Final Year Project Showcase for Batch-2016

Department of Computer Science & Information Technology

1	**Project Idea**	**Video Surveillance-Based Intelligent Traffic Management System** This significant increase enforced modern transportation system to promote the performance of traffic controlling system. To maintain the traffic effectively and safely, automation and artificial intelligence have become the mainstream. In this regard we have developed a system that may be used for automatically surveillance traffic to solve traffic problems include: vehicle count, vehicle collision, vehicle moving direction, traffic density, traffic pollution detection system etc.  Graphical output of the developed model. Future work: In future, the system also performs automatic detection of bike-riders with or without helmet and number plate detection using surveillance videos in real time.  Project Objectives: Detection and classification of the vehicles (car, truck, bicycle, motorcycle, bus) Detection of vehicle direction of travel Prediction the time of vehicle detection Traffic pollution estimation Recognition of approximate vehicle color Forward Collision Detection Drone view detection for estimating traffic density Graphical User Interface for Users
2	**Process**	From those videos object of interest are taken using supervised learning fashion and then applied machine learning algorithm, to learn multi-class classifier include bike, car, rickshaw, etc. the module of vehicle detection based on machine learning is extremely effective for roads with heavy traffic flow after it we train detector for each class (bike, car, rickshaw, etc.) by "Faster RCNN model" which is developed on TensorFlow. The idea

which we proposed processes an input video to track and detects the vehicle through its motion, classification, the speed, traffic density, vehicle color, direction and also counts the total number of vehicles.

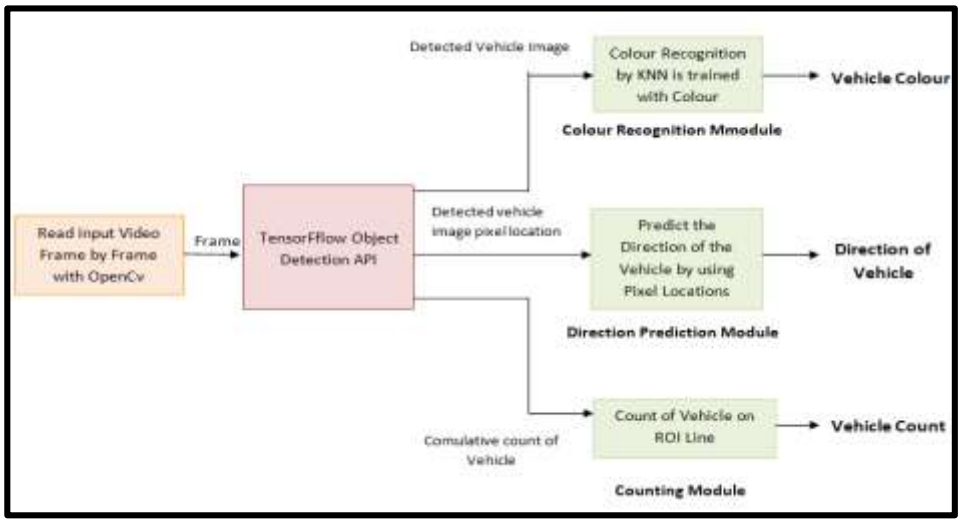


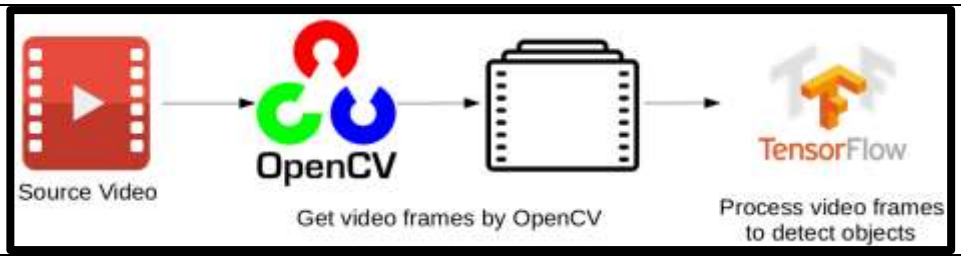
Figure: System Architecture – Vehicle detection/ Count

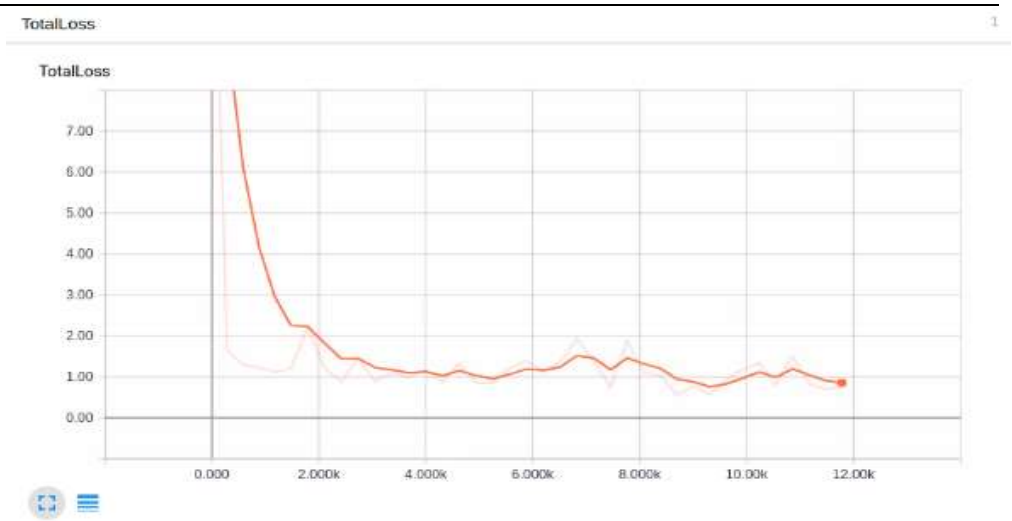
Identification is also being incorporated for identifying certain cars and the distance between driving car and detected objects is also calculated.

To enhance the process, we use consolidation of different image processing and computer vision techniques. The TensorFlow Object Counting API is used as a base for object counting on this project. Tensor Flow's Object Detection API is an open source framework built on top of Tensor Flow that makes it easy to construct, train and deploy object detection models.

Figure: Entity Relationship Diagram

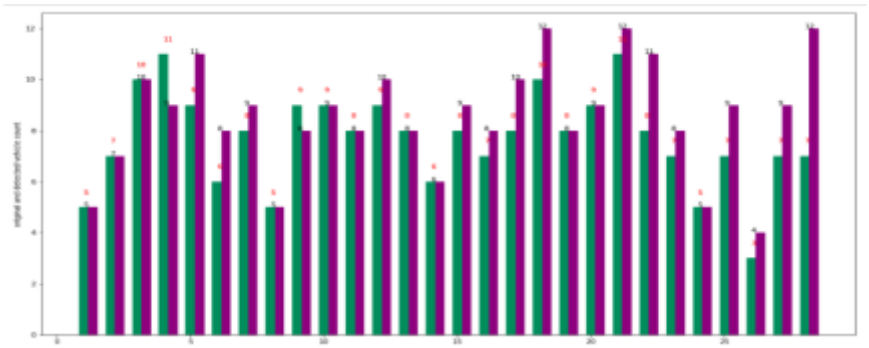
This is a loop that continue working till reaching end of the video. The main pipeline of the tracker is given at the figure given below.

		
3	**Outcome**	In this project we leveraged the task of object detection for self-driving vehicle by using Tensor Flow API followed by Faster RCNN neural network. The efficiency in detection for objects is high but at very low speed. As for now we have tested the model on the dataset prepared from the various datasets provided. The model works fine in data multiple vehicles in an image, classifying each of them and then producing a total count of vehicles at Roi line. Inconsistency in computing speed can be overcome by increasing the computation cost. We are planning to augment the model on real time systems for performing object recognition and classification. The experimental results show that compared with the traditional machine learning methods, the model has been improved both in average target detection and detection rate. The classification test result of this article is also suitable for vehicle type detection in different scenarios and has achieved good results.  Figure: Graphical Outcome.
4	**Evidences (Theoretical Basis)**	Below is the graph representing the total loss in detecting objects in real-time.



We created 11 recall levels equally spaced from 0.0 : 0.1: 1
The 0.2 recovery has the highest accuracy value of 1.00. The recovery value of 0.4 has different precision values of 0.4, 0.67, 0.5. In this scenario, we use the highest precision value of 0.67. When the precision value is 0.6, we have an accuracy value of 0.5, but for a recall of 0.8, we see a higher precision value of 0.57. Based on the 11-point interpolation justification, we take the maximum of all future points, so the precision that we need consider is 0.57 instead of 0.5. Finally, for a recall of 1.0, we take the max precision which is 0.5.

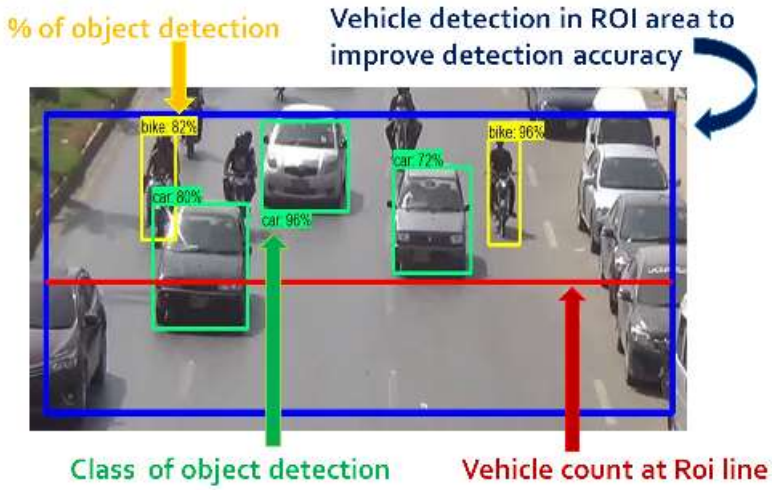
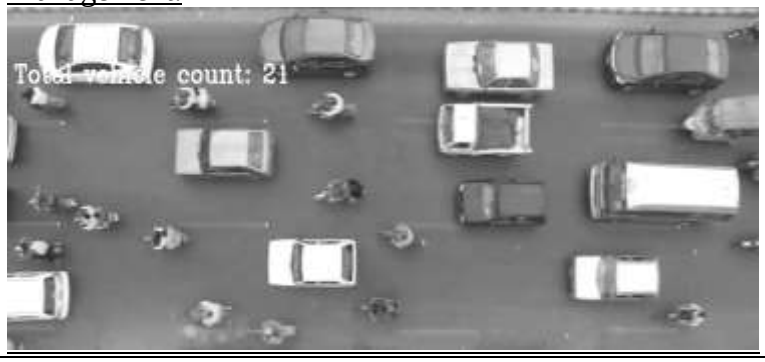
Recall	Precision
0.20	1.00
0.20	0.50
0.40	0.40
0.40	0.67
0.60	0.50
0.60	0.50
0.80	0.57
0.80	0.44
1.00	0.50
1.00	0.47

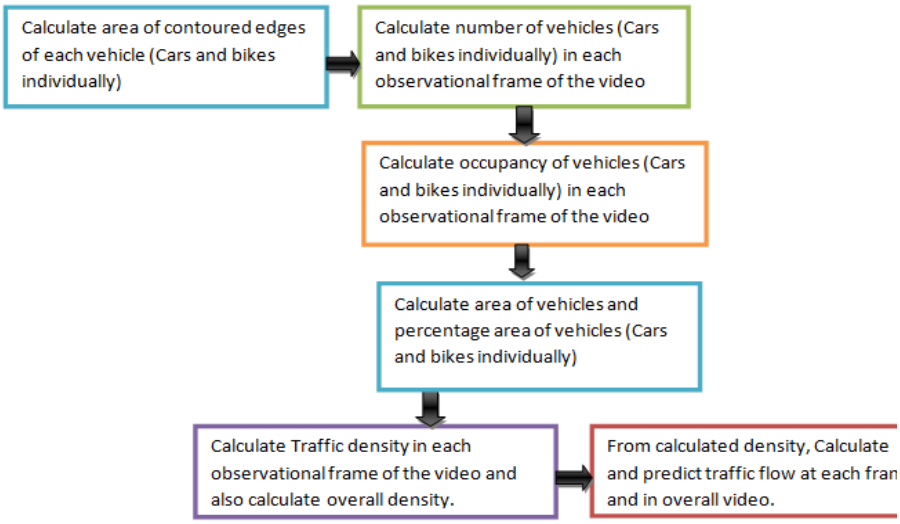
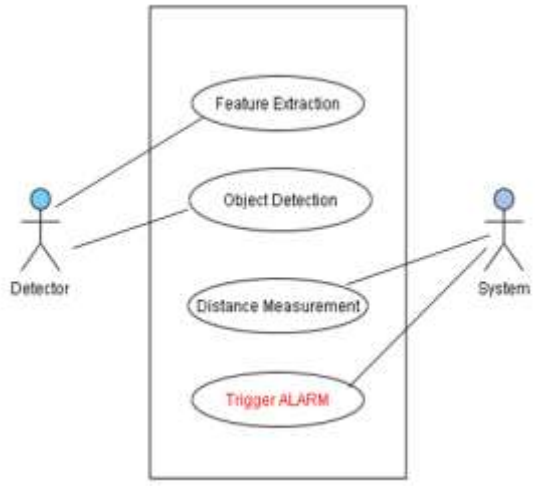


*Visualization: C*omparative analysis of the ground truth and detected cars in each frame

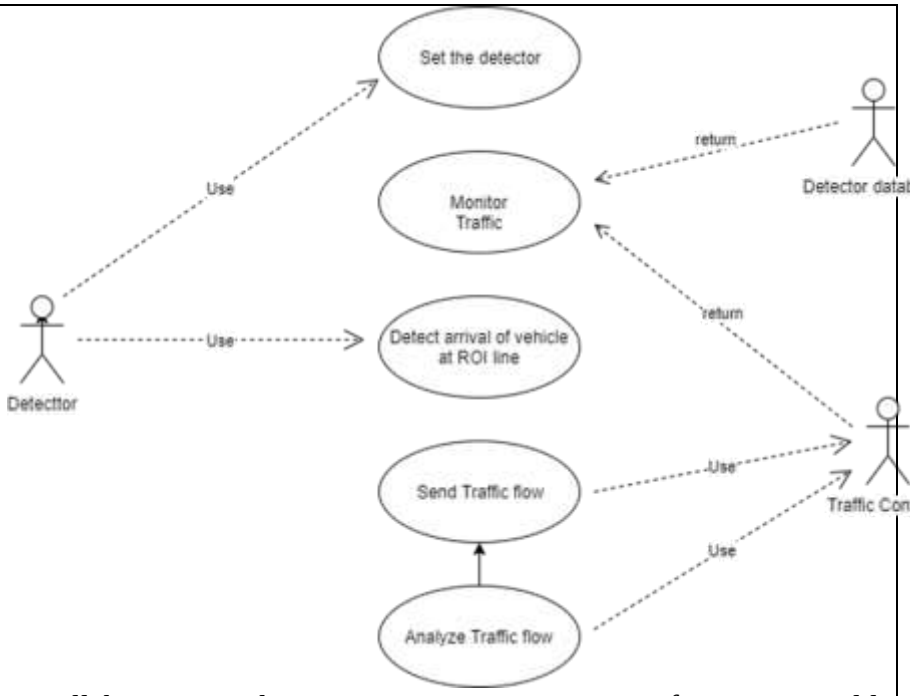
5	**Competitive Advantage or Unique Selling Proposition** (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market

	share or capturing new market or having superior performance over competitor. In summary, any striking aspect of the project which compels industry to invest in FYP or purchase it. Some detail description is required in terms of how, why when what. You can select one or more from following dropdown and delete rest of them)	
a	**Cost reduction of existing Product**	System Resources Required Geforce RTX 2080 Ti RTX. Dahua And Hikvision HD CCTV System System Resources Used NVIDIA Geforce GT 630M Gaming Laptop Video Sources
b	**Process Improvement which leads to superior product or cost reduction, efficiency improvement of whole process** (e.g. What is issue is current process and what improvement you suggests)	We have learned from many research papers that the object detection algorithm applicable for our project gives high accuracy with the required GPU computing system (NVIDIA GEFORCE RTX 2070 Super Graphics card). Therefore, we applied for funding on Ignite National Technology Fund, who assists final year undergraduate students of ICT related disciplines studying in the Institutions by providing them financial assistance for developing prototypes / working models of their Final Year Projects (FYP). Camera systems for video surveillance systems. There's a lot that goes into a typical CCTV system, such as viewing, recording, and archiving the video footage.
c	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region)	As told above the need for high GPU computing, till now our funding requirement is not pleased, so we deploy our project on one of our university GPU system having specification (NVIDIA GEFORCE GTX 1050 Super Graphics card) which gives better accuracy and speed but still we didn't get the speedup proposed and required for our project. To achieve the speedup that is required for our project, we also deploy our project on cloud (Amazon Web Service). Amazon Web Services (AWS), a subsidiary of Amazon, provides cloud computing platforms and APIs on demand on a pay-as-you-go basis to individuals, businesses and governments.

d	**Expanding of Market share** (e.g. how it expand and what is problem with current market	Our computer vision enabled video analytics pipeline allowed for the analysis of the traffic videos from certain views and distance enabling for the localization and categorization of vehicles and pedestrians in the scenario, tracking their motions/paths allowing for the extraction of parameters such as total traffic count, interval count, lane count, traffic flow, density and more. Need of traffic monitoring cameras to take a series of static images of vehicles, including vehicle registration plate details. The images will be taken when vehicles are approaching and leaving the camera detection zones. 
e	**Capture new market** (e.g. Niche market or unaddressed segment)	Karachi was recently ranked among the world's worst cities by traffic congestion. Karachi drivers spend approximately 68% more of their time in traffic than drivers in any other city in the world. A 2018 study revealed that 1 out of 7 traffic policemen suffer from respiratory issues due to prolonged exposure to air pollution. Officials from the Karachi Traffic Police were determined to find a solution to their ever-increasing traffic problem and decided to implement a new Video Surveillance-Based Intelligent Traffic Management. 

		 Figure: Computation of Traffic Congestion
f	**Any Environmental Aspect** (e.g. carbon reduction, energy efficient etc.)	The environment pollution is still increasing gradually despite the various efforts of government. Our project provides a solution to monitor environmental pollution using the graphical representation.
g	**Any Other Aspect**	A traffic collision, also called a motor vehicle collision, car accident, or car crash, occurs when a vehicle collides with another vehicle or person. This model works in a way that, when a vehicle or person becomes nearer to the driving vehicle then to avoid collision it will trigger warning.  Figure: Traffic Collision

		 Determining other object distances and collision warning – serves the purpose of Self Driving Cars.
6	**Target Market** (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about user of the product, process or service	For vehicle detection and counting we train our dataset in order to detect the vehicle and count them providing information about the last passed vehicle. This can be use when we need any vehicle information about the vehicle by the traffic detector. The flow of traffic is then analyzed, and the final information is provided to the traffic controller. This system can also be used by the drivers to avoid collisions and in future can be add up to self-driving cars.  Traffic density computation based on Traffic classification e.g. car, bike etc.

		 In collaboration with NEDUET - IT Department in future we would deploy our project on NED Main gate to determine traffic and pollution. The Traffic system in Pakistan such as Think transportation, Traffic management system etc. Think Transportation undertake an assignment to estimate traffic parameters from an in-house built computer vision algorithm named as “Vision Genius”.
7	**Team Members** (Names & Roll No.)	Werda Farooq **CT-016** (GL) Ariba Sadaf **CT-010** Hiba Ejaz **CT-022**
8	**Supervisor Name**	Dr. Najeed Ahmed Khan (najeed@neduet.edu.pk)
9	**Pictures**	Vehicle Detection and Counting system

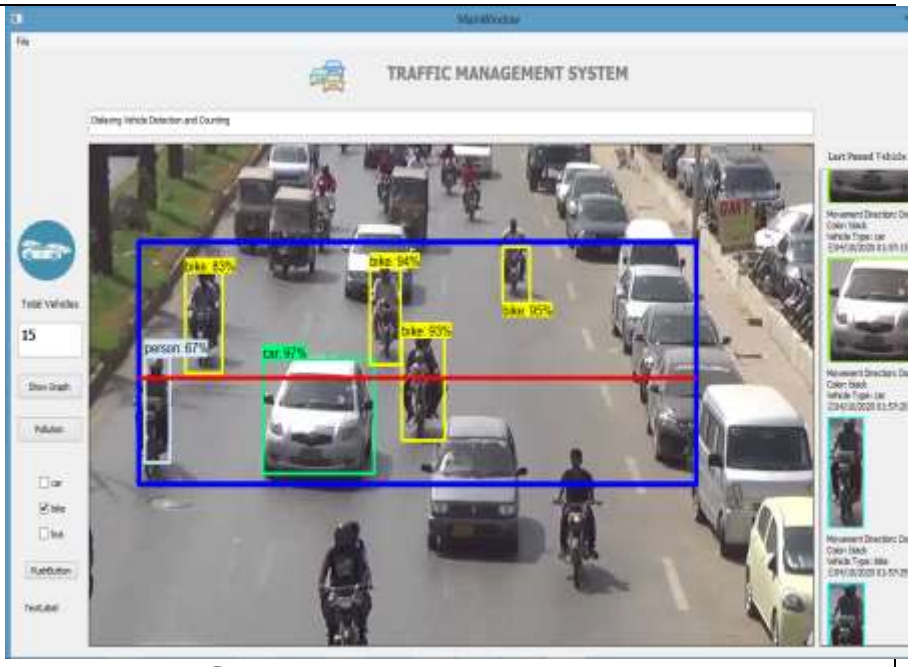


Figure 1: Main GUI

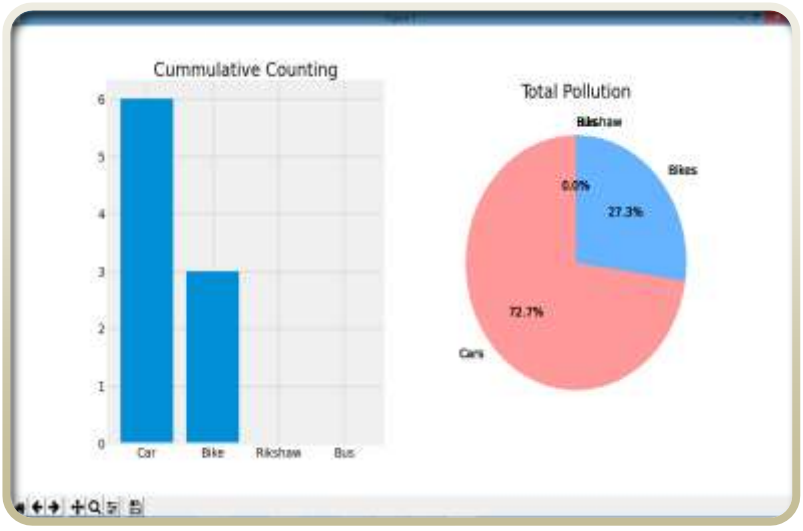


Figure2: Cumulative counting determine the estimate pollution

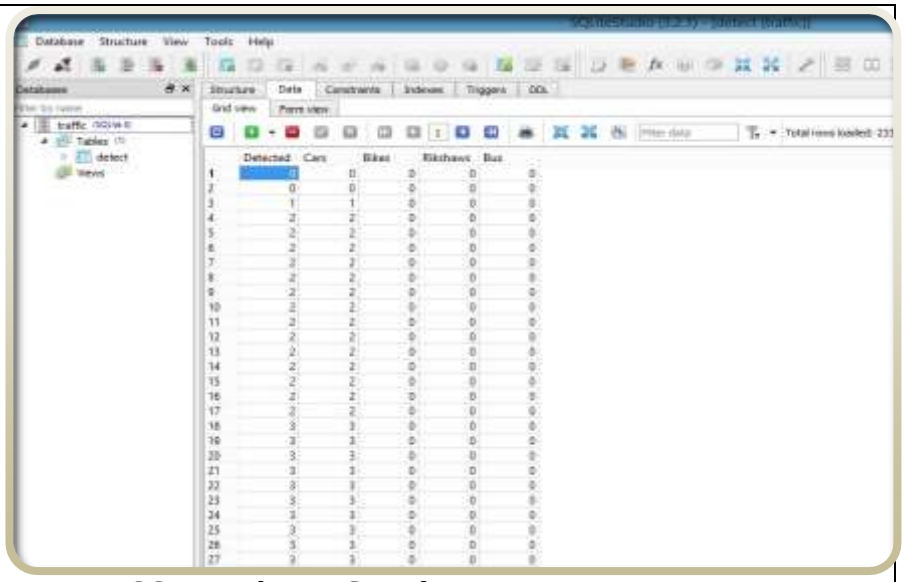


Figure 2: SQL Database - Cumulative counting

Forward Collision Detection System (FCDS)

Figure 3: Warning system

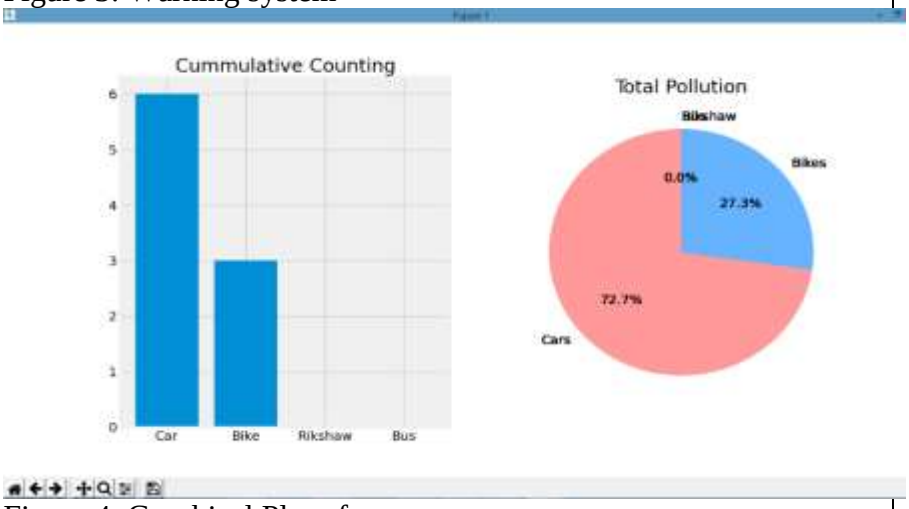


Figure 4: Graphical Plot of system

		Drone View Detection (DWD) and Traffic Density Determination  Figure 5: Drone system
10	**Video**	The output (results) of the project's video will be provided.