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# Traffic Violation Detection

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**ABSTRACT:** Most vehicles on roads in India are increasing faster because of which traffic management has become one of the main problems. The effective management of traffic is possible when every violation on the road is often detected. The use of conventional/manual methods together with existing technologies to detect traffic rule violation is inefficient because of which traffic management has become very difficult. The traffic violation detection project is an intelligent system that aims to detect and classify traffic violations in real-time using computer vision and machine learning techniques. The system utilizes video footage from traffic cameras and processes it to identify any violations occurring. The proposed system uses object detection algorithms to identify vehicles in the footage and then extracts relevant features such as direction and position. These features are then processed using machine learning models to determine if any traffic violations have occurred. Once a violation is detected, the system can automatically alert traffic authorities to take appropriate action. In this project, the system is proposed with the assistance of image processing and using a custom trained Yolo-v4 for violation detection and tracking. It will help to enforce strong regulation of traffic rules and build towards a smart city via this project. Overall, the traffic violation detection project is a promising solution to improve road safety and traffic management.

**KEYWORDS:** Image processing, Deep learning, YOLO algorithm, Convolutional neural networks, Optical character recognition, Fully convolutional network.

## I. INTRODUCTION

Breaking traffic rules is not only illegal but even dangerous to the safety of people. Hence, it's not surprising to see the authorities' imposing penalties on traffic rule violators, with the severity of the punishment varying as per the nature of the offense. Breaking the traffic law could lead to many outcomes and problems starting from a fine of a certain amount to cancellation of the driving license and even imprisonment in some scenarios.

Traffic rule violations are now a major problem for most of the emerging nations in the modern and changing world. Both the number of motorcycles on the road and the number of traffic law offenses are growing quickly. Even though Traffic management has automated, making it a highly difficult challenge. The main objective of this project is to avoid traffic rule violations in a more efficient manner. The proposed model includes a computer-based camera based automated system for image capture.

Due to the low cost and widespread use of motor bikes, rigorous regulations are necessary to prevent accidents. Since wearing a helmet is required by traffic laws, breaking them carries serious penalties. At present, traffic police who are in charge of controlling the traffic and CCTVs are only placed at traffic signals. Another constraint is the capacity of this personnel to quickly capture as many violations photographs as possible towards proof before the vehicle rushes away. Vehicles automatically identify and report traffic violations on the road around them as they move around thus acting as crowd-sourced law enforcement. The motive of the project is to automate the traffic signal violation detection system and make it convenient for the traffic police department to monitor the traffic and act against the person who violates the rules, in a fast and efficient way. Analysing and tracking the vehicle and their activities accurately is the main objective of the system.

## II. RELATED WORK

1. S.R.Ibadov, B.V.Kalmykov, R.R.Ibadov- The European Physical Journal Conference “Method of Automated Detection of Traffic Violation with a Convolutional Neural Network”.

This article indicates the relevance of analysing and detecting methods and systems for detection of photo-video violations of the Rules of the road. This method includes several steps: 1) Detecting of the three classes of objects on a video sequence (pedestrian crossing, a motor vehicle, and a human on the pedestrian crossing; 2) Analysing the movements of the vehicle and the human on the pedestrian crossing; 3) Differentiating the ways of the pedestrian and the vehicle and determining whether there has been a violation of the Rules of the road for a certain period. For real-time object detection, they have used neural network YOLO V3.

2. Yonten Jamtsho, PanomKhawn, Riyamongkol Rattapoom waranusast – ICT Empress “Real-time license plate detection for non-helmeted motorcyclists using YOLO”. This paper presents the real-time detection of LP for non-helmeted motorcyclists using the real-time object detector YOLO (You Only Look Once). In this approach, a single convolutional neural network was deployed to automatically detect the LP of a non-helmeted motorcyclist from the video stream. The centralized tracking method with a horizontal reference line was used to eliminate the false positives generated by the persons who wear helmets as they leave the video frames.

3. Bobburi Tralathasri, Dammati Vidya Sri, Gadidammalla Narendra Kumar, Annam Subbarao, Palli R Krishna Prasad - International Journal of Computer Science and Mobile Computing “Real time object detection using YOLO Algorithm”. This article focuses on real time object detection along with image processing. In image detection along with classification this model assigns the class label to an image, In Object localization we draw and the bounding boxes around the objects. It combines both the tasks where it includes both the bounding box around each other object and then assigns the class label to the image. Aniruddha Tonge et al. [2020] In the suggested technique, the system detects motorcycles using YOLO-based object detection, and then checks each motorcycle for particular violations, such as not wearing a helmet or crosswalk. A CNN (Convolutional neural network) based classifier is used to detect helmet violations.

4. Kruti Lavingia, Mihirsinh Vaja, Pooja Chaturvedi, Ami Lavingia - IEEE 7th International Conference on Recent Advances and Innovations in Engineering (ICRAIE) “Machine Learning Based Approach for Traffic Rule Violation Detection”. The goal of this paper is to design an automated system model to monitor the violation of traffic rules, specifically the number of people sitting on a two-wheeler. Typically, in areas near the security offices, people tend to follow the rules, but in areas where no one is watching, people violate the rules. In the case of an organizational campus, if there are three people traveling on a two-wheeler but when they encounter a security guard, one of the persons gets down and walks ahead of the guarded area and then again sits back on the vehicle. In such cases, efficient methods are required to monitor the violation of specified traffic rules without human intervention. For the above-mentioned challenge, a deep learning-based solution is provided where the process starts with object recognition using YOLOv3 (You Only Look Once) model, using which a person sitting on any particular vehicle is identified based on a minimum threshold distance. Also, for the distance calculation, a depth estimation algorithm which helps us in finding the 3-D distance between objects from a 2-D image is implemented. Moreover, the number plate of the vehicle violating the above-mentioned rule is identified for easy identification of the person violating the rule. The proposed approach is implemented on a real time video streaming dataset. The simulation results show the efficiency of the proposed approach in terms of accuracy, precision and recall as 91%, 86% and 94% respectively.

5. Apoorva Saumya, V. Gayathri, K. Venkateswaran, Sarthak Kale, N. Sridhar - International Conference on Smart Electronics and Communication (ICOSEC) Published on 1 September 2020. This paper plans to unwind this issue by automating the technique for distinguishing the riders with and without helmets. The system takes a video of traffic on an open street as an information and recognizes the moving items inside the scene. This work proposes a system based on the location of individual or different riders taking a trip on bikes with no helmets. Inside the proposed approach, from the beginning stage, bike riders are recognized with the use of YOLOv3 model which is a consistent type of YOLO model, the forefront methodology for object distinguishing helps as such in distinguishing the riders with and without helmet. The vertical projection of the binary image is used for counting the number of riders if it exceeds two.



### III. METHODOLOGY

#### IMAGE PROCESSING :

Image processing refers to the analysis and manipulation of a digital image to enhance its quality and interpret information present in it.

The Original YOLO-YOLO was the first object detection network to combine the problem of drawing bounding boxes and identifying class labels in one end-to-end differentiable network.

**YOLOv2:** YOLOv2 made a number of iterative improvements on top of YOLO including Batch Norm, higher resolution, and anchor boxes.

**YOLOv3:** YOLOv3 algorithm is mainly constructed of a particular connected Convolutional Neural Network. Layers of CNN is a class of deep neural networks (DNN) to analyze digital images or videos. It is a class of multi-layer perceptron, refers to a fully connected network (FCN) in which all neurons of one layer are connected to other neurons in the next layer. CNN is a specialized category of neural networks used effectively to process data in a gridlike manner. Parameter sharing is a distinguishing feature of CNNs, which is of great significance in object detection. CNN's are different from fully connected forward neural networks, each of its trained weight is used, such that in overall CNN architecture every component makes use of the kernel in the input position, meaning that in each location and position, a category of all the parameters is learned instead of a different category of parameters. This property is very valuable in encapsulating the whole entire environment.

The algorithm begins with a feature extraction of a single digital image in frame by frame format from the digital video, after which feature extracted digital image is rendered to different sizes of 416x416 image. YOLO v3 CNN which has a total of a hundred and six layers. Leaving the convolutional neural network layer, the network can detect multiple objects simultaneously in a given single input digital image. The notion of breaking down given digital input images into n number of grids is only used in the YOLOv3 algorithm when relating to another algorithm.

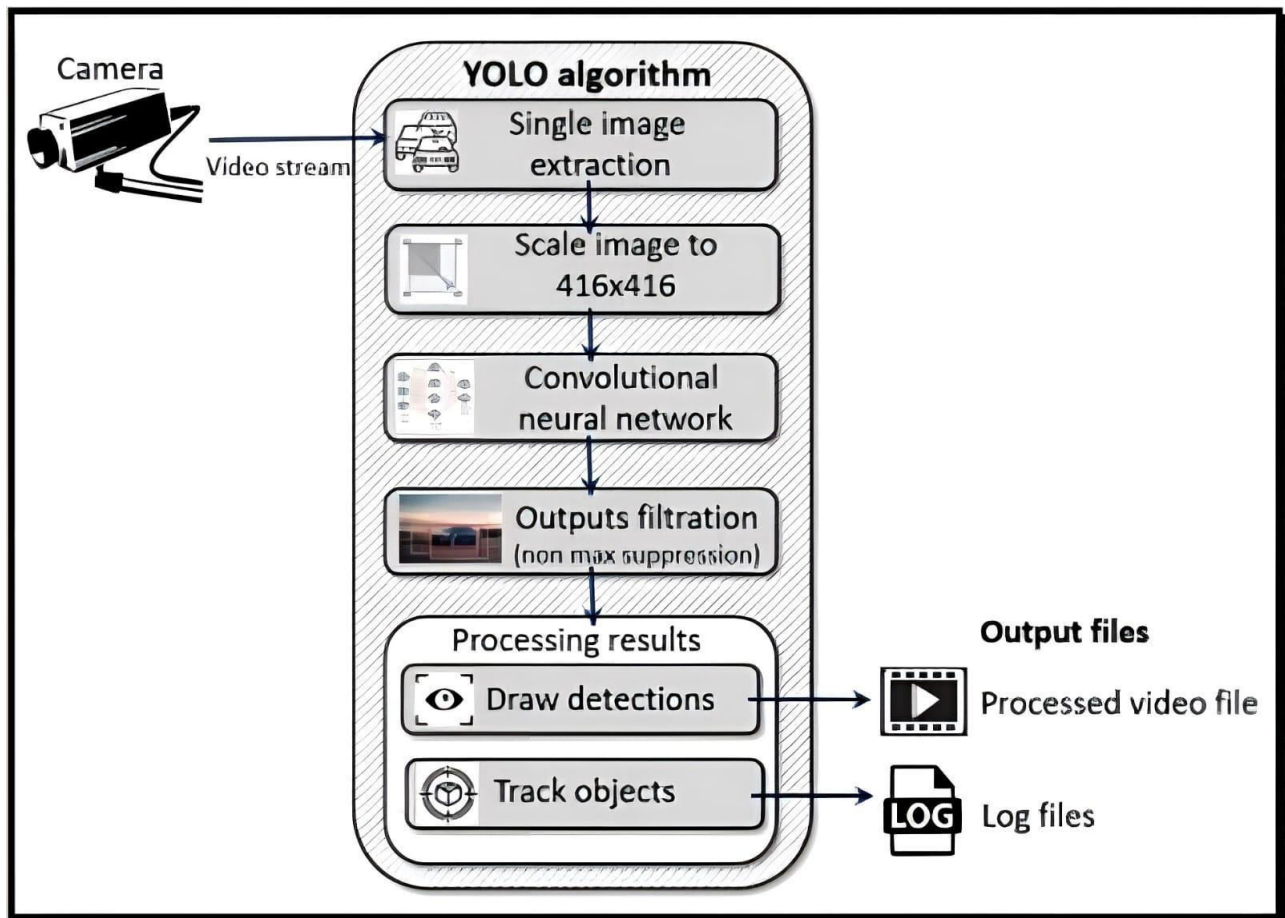
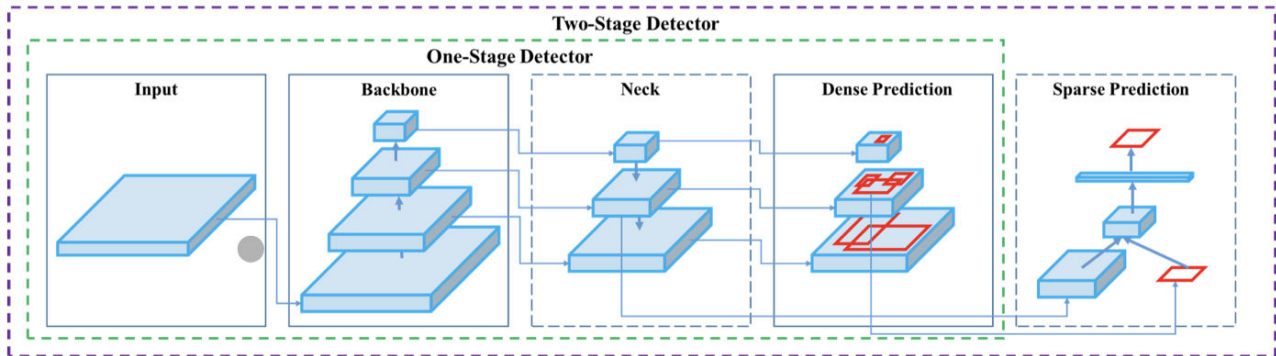
#### METHODOLOGY:

The methodology for traffic violation detection using YOLO (You Only Look Once) algorithm typically involves the following steps:

- 1. Data collection:** The first step is to collect a large dataset of traffic images or videos that can be used to train the YOLO algorithm. This can include footage of various traffic violations such as running a red light, illegal parking, and speeding.
- 2. Data annotation:** The next step is to annotate the dataset with bounding boxes that identify the location and type of each traffic violation. This is typically done using labeling tools such as Labeling.
- 3. Data preprocessing:** Once the data is annotated, it needs to be preprocessed to prepare it for training the YOLO algorithm. This involves tasks such as resizing the images, normalizing the pixel values, and converting the annotations into YOLO format.
- 4. Model training:** The YOLO algorithm is then trained on the preprocessed dataset using a deep neural network. This involves optimizing the network's weights and biases to minimize the detection error and improve its accuracy.
- 5. Model testing:** After the model is trained, it needs to be tested on a separate set of images or videos to evaluate its performance. This involves measuring the precision, recall, and F1-score of the detections.
- 6. Model optimization:** Based on the testing results, the model can be optimized by adjusting its hyperparameters, changing the network architecture, or adding more data to the training set.

**7. Model deployment:** Once the model is optimized, it can be deployed in a real-world traffic environment using cameras or sensors to detect traffic violations in real-time.

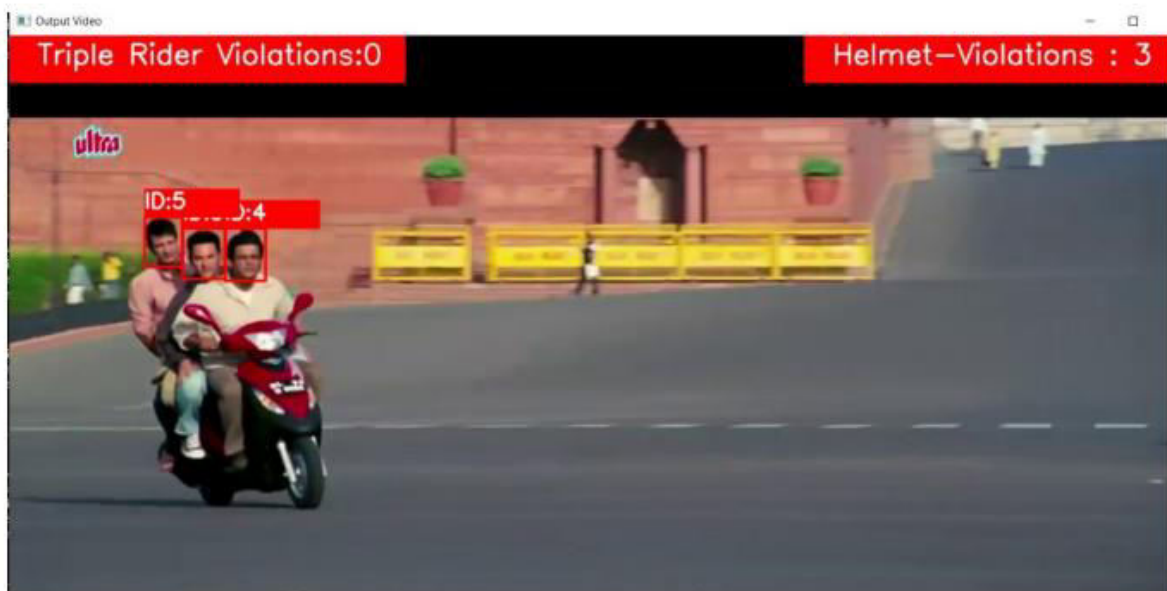
**8. Model maintenance:** Over time, the model may need to be updated and retrained to adapt to changes in traffic patterns or new types of violations. This involves collecting more data, re-annotating the data, and retraining the model using the updated dataset.



#### IV. EXPERIMENT RESULTS



(i) Input Video Feed - Three riders riding in a bike without any of them wearing helmet.



(ii) Helmet Detection - Detecting helmet of all the riders in the bike and counts the violations



(iii) Triples riding detection - Detecting the number of riders and alerts the Triple Rider violation when there are three riders on a bike

## V. CONCLUSION

The performance is mainly focused on Accuracy. Machine learning techniques provide an effective mechanism in detection and data mining as it overcomes the problem with traditional techniques. These techniques enhance the data optimization along with improving the efficiency with better results and greater predictability. The benefits of the traffic violation detection system are numerous, including reducing the number of accidents caused by reckless driving, improving traffic flow, and promoting safer roads. The system is also scalable, allowing it to be deployed in various locations and integrated with other traffic management systems. Overall, the traffic violation detection project is a promising solution to improve road safety and traffic management. For future work, the system can be improved by including other types of vehicles and detecting corresponding vehicle-related traffic violations to make the system more robust and complete. Also, architectures can be built to handle multiple camera views and to tackle more violation types. Additionally, newer object detection models can be experimented with to benchmark models for accuracy and speed.

## REFERENCES

- [1] A. Bochkovskiy, C.-Y. Wang, and H.-Y. Mark Liao, "YOLOv4: Optimal speed and accuracy of object detection," 2020, arXiv:2004.10934.
- [2] N. Wojke, A. Bewley, and D. Paulus, "Simple online and realtime tracking with a deep association metric," in Proc. IEEE Int. Conf. Image Process. (ICIP), Sep. 2017, pp. 3645–3649, doi: 10.1109/ICIP.2017.8296962.
- [3] A. Bewley, Z. Ge, L. Ott, F. Ramos, and B. Upcroft, "Simple online and realtime tracking," in Proc. IEEE Int. Conf. Image Process. (ICIP), Sep. 2016, pp. 3464–3468, doi: 10.1109/ICIP.2016.7533003.
- [4] R. Smith, "An overview of the Tesseract OCR engine," in Proc. 9th Int. Conf. Document Anal. Recognit. (ICDAR), Sep. 2007, pp. 629–633, doi: 10.1109/ICDAR.2007.4376991.
- [5] A. Tonge, S. Chandak, R. Khiste, U. Khan, and L. A. Bewoor, "Traffic rules violation detection using deep learning," in Proc. 4th Int. Conf. Electron., Commun. Aerosp. Technol. (ICECA), Nov. 2020, pp. 1250–1257.
- [6] J. Chiverton, "Helmet presence classification with motorcycle detection and tracking," IET Intell. Transp. Syst., vol. 6, no. 3, pp. 259–269, 2012.
- [7] K. Dahiya, D. Singh, and C. K. Mohan, "Automatic detection of bikeriders without helmet using surveillance videos in real-time," in Proc. Int. Joint Conf. Neural Netw. (IJCNN), Jul. 2016, pp. 3046–3051.



- [8] X. Wang, L.-M. Meng, B. Zhang, J. Lu, and K.-L. Du, "A video-based traffic violation detection system," in Proc. Int. Conf. Mech. Sci., Electr. Eng. Comput. (MEC), Dec. 2013, pp. 1191–1194.
- [9] N. C. Mallela, R. Volety, R. P. Srinivasa, and R. K. Nadesh, "Detection of the triple riding and speed violation on two-wheelers using deep learning algorithms," *Multimedia Tools Appl.*, vol. 80, no. 6, pp. 8175–8187, Mar. 2021.
- [10] B. Y. Reddy and M. Budka, "Detection of motor bicyclist violating traffic rules using computational neural networks," *Tech. Rep.*
- [11] V. Mandal and Y. Adu-Gyamfi, "Object detection and tracking algorithms for vehicle counting: A comparative analysis," *J. Big Data Anal. Transp.*, vol. 2, pp. 251–261, Nov. 2020.





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