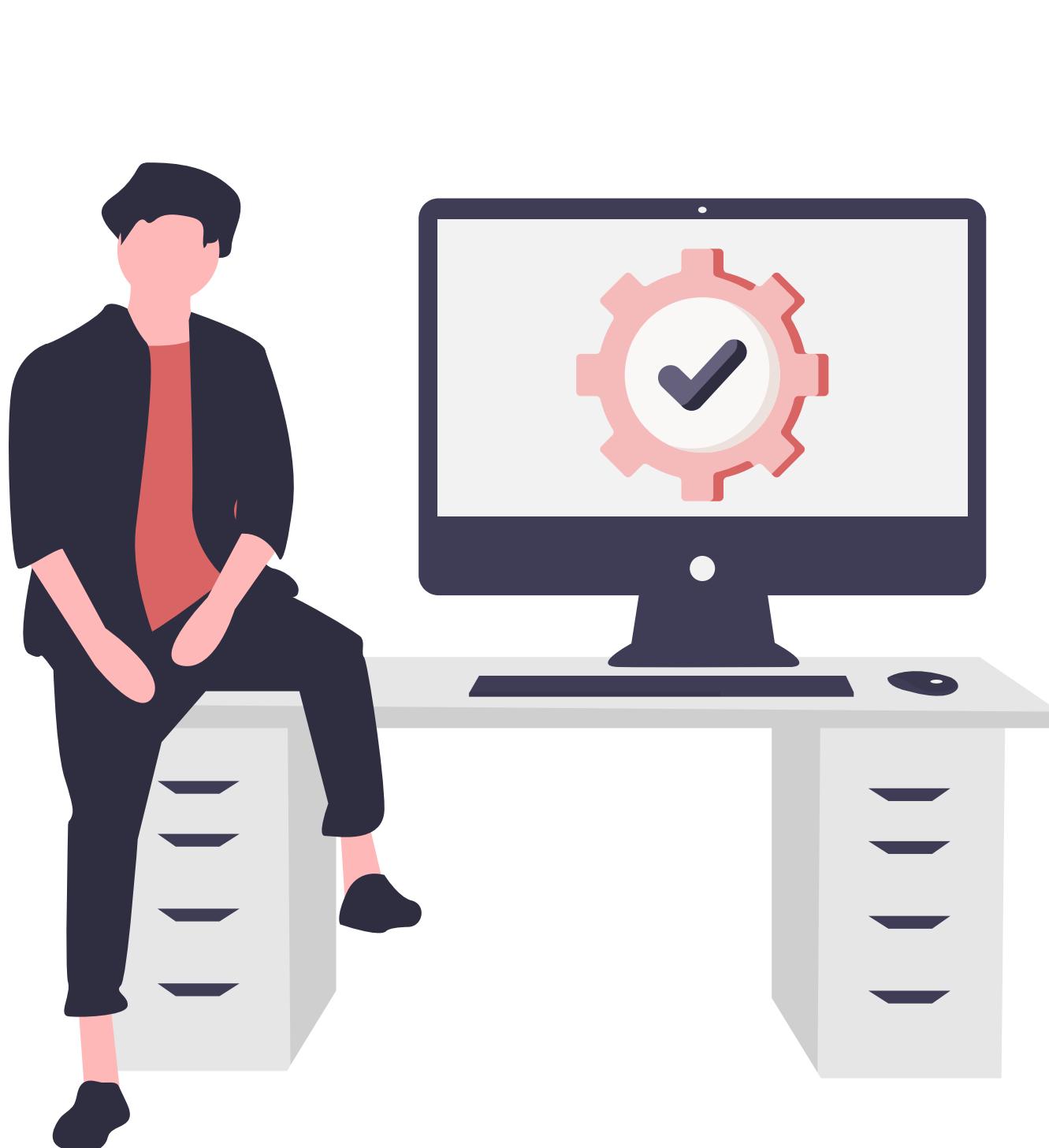
- Technical Restrictions: Extreme Weather conditions



Deployment Diagram



System Requirement



Hardware Requirements

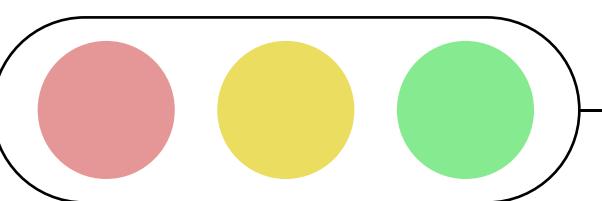
- Operating System : Windows or Ubuntu
- System RAM : 8GB
- System ROM : Cloud Storage or 1TB per slot
- System GPU : Minimum GTX 710 or equivalent
Preferred GTX 1650 or equivalent
- System Processor : Intel i5 or Higher
- Bandwidth : 5.0 GHz up to 1GBPS transmission rate
- Camera : 720p resolution or higher



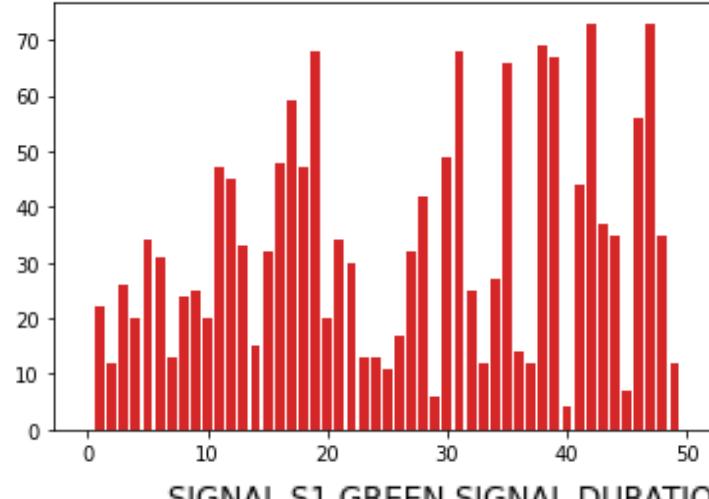
Software Requirements

- Programming Language : Python 2.7.x/3.x
- Python Dependencies : Scikit-image, OpenCV, Matplotlib

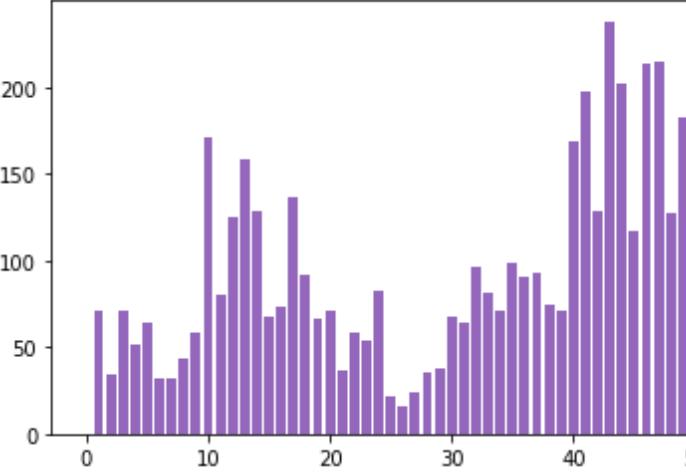
Result Analysis



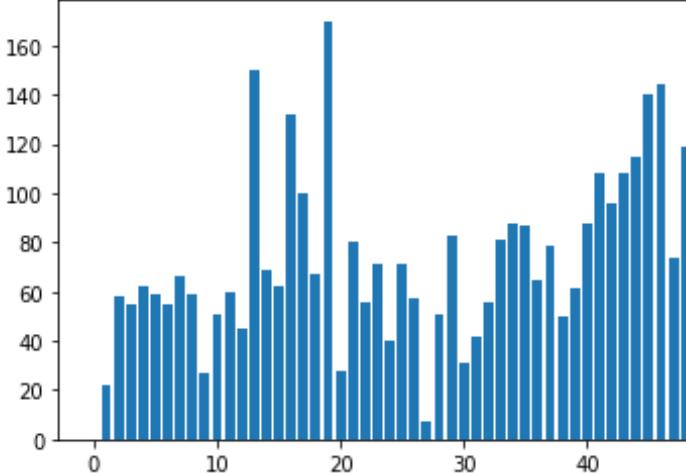
SIGNAL S1 TOTAL NUMBER OF VEHICLES



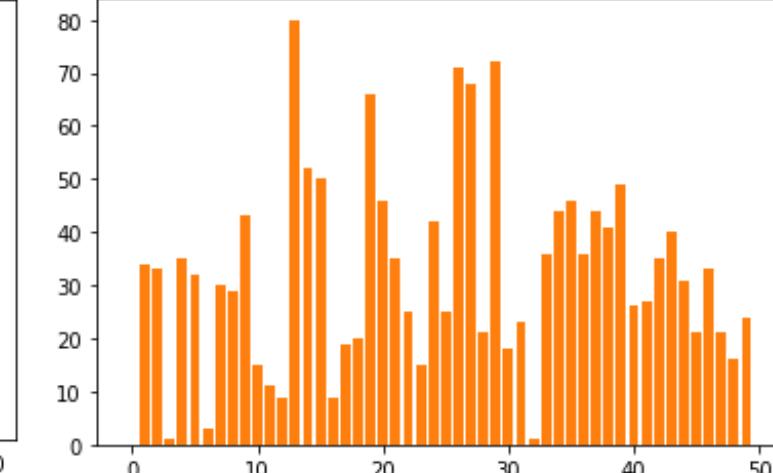
SIGNAL S2 TOTAL NUMBER OF VEHICLES



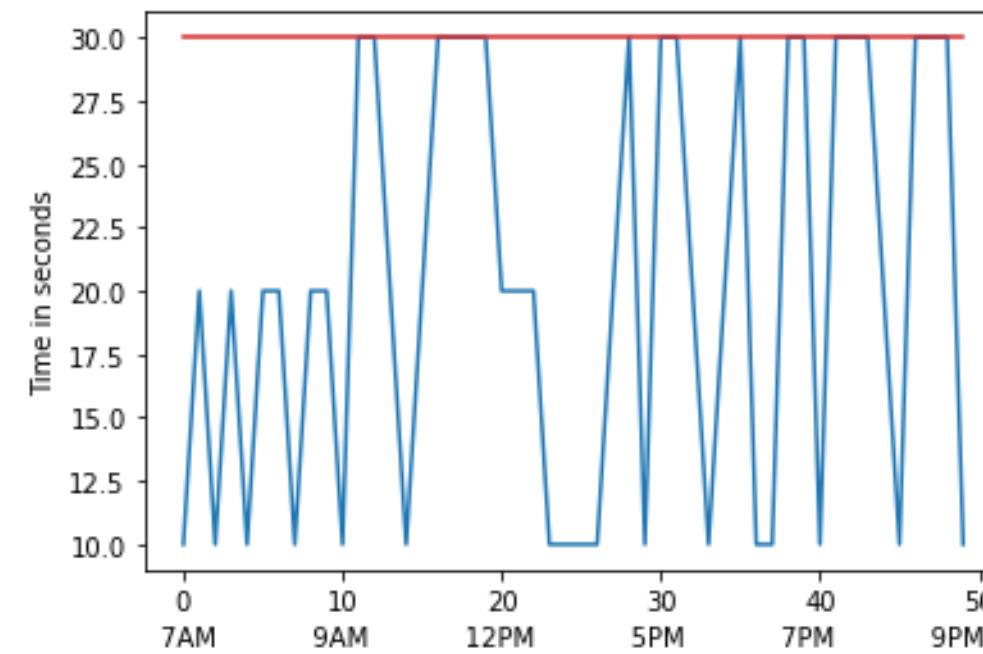
SIGNAL S3 TOTAL NUMBER OF VEHICLES



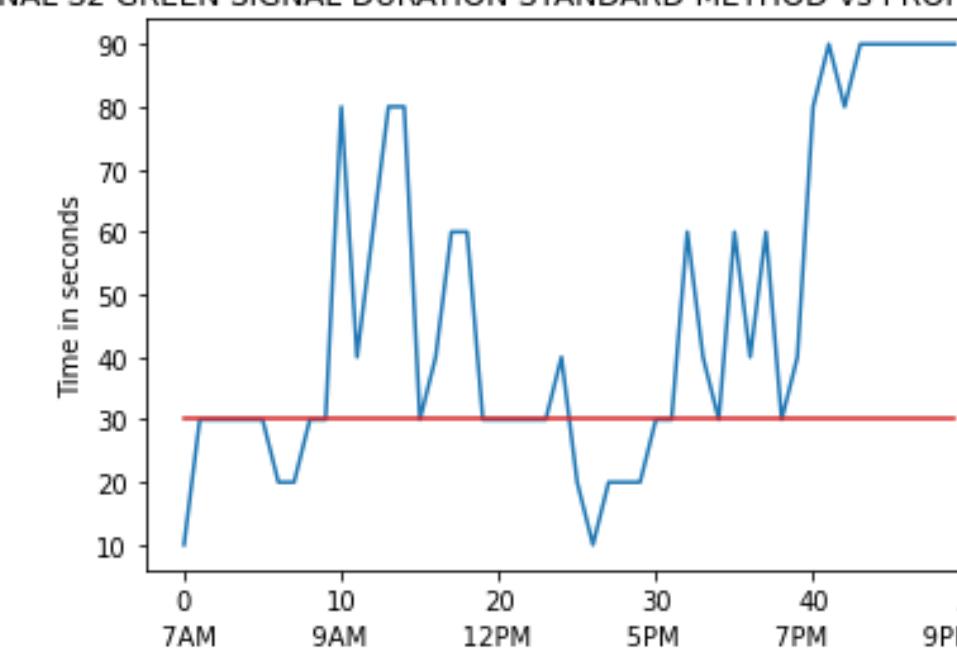
SIGNAL S4 TOTAL NUMBER OF VEHICLES



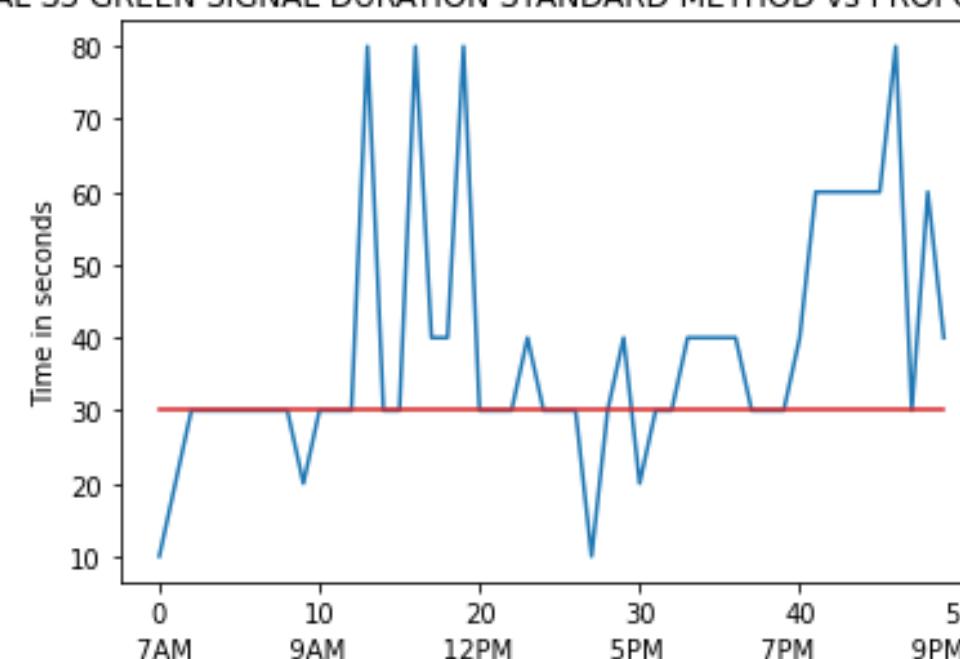
SIGNAL S1 GREEN SIGNAL DURATION STANDARD METHOD vs PROPOSED METHOD



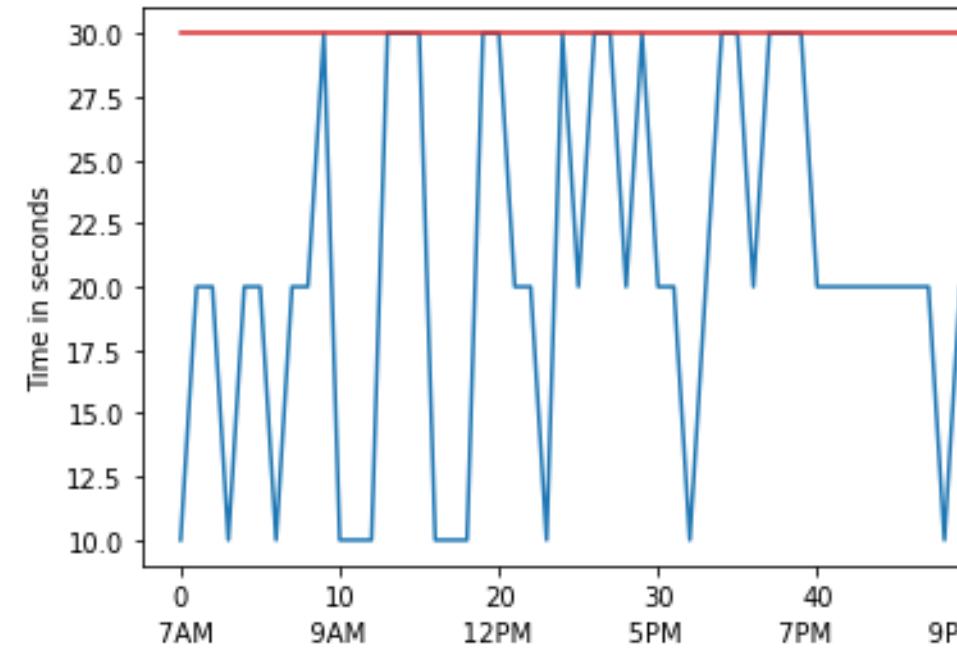
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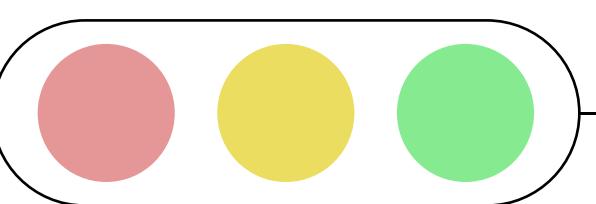
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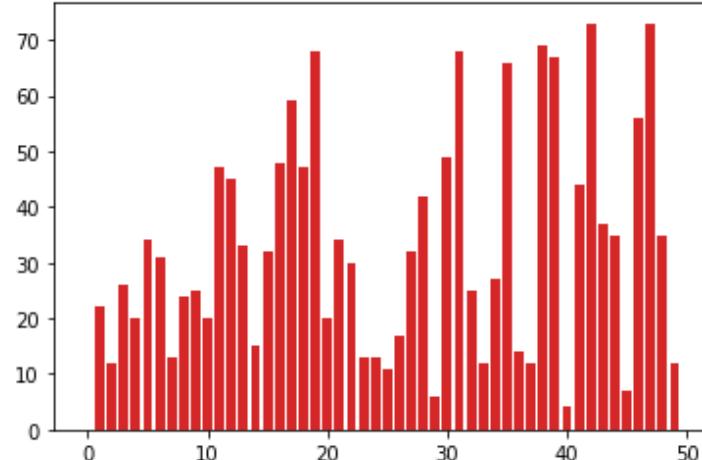
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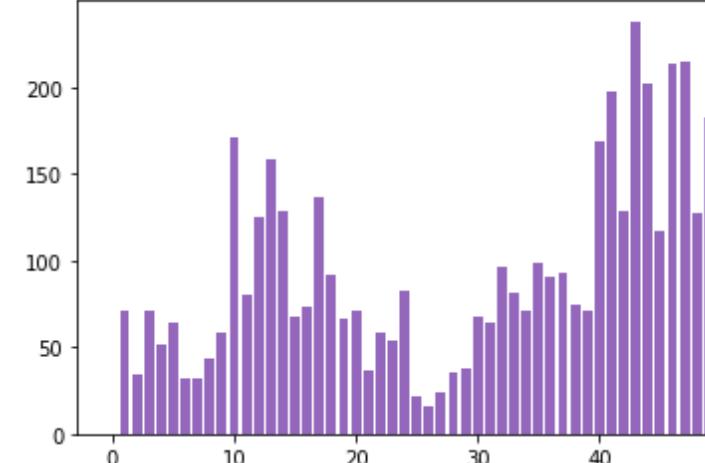
Result Analysis



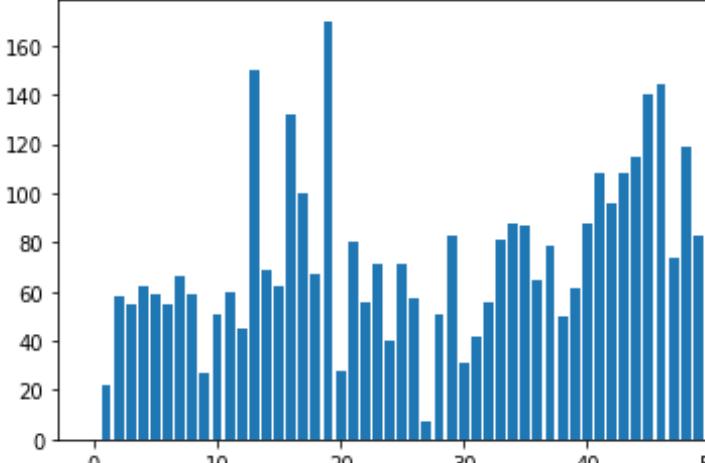
SIGNAL S1 TOTAL NUMBER OF VEHICLES



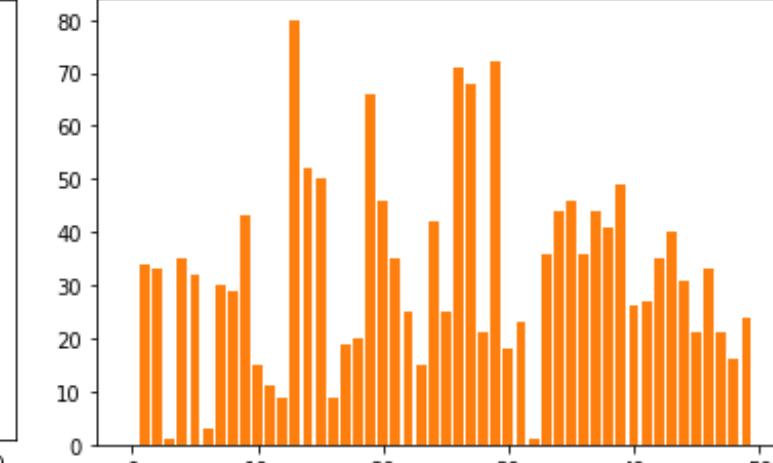
SIGNAL S2 TOTAL NUMBER OF VEHICLES



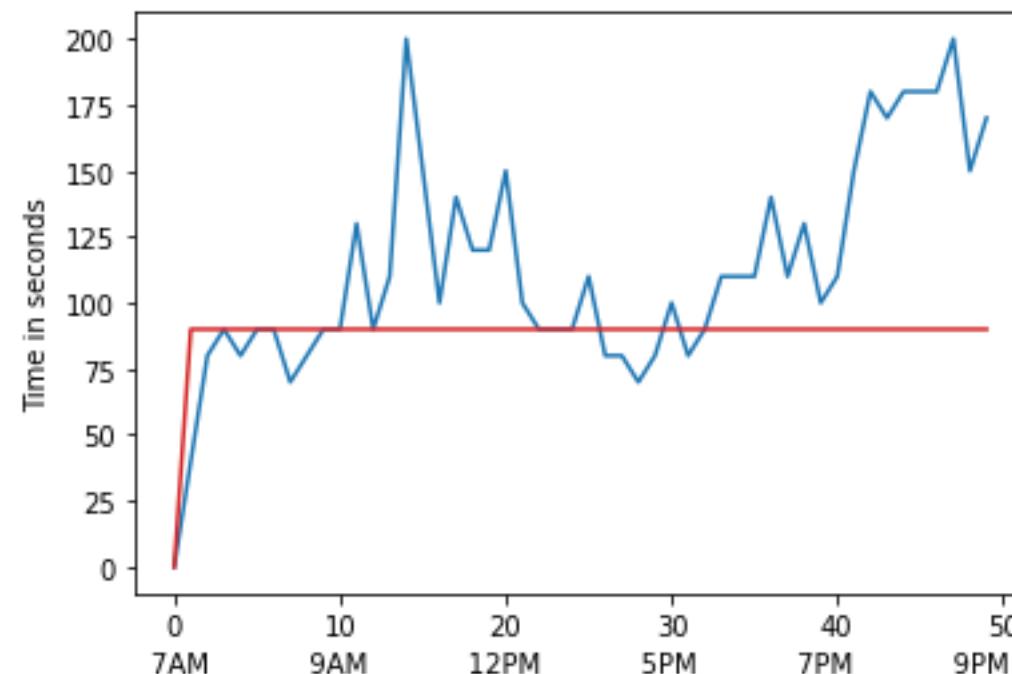
SIGNAL S3 TOTAL NUMBER OF VEHICLES



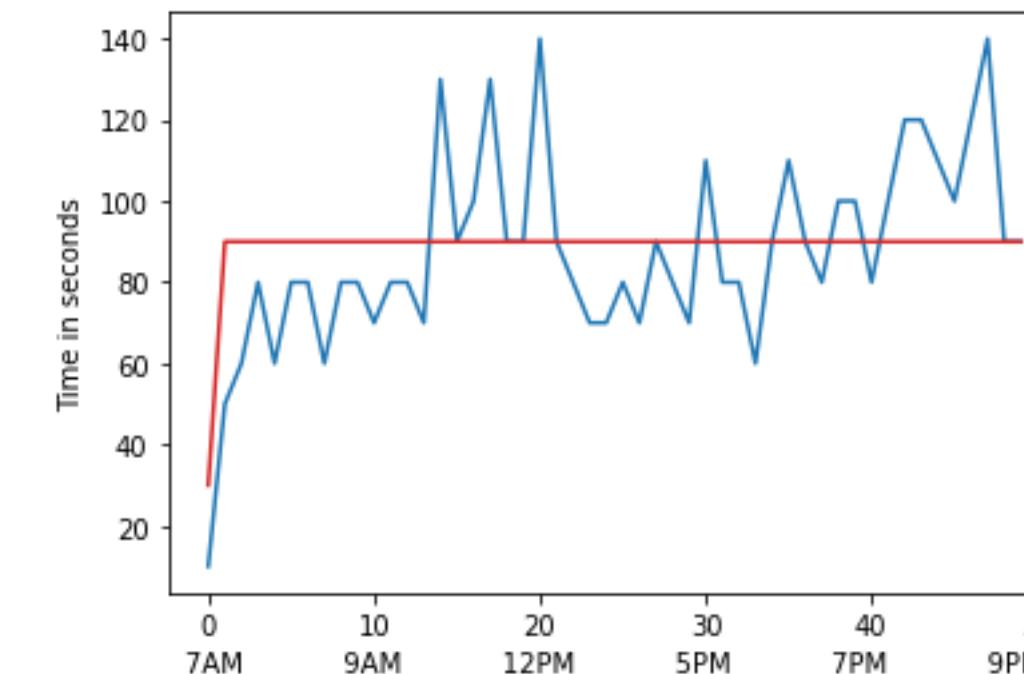
SIGNAL S4 TOTAL NUMBER OF VEHICLES



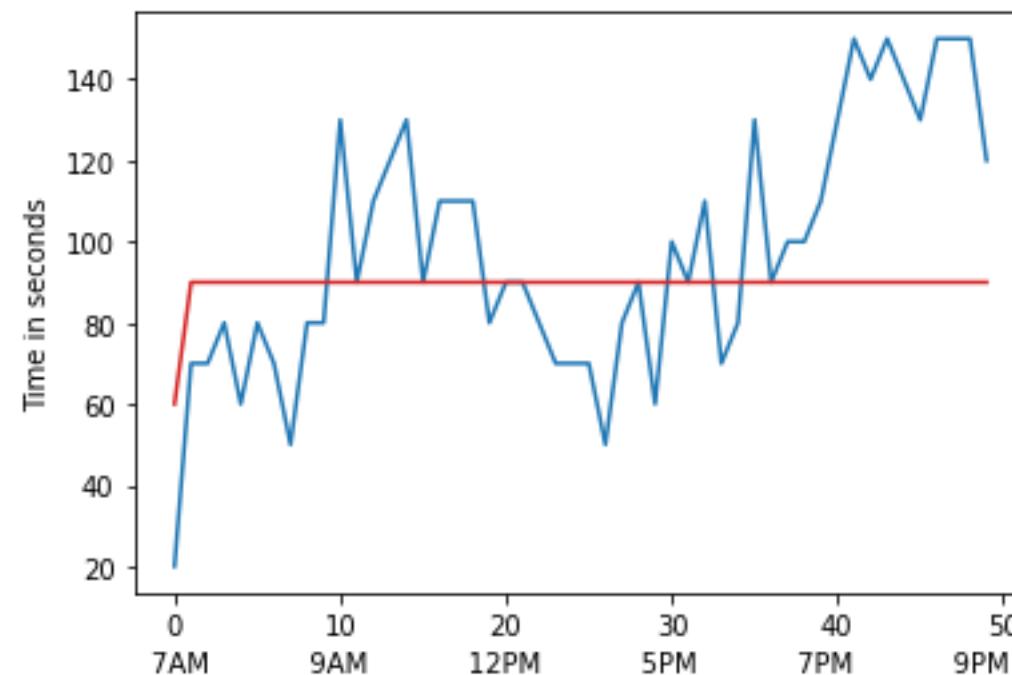
SIGNAL S1 RED SIGNAL DURATION STANDARD METHOD vs PROPOSED METHOD



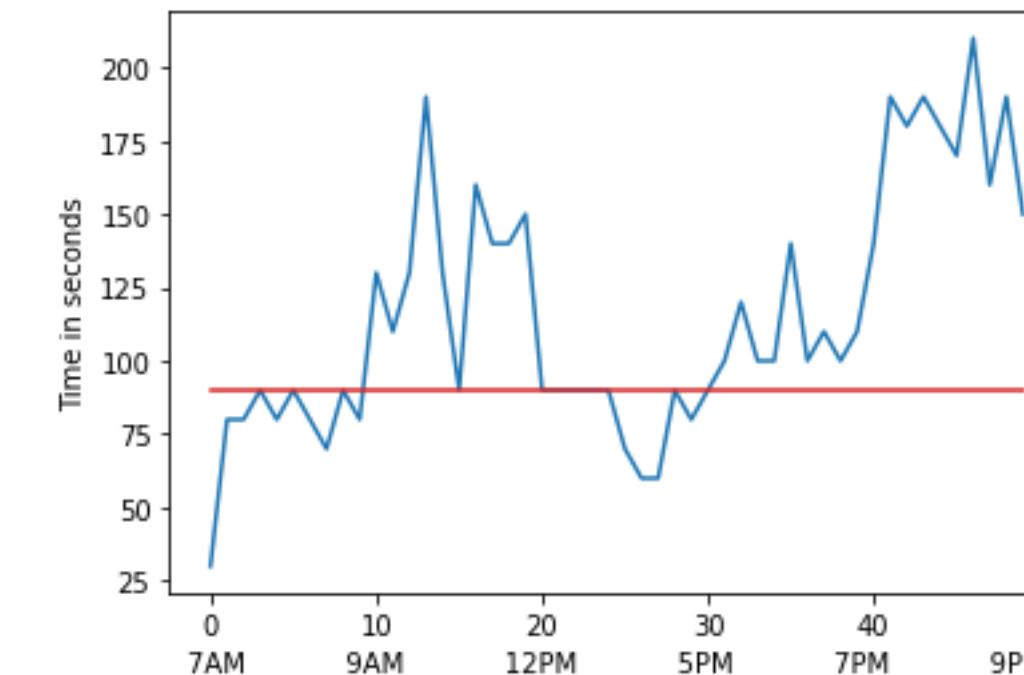
SIGNAL S2 RED SIGNAL DURATION STANDARD METHOD vs PROPOSED METHOD



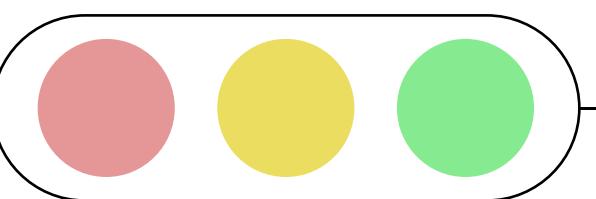
SIGNAL S3 RED SIGNAL DURATION STANDARD METHOD vs PROPOSED METHOD



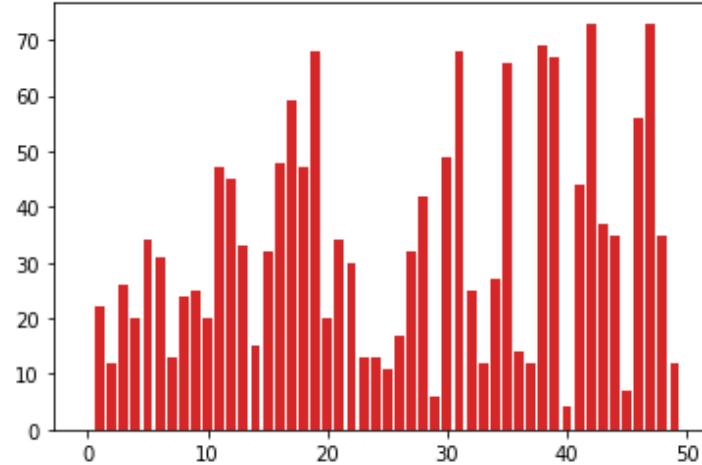
SIGNAL S4 RED SIGNAL DURATION STANDARD METHOD vs PROPOSED METHOD



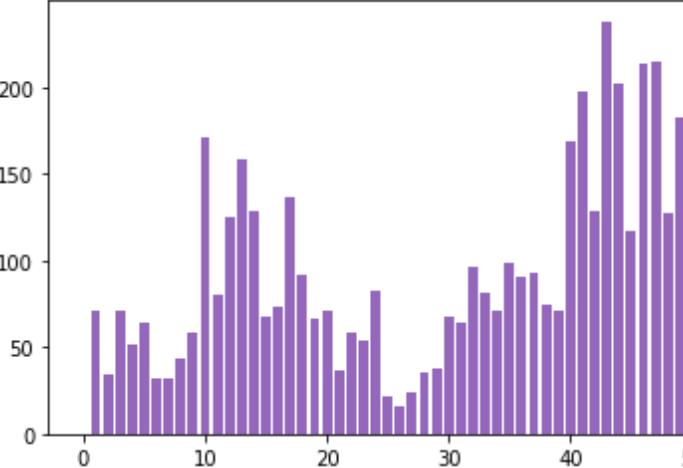
Result Analysis



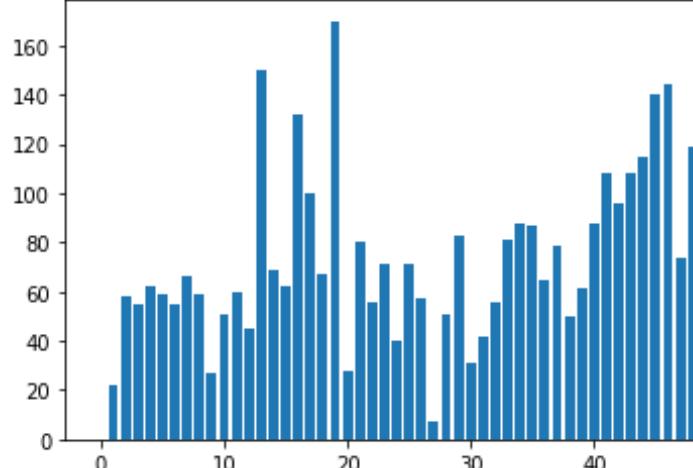
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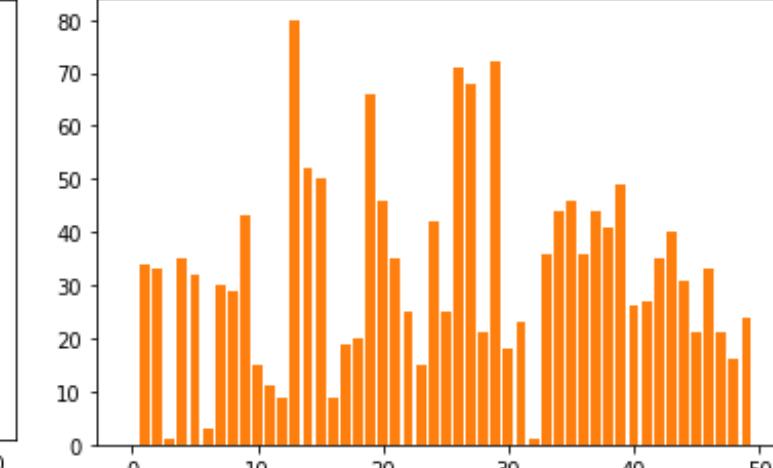
SIGNAL S2 TOTAL NUMBER OF VEHICLES



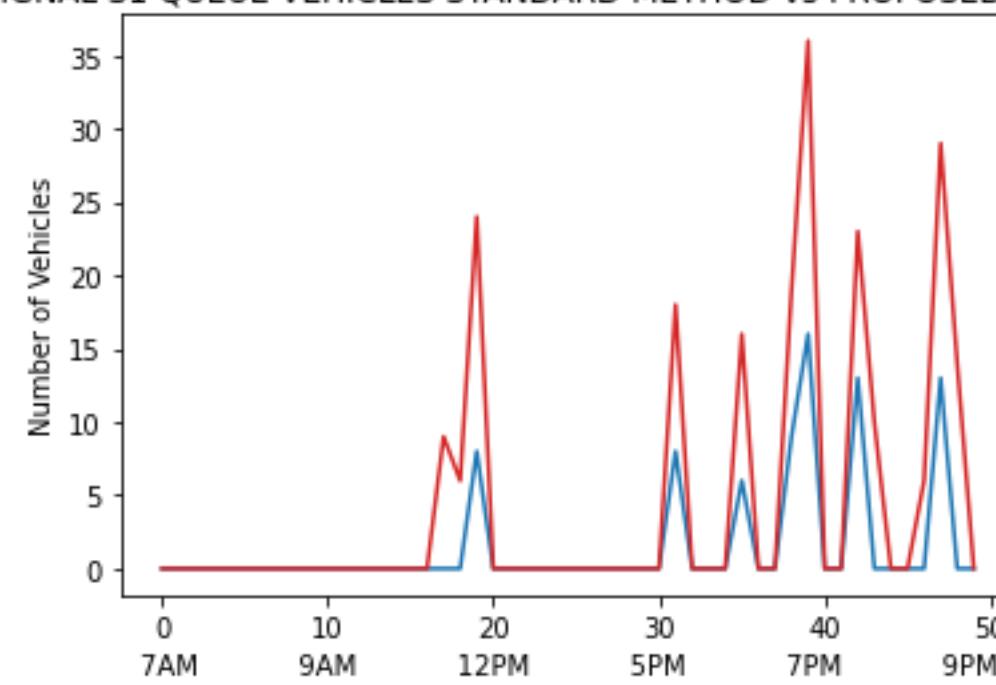
SIGNAL S3 TOTAL NUMBER OF VEHICLES



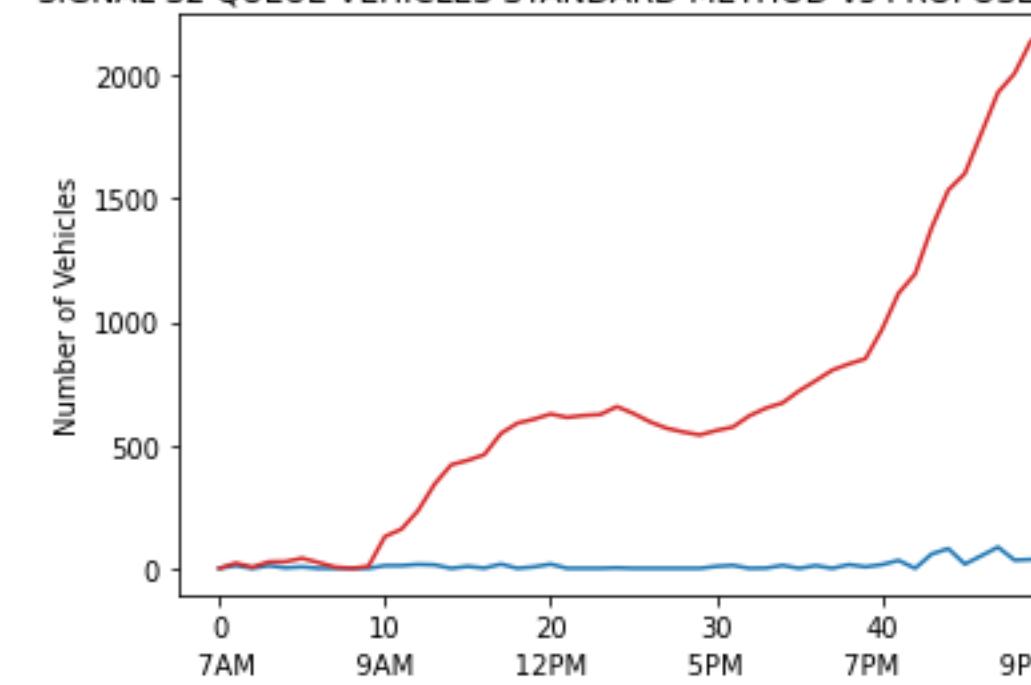
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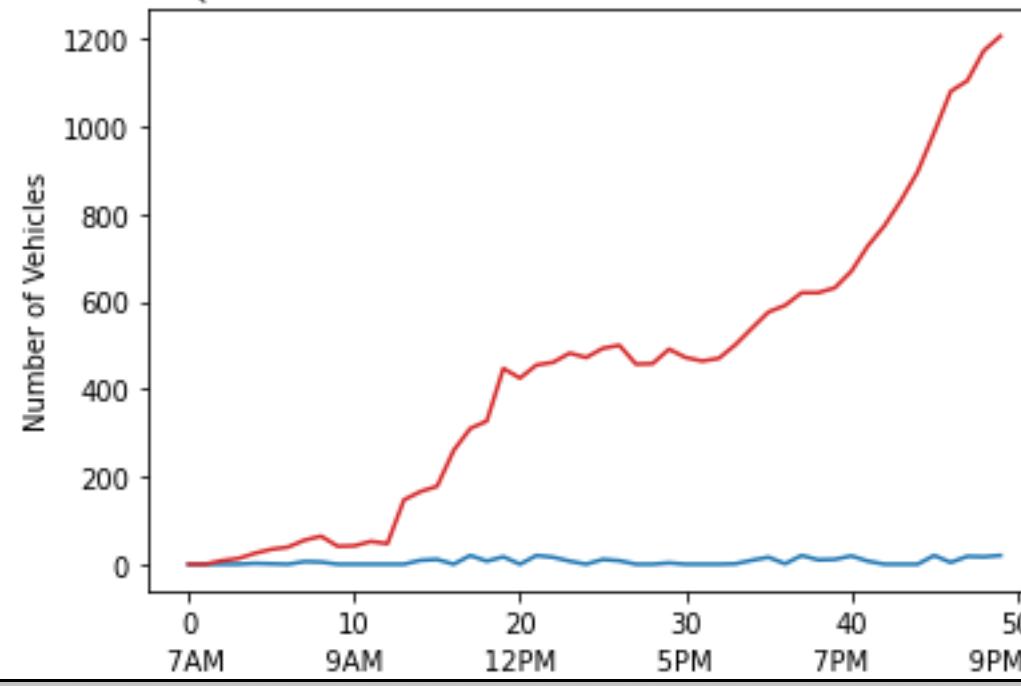
SIGNAL S1 QUEUE VEHICLES STANDARD METHOD vs PROPOSED METHOD



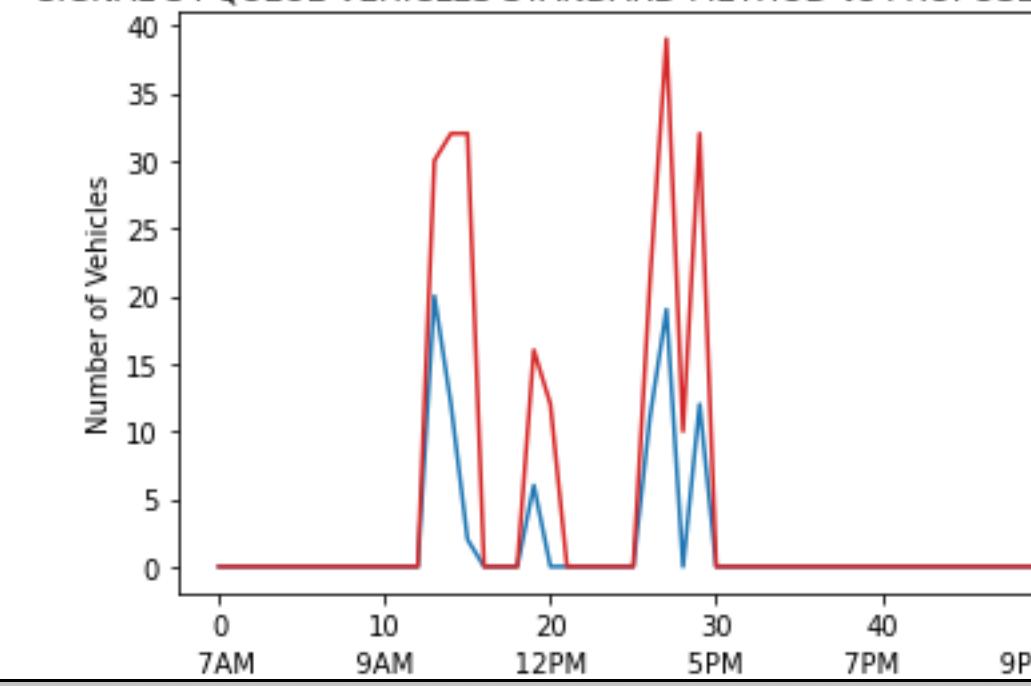
SIGNAL S2 QUEUE VEHICLES STANDARD METHOD vs PROPOSED METHOD



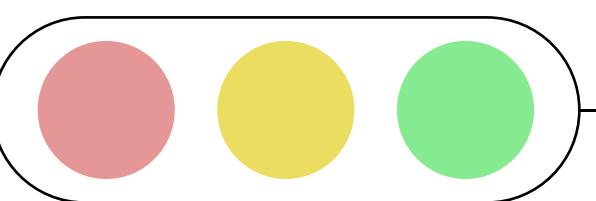
SIGNAL S3 QUEUE VEHICLES STANDARD METHOD vs PROPOSED METHOD



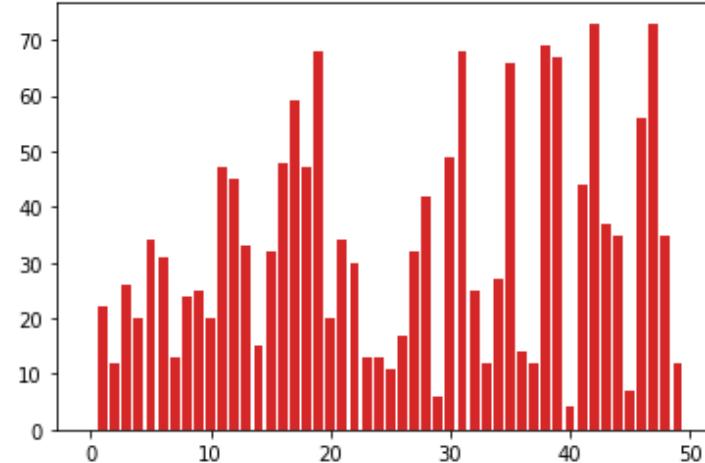
SIGNAL S4 QUEUE VEHICLES STANDARD METHOD vs PROPOSED METHOD



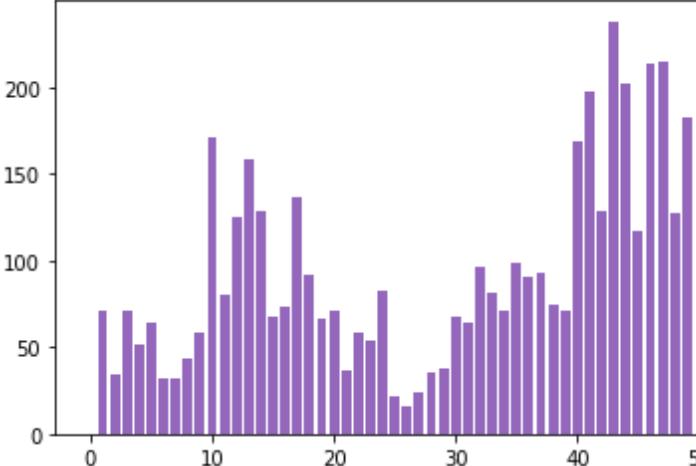
Result Analysis



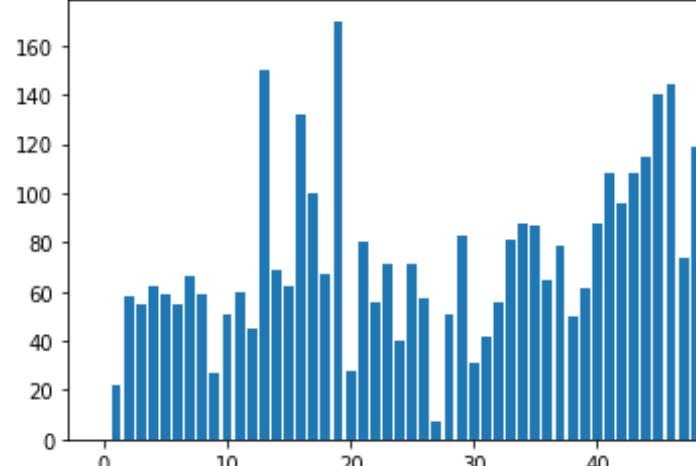
SIGNAL S1 TOTAL NUMBER OF VEHICLES



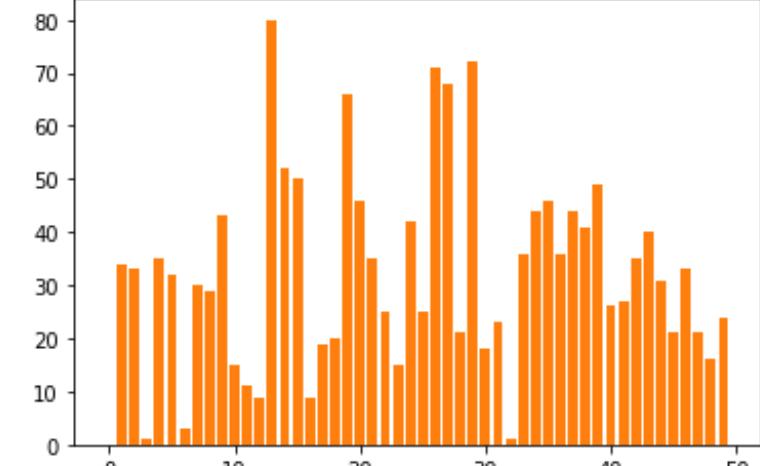
SIGNAL S2 TOTAL NUMBER OF VEHICLES



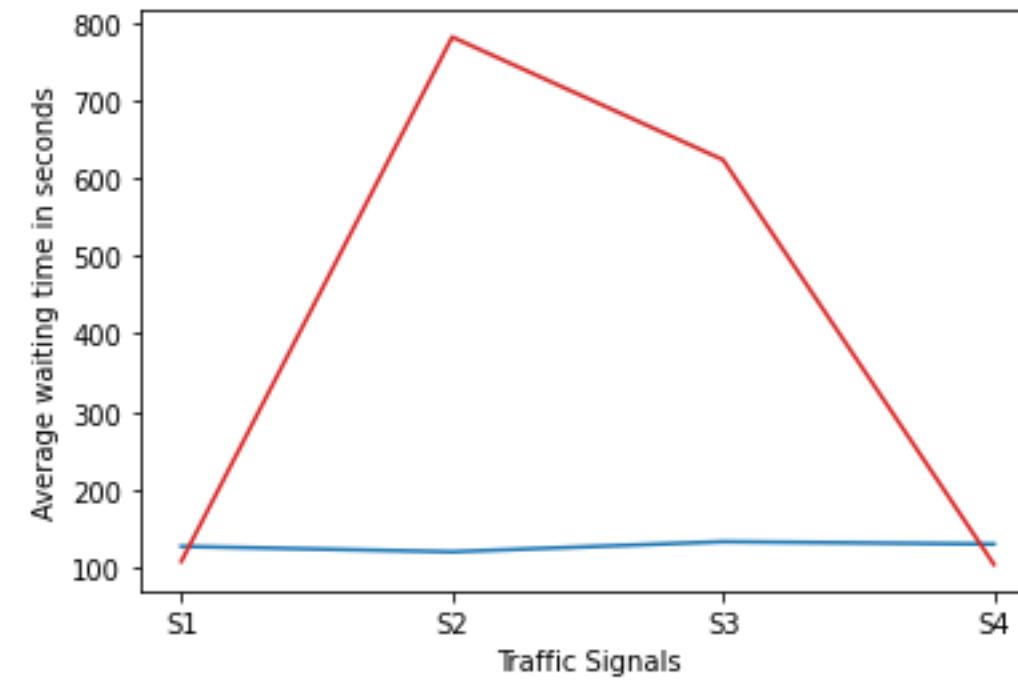
SIGNAL S3 TOTAL NUMBER OF VEHICLES



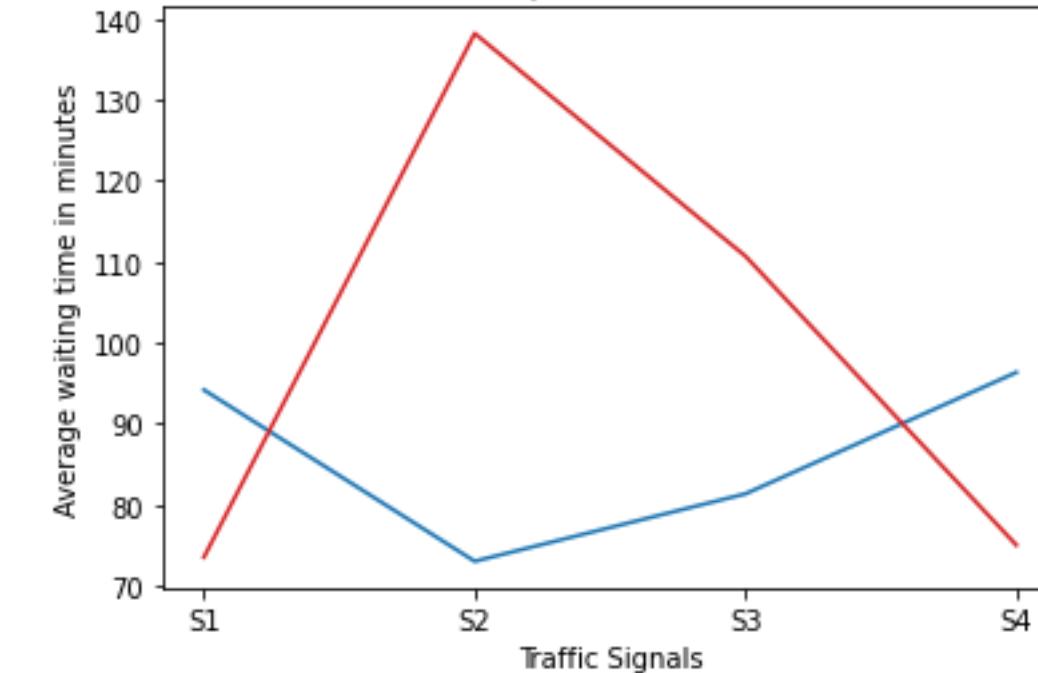
SIGNAL S4 TOTAL NUMBER OF VEHICLES



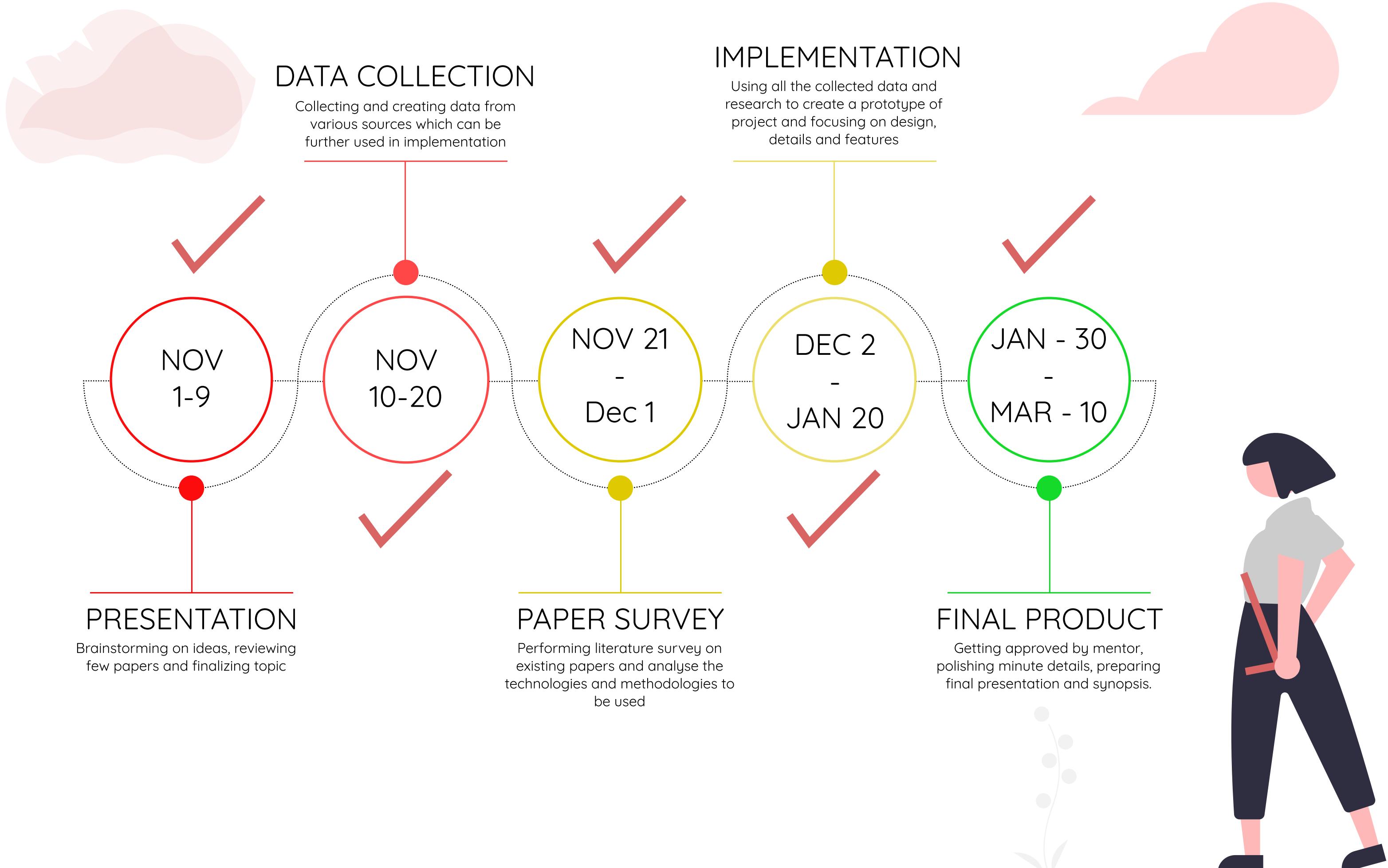
AVERAGE WAITING TIME AT EACH SIGNALS



PLOTTING TIME REQUIRED TO CLEAR EACH LANE



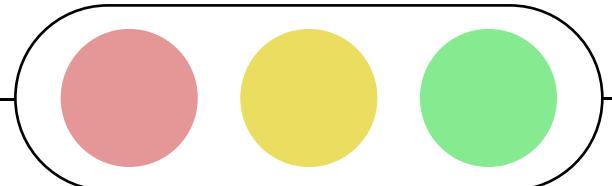
Project Timeline



Conclusion

The proposed system will help to manage the traffic more efficiently, which will eventually result in reduced traffic hours and the annual money spent on traffic congestion. As compared to many other possible solutions, our proposal is much more feasible and easier to implement. As the system is dynamic in nature, it is capable of easily adapting to occasional festive traffic without additional modifications. As a result of reduced traffic congestion, average number of vehicles present at each signal is also reducing significantly. Since, vehicles are not waiting in ideal mode, it is also consuming less petrol and as a result pollution is also decreasing. Apart from solving the congestion problem, this is an effective tool for analysing traffic trends in cities. With further modification and expansion, it can scale up to serve as a traffic command center of entire city and hence an effective and much-needed system for developing countries

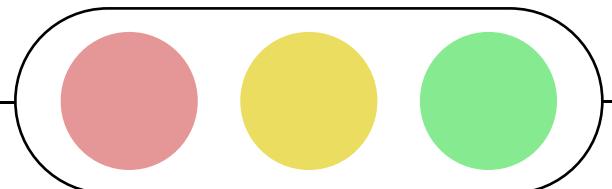




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- [4] M. S. Uddin, A. K. Das and M. A. Taleb, "Real-time area based traffic density estimation by image processing for traffic signal control system: Bangladesh perspective," 2015 International Conference on Electrical Engineering and Information Communication Technology (ICEEICT), Dhaka, 2015, pp. 1-5, doi: 10.1109/ICEEICT.2015.7307377.
- [5] M. V., V. V. R. and N. A., "A Deep Learning RCNN Approach for Vehicle Recognition in Traffic Surveillance System," 2019 International Conference on Communication and Signal Processing (ICCSP), Chennai, India, 2019, pp. 0157-0160, doi: 10.1109/ICCSP.2019.8698018.

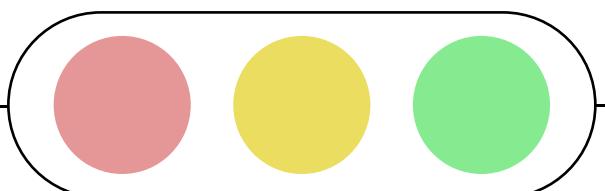


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THANK YOU

