# Traffic violations and suspicious activities recognizer

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**Abstract**

**Nowadays in the new advancing world, traffic rule violation and suspicious activities have become a major issue for quantities of traffic rule violation are expanding exponentially. Overseeing traffic rule violation has consistently been a dangerous and trading off undertaking. Despite the fact that the larger part of the creating nations. The quantities of vehicles are expanding quickly just as the procedure of traffic the executives has gotten robotized, it's an extremely testing issue, because of the decent variety of plate designs, various scales, revolutions and non-uniform brightening conditions during picture obtaining. The vital target of this undertaking is to control the traffic rule infringement precisely and cost adequately. Suspicious human activity recognition from surveillance video is an active research area of image processing and computer vision. It is very difficult to watch public places continuously, therefore an intelligent video surveillance is required that can monitor the human activities in real-time and categorize the as usual and unusual activities. Wein cludea brief introduction of the suspicious human activity recognition with its issues and challenges.**

**The Traffic Violation and Suspicious Activity Recognition Project is an AI-driven system designed to enhance road safety and public security by automatically identifying traffic violations and suspicious activities. The system leverages advanced image processing and machine learning techniques to detect traffic infractions such as signal jumping, no parking, triple riding, and riding without a helmet. Upon detecting a violation, the system automatically captures the vehicle's number plate using Optical Character Recognition (OCR) technology, recognizes the number, and generates a notification for the responsible user. Additionally, the system detects accidents and promptly informs nearby hospitals or emergency stations for rapid response. In cases of suspicious activities, such as weapon detection or unusual behavior around restricted areas, the system notifies law enforcement agencies, ensuring swift action.**

## I.    INTRODUCTION

In the previous hardly any decades, noteworthy activities in the field of moving object recognition and following have been done to make following applications dependable, powerful and proficient: video observation, mechanical technology, verification framework, media creation, natural research and so on. Be that a sit may, there are numerous difficulties which produce leaps in the improvement of these applications. These difficulties may incorporate light change, dynamic foundation, cover, impediment, shadow and so forth. The quantity of mishaps on the streets is

because of the standard infringement. To stay away from such petty criminal offenses, traffic police must be accessible out and needs to constantly make sure if some vehicle is disregarding this standard.

Specific computerized arrangements were created to dispose of the violations; anyway every one of them had certain confinements. For instance, the video catching cameras wiped out need of a position to be available to check rule infringement. Be that as it may, entire put away video must be checked physically for the standard infringement situation. In the proposed framework, an answer for signal breaking infringement is given.

The framework incorporates a mechanized framework by utilizing IR sensor, camera and number plate acknowledgment application. In the framework IR sensor will be set close to zebra crossing line. In the event that any vehicle crosses the zebra line, the work area application will be started and will catch number plate picture. Number plate acknowledgment application by utilizing picture handling calculation will perceive number plate and SMS will be sent to the guilty party if there should arise an occurrence of rule infringement scenario.

Manual Suspicious Human Activity Recognition from Video Surveillance is an active research area of image processing and computer vision which involves recognition of human activity and categorizes them into normal and abnormal activities. Abnormal activities are the unusual or suspicious activities rarely performed by the human at public places, such as left luggage forex plosive attacks, theft, running crowd, fights and attacks, vandalism and crossing borders. Normal activities are the usual activities performed by the human at public places, such as running, boxing, jogging and walking, hand waving and clapping. Now-a-days, use of video surveillance is increasing day by day to monitor the human activity which prevents the suspicious activities of the human.An important chore of the video surveillance is to analyze the captured video frames for identifying unusual or suspicious activities in security-sensitive region of any country such as banks, parking lots, department stores, government buildings, prisons, military bases (Gouaillier and Fleurant 2009).

## II.    LITERATURE SURVEY

In the framework along with the economical development, traffic has extended enormously these days. As a result of the extending urban people and from this time forward the amount of vehicles, need of controlling the traffic in paths, turnpikes and boulevards is essential. Existing system a structure that separates the vehicle dynamically in street is done by using picture taking care of. The use joins computations used for continuous vehicle area, which relies upon establishment differencing and morphological exercises. Another image taking care of technique used is the edge acknowledgment methodology where the edges of the thing is recognized and various strategies for figuring traffic limits, for instance, checking the amount of vehicles, speed of the vehicles by applying an edge regard. The utilization of picture dealing with and PC vision techniques to the assessment of video progressions of traffic stream offers broad updates over the current methodologies for traffic data collection and road traffic watching. Other procedures experience the evil impacts of real inconveniences in that they are expensive to present and keep up and they can't perceive slow or fixed vehicles. Video sensors offer a reasonably low foundation cost with little traffic interference during upkeep. Most of the city traffic is compelled by sensors additionally, cameras will be presented in huge xpress ways and lanes. Such structures can allow expelling information from the more prominent traffic issue and urges us decide to improve the traffic methodology. The paper intends to render automate control system for traffic on streets and avenues. [1].

The paper proposes another adaptable establishment extraction and invigorating estimation for vehicle area and following. Dull level estimation and two tightening loads are familiar with decline the impact of condition lighting condition in establishment extraction system, two discriminant limits are used to perceive counterfeit moving things and certified moving articles for dealing with the stop issue of establishment reviving. The test outcomes show that the proposed procedure is progressively healthy, exact and notable than standard methods, and is anything but difficult to complete and sensible for consistent vehicle area and following [2].

Body activity recognition using wearable sensor technology has drawn more and more attentions over the past few decades. The complexity and variety of body activities makes it difficult to fast, accurately and automatically recognize body activities. To solve this problem, this paper formulates body activity recognition problem as a classification problem using data collected by wearable sensors. And three different machine learning algorithms, support vector machine, hidden markov model and artificial neural network are presented to recognize different body activities. Various numerical experiments on a real world wearable sensors dataset are designed to verify the effectiveness of these classification algorithms of police mannequin. Outcomes of a precise field evaluation show that the structure performs well in an arrangement of veritable rush hour gridlock scenes [3].

The expelled splendid articles are then taken care of by a spatial gathering and following procedure that finds and analyzes the spatial and short lived features of vehicle light models, and recognizes and arranges moving vehiclesandmotorbikesinbusytimegridlockscenes.Theproposedconstantvisionstructurehasmoreoverbeen realized and surveyed on a TI DM642 DSP-based embedded stage. The system is set up on raised stages to perform traffic perception on real interstates and urban avenues. Exploratory results show that the proposed traffic surveillance approach is achievable and reasonable for vehicle acknowledgment and conspicuous verification in various night time circumstances [4].

III.                                    METHODOLOGY

1.  System Architecture

The proposed system comprises the following components:

• **Input Layer:** Cameras and IoT sensors strategically placed within the store to capture real-time video feed and data.

• **Processing Layer:** Use of computer vision algorithms(e.g.,YOLO, OpenCV) to detect and track individuals.

• **Data Analytics Layer:** Integration of machine learning models for analysing traffic patterns, identifying violatons, and generating actionable insights.

• **Output Layer:** A dashboard providing real-time visualizations, notifications for , and detailed reports for decision-making.

**2.** Working of the System

- **Data Collection:** Cameras capture live video streams, and IoT sensors gather data on foot traffic and occupancy.

- **Processing:** Computer vision algorithms analyse the video feed to detect vehicle and count people. Machine learning models process this data to identify trends and peak hours.

- **Real-time Alerts:** The system identifies traffic violations and suspicious activities and generates alerts through notifications.

- **Visualization:** Data is present edinauser- friendly dashboard and through notification, showing violations, peak hours, and traffic heat maps.
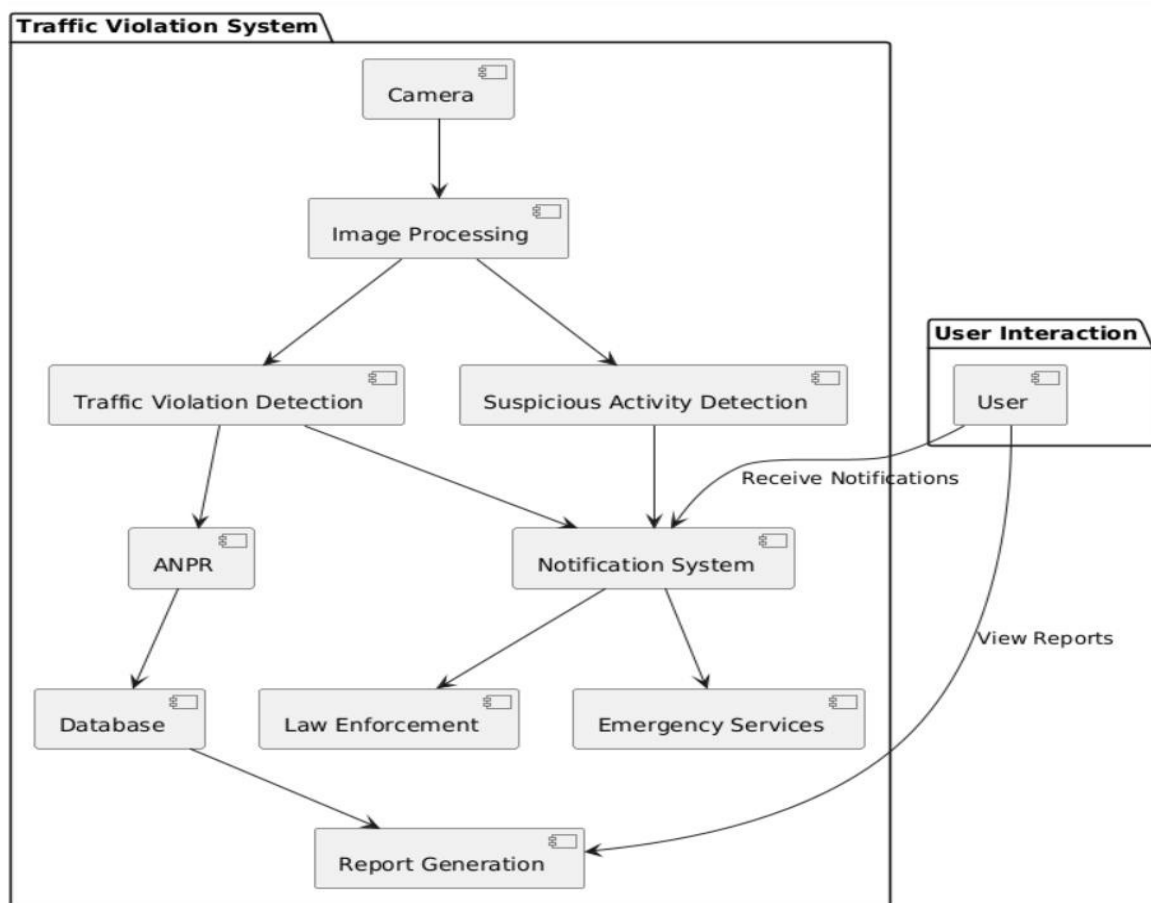


*Fig1.Block diagram of model*

**3. Hardware Required**

System              :intel i3/i52.4GHz. Hard Disk              : 500 GB
Ram                    :4/8GB

**4. Software required**

**I.      OS (Operating System)**

An Operating System acts as the backbone for any device, managing both hardware and software resources. For a mobile application or system project:

- Why OS is important:
- It provides a platform to execute your application.
- Allows access to APIs like internet for Firebase communication, and storage services.
- Ensures smooth multitasking (e.g.,showing the map while fetching petrol booking status).

**II.     OpenCV**

OpenCV (Open Source Computer Vision Library) is an open-source computer vision and machine learning software library. It contains more than 2,500 optimized algorithms and is widely used for real-time image and video processing tasks. In this project, OpenCV plays a crucial role in processing surveillance video feeds to detect and analyze traffic violations and human activitie Real- time Database. Techniques such as grayscale conversion, edge detection, and background subtraction are used to enhance frames for better detection accuracy. OpenCV is used in conjunction with deep learning models (like YOLO) for detecting vehicles, helmets, number plates, and pedestrians in real- time.

**III.    Python**

Python is a powerful, high-level programming language known for its simplicity and versatility. It is the primary language used to develop this AI-driven system due to its extensive support for machine learning, image processing, and automation libraries. Python facilitates the use of deep learning frameworks such as TensorFlow and PyTorch, which are essential for implementing the I3D and SlowFast models used in this system. Python libraries like pytesseract are used to extract text from images, enabling accurate number plate recognition.

**IV.     Libraries required**

**1.      OpenCV**

Open source PC vision library and AI programming library .OpenCV is a cross-stage library utilizing which can grow constant PC vision applications. It chiefly centers around picture handling, video catch and examination including highlights like face identification and item location.

## 2.   Keras

Keras is an incredible simple to-utilize python library for creating and assessing profound learning models. It wraps the effective numerical calculation libraries the ano and tensorflow and permits you to characterize and prepare neural system models in a couple of short lines of code.

### 3.  numpy

Num Pyis a powerful Python library for numerical computations.

- Use Case:

- Performing efficient mathematical operations on arrays.

- Image processing and transformations when working with camera inputs(e.g.,matrix manipulations).

## 4.  Tensorflow

The Tensorflow is the essential programming device in profound learning. lt is an open source man- made consciousness library, utilized for information stream diagrams to manufacture models. Tensorflow is principally utilized for: discernment, arrangement, finding, getting, creation and forecast

## IV.                                                 RESULTS

The developed system successfully detected various types of traffic violations such as signal jumping, riding without a helmet, triple riding, and no-parking violations with high accuracy. Using advanced object detection techniques and pretrained models, the system was able to process real-time surveillance footage and identify rule-breaking scenarios efficiently. The vehicle number plates were accurately recognized under diverse conditions using Optical Character Recognition (OCR), even in cases of varying illumination, angles, and plate designs.

Upon detecting a violation, the system automatically captured an image of the vehicle and extracted the number plate information to generate fine notifications, thus minimizing manual intervention. In addition to traffic enforcement, the system also demonstrated effective accident detection capabilities by identifying crashes and sending immediate alerts to nearby hospitals or emergency response units, thereby improving emergency response time.

The project also focused on suspicious activity recognition using deep learning techniques, particularly in identifying unusual human behavior and potential threats like weapon detection near restricted zones. These activities were flagged in real-time, and appropriate notifications were sent to law enforcement authorities for timely action. By integrating models like SlowFast and I3D, the system achieved robust performance in both spatial and temporal analysis of surveillance footage.

Evaluation on benchmark datasets such as the AI City Challenge and UA-DETRAC confirmed the reliability and scalability of the system in practical scenarios. Overall, the project effectively demonstrated how AI-driven video surveillance can enhance road safety, reduce traffic violations, and strengthen public security through intelligent, automated monitoring.
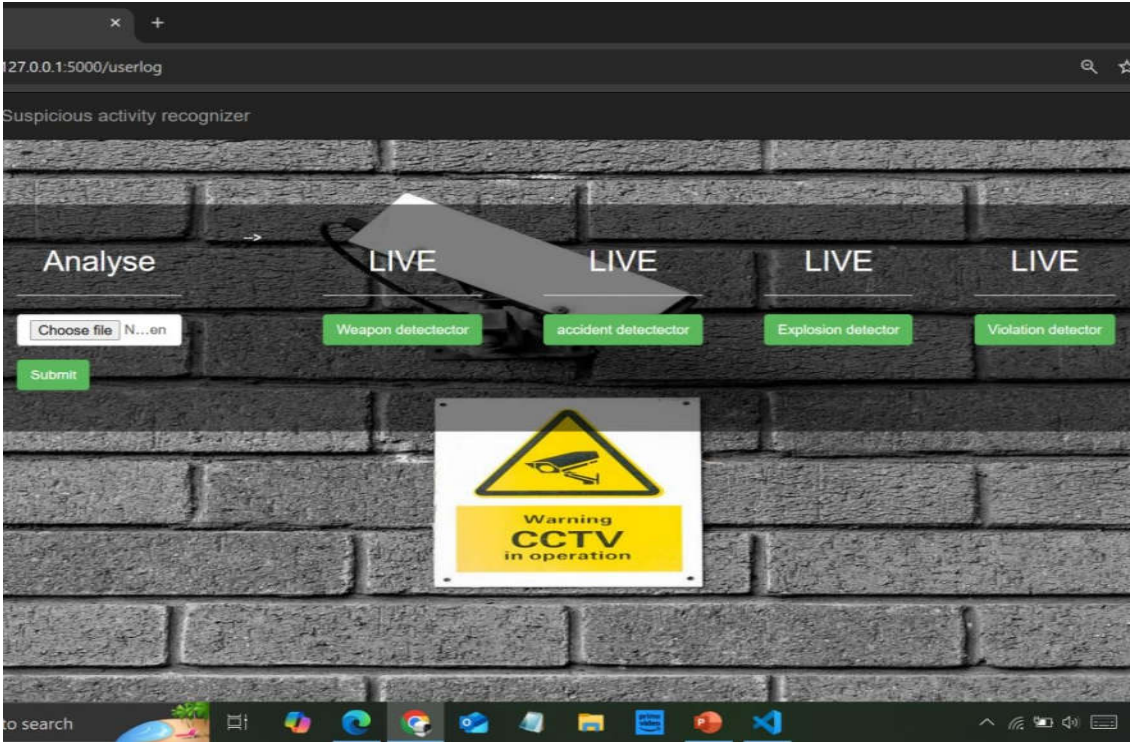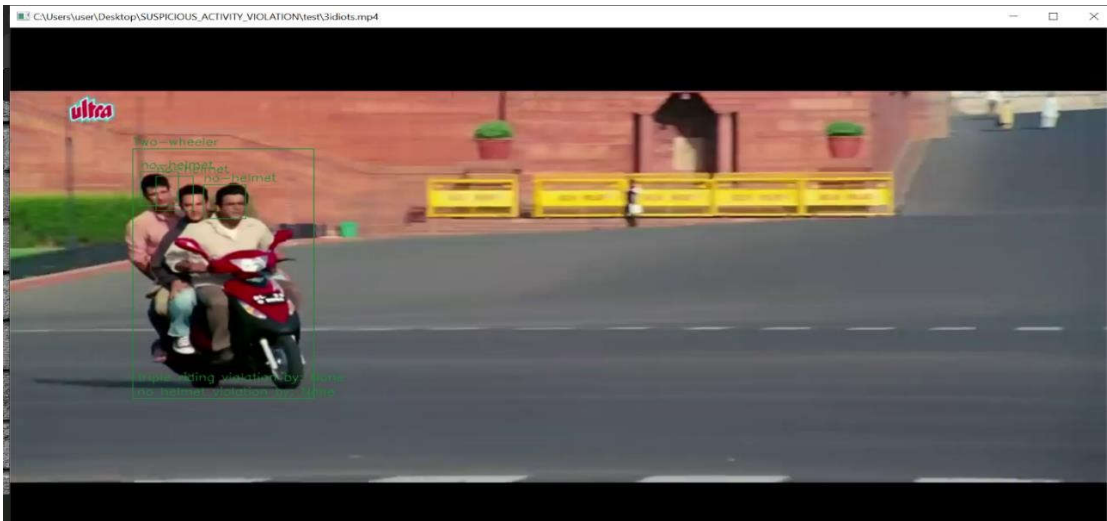
**Fig2.Main page**
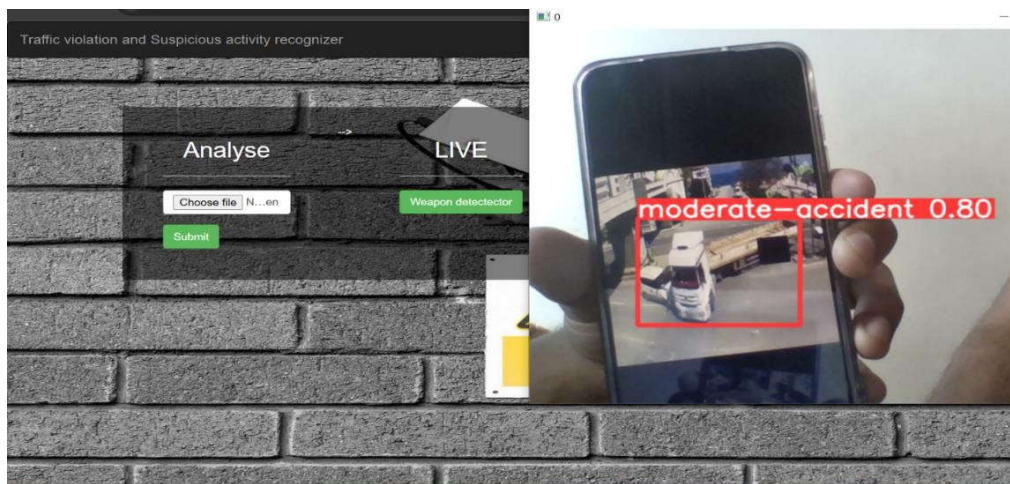


**Fig3.Triple riding violation**

**Fig4.Accident detection**
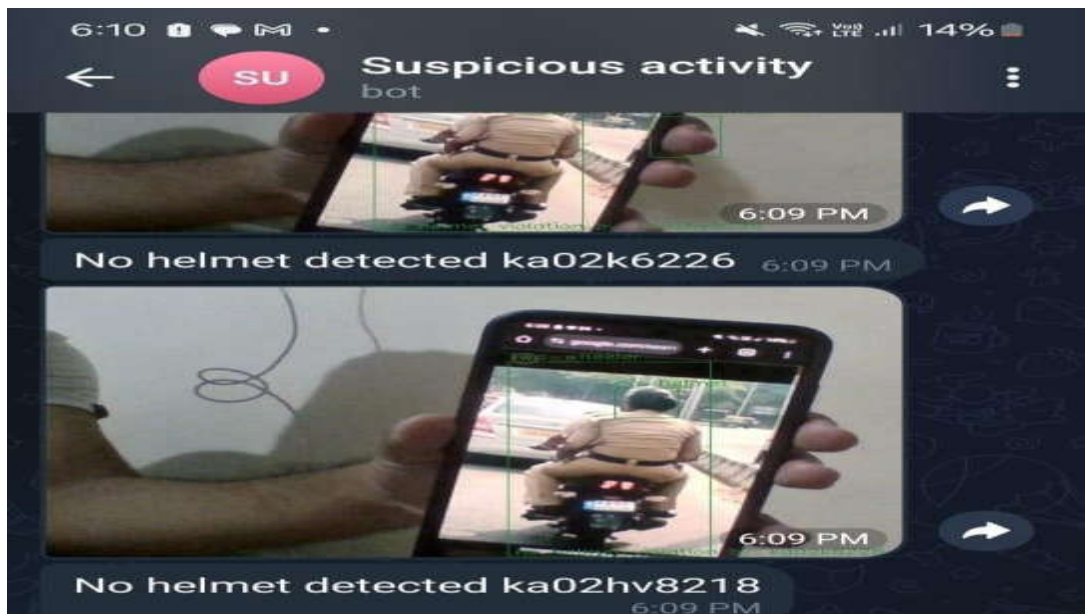


**Fig5.Telegram bot notification**
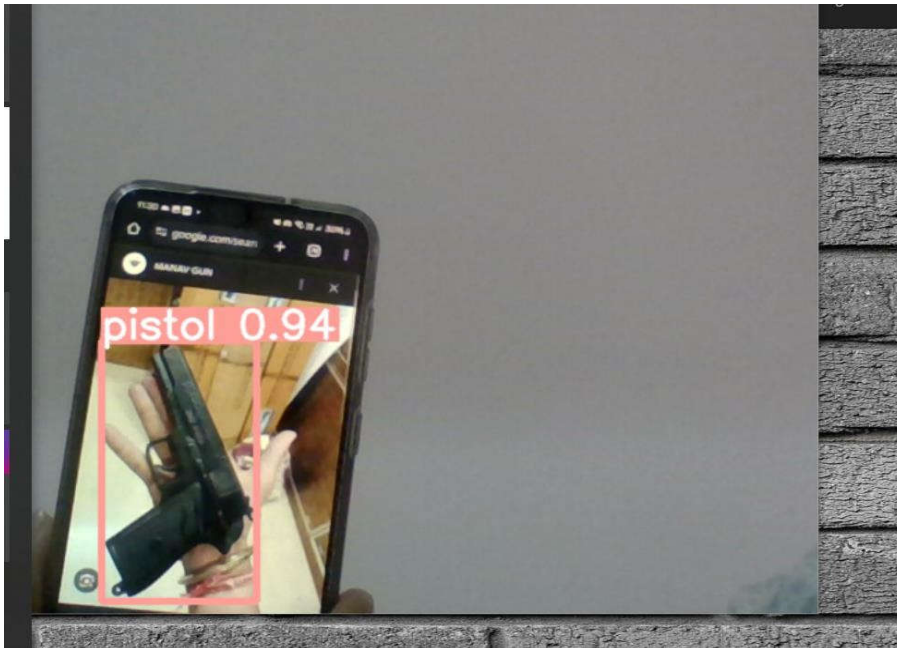
**Fig6.Weapon detection**

V.                              CONCLUSION

The proposed framework is a replacement to human traffic cop. The strategies for traffic observation have been introduced and the work on movement identification, tag extraction and character acknowledgment is done. The proposed framework catches the picture in rush hour gridlock signal extraction and character acknowledgment of tag will be considered during rule violation. Order of the traffic rule infringement will be done and the message will be send to the owners of the vehicle to illuminate them about the sort regarding rule abused and furthermore about the fine that must be paid.

Despite The improvement of this model prompts the examination of new regions of robotization of traffic checking. The more precise component plan and increasingly hearty discovery strategy investigate will be executed in future. Shrewd bicycle can likewise be proposed which thus neglects to begin without wearing head protector and also that can stretch out the framework to discover the quantity of traffic wrong doers in a region.

## VI. REFERENCES

[1]   A. K. Karthik & N. Pavithra & R. Nandini & C. Punyashree, "Automated Vehicle Driving usingImageProcessing",internationaljournalofcomputerscienceandengineering,volume-2,issue-4,april 2014.

[2]   R. Handaric. "An image recognition software tool for car identification based on license plate", transylvania university of braşov series i:engineering sciences, volume-5 (54) no. 1, 2012.

[3]   Y. M. Prutha, S.G. Anuradha, "Morphological Image Processing Approach of Vehicle Detection for Real-Time Traffic Analysis", international journal of engineering research & technology (IJERT) Volume 03, Issue 05, May 2014.

[4]   W.-L. Hsu, H.-Y., M. Liao, B.-S. Jeng and K.-C. Fan, "Real-time traffic parameter extraction using entropy", Proc. Inst. Elect. Eng.Vis. Image Signal Process.*, vol. 151, no. 3, pp. 194-202, Jun.2004.

[5]   T.Yamashita,K.IzumiandK.Kurumatani,"Effectiveinformationsharingbasedon massusersupport for reduction of traffic congestion", The Proceedings of International Conference of ComplexSystems,2004.

[6]   M. Schnhof and D. Helbing, "Empirical features of congested traffic states and their implications for traffic modelling", transportation science*, vol. 41, pp. 135-166, May 2007.

[7]   J. Kong, Y. Zheng, Y. Lu and B. Zhang, "A novel background extraction and updating algorithm for vehicle detection and tracking", Proc. IEEE Int. Conf. Fuzz. Syst. Knowl. Discovery, pp. 464-468, 2007.

[8]   J. L. Wilder, A. Milenkovic and E. Jovanov, "Smart wireless vehicle detection system", System Theory. 40th Southeastern Symposium, pp. 159- 163, March 2008.

[9]   O. Jahn, R. H. Mhring, A.S.Schulz andN. E.S. Moses, "System-optimal routingoftraffic flows with userconstraintsinnetworkswith congestion", Operations Research. Vol. 55, August 2001.

[10]  K. Collins and G.-M. Muntean, "A vehicle route management solution enabled by wireless vehicular networks", INFOCOM Workshops IEEE*, pp. 1-6, April 2008.