

# Helmet Detection and Number Plate Recognition

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**Abstract**—Today, two- wheelers are the most popular form of transportation. Historically, the bicycle has been the principal mode of transportation for motorcycles. Recently, there have been more motorcycle-related accidents. We are using an image processing approach to identify whether the person is wearing a helmet or not. When riders are caught riding motorcycles without a helmet, traffic authorities may punish them, check CCTV footage, or patrol road crossings. By reading the motorcycle's licence plate, we can identify the rider using the OCR (Optical Character Recognizer) Algorithm.

**Key words:** Number plate identification, helmet detection, YOLO algorithm, and OCR algorithm.

## I. INTRODUCTION

When driving a two-wheeled vehicle, the system makes an effort to provide the most crucial safety precautions for both the rider and the passenger. in many This has become a major cause of death in areas where the possibility of a car collision is quite high and people are least concerned about taking care of themselves. On major thoroughfares and in urban areas, there has been a discernible rise in fatal motorbike accidents in recent years. All of this is the outcome of fatalities brought on by the absence of protective helmets.

This automatic helmet recognition approach is essential for ensuring public safety in areas where traffic police cannot be stationed on every street to enforce stricter regulations. Because identifying motorcycles that are not wearing helmets is crucial for boosting traffic safety and lowering the frequency of accidents, we are using detection methods to reduce the causes. The number plate of the vehicle is recognised as a string of characters and digits, and as evidence, the data from the number plate is saved in a database. Real-time photographs and surveillance make it easy to spot those who disobey the law.

There is a need for a system that can automatically identify people who are not wearing helmets, as well

as one that can extract the vehicle number from the motorcycle's number plate in order to identify the motorcyclist who needs to be fined. Road accidents are increasing very quickly in India, and many deaths result from head injuries as a result of the large number of people who do not wear helmets.

The image is cropped to only show the rider's licence plate. The number plate number is output when the OCR (Optical Character Recognition) model recognises the text in the image. This lessens the likelihood of head injuries during accidents.

## II. PROBLEM STATEMENT

The problem statement for helmet detection and license plate recognition with generating challan is to create a system that can automatically detect whether a motorcyclist is wearing a helmet and recognize the license plate number on the motorcycle. If the system detects that the motorcyclist is not wearing a helmet or the license plate is not valid, it should generate a challan or a fine notice for the violation. The system should be able to detect helmets in different lighting conditions, angles, and distances. It should also be able to recognize license plates on vehicles regardless of the font, size, and orientation of the characters.

The system should have a database of valid license plate numbers and should be able to compare the recognized license plate number with the database to determine if the license plate is valid or not. The system should also have the ability to generate a challan or a fine notice with the details of the violation, such as the motorcyclist's name, the violation type (helmet not worn or invalid license plate), and the fine amount. The system should be able to send the challan or fine notice to the motorcyclist's address or generate a physical copy of the notice.

Overall, the system should help in enforcing traffic rules related to helmet use and license plate validity and reduce the number of traffic violations.

### III. RELATED WORK

The literature survey details on research made related to the proposed system.

A. N. Anil Kumar This study presents a non-element rider identification system that aims to automate the process of identifying the traffic infraction of not wearing a helmet and obtaining the number plate number of the offending vehicle. The key idea is object detection at three layers using deep learning. The objects are identified as people or motorcycles at the first level using a YOLO v2 helmet, a YOLO v3 licence plate at the second level, and a YOLO v2 licence plate at the final level. The licence plate registration number is then retrieved using OCR. All of these procedures, particularly the one that extracts the licence number, are subject to predetermined restrictions and criteria.

The speed of execution is critical because this job uses video as an input, so we used the aforementioned approaches to design an integrated system.

Mureshwar R. N. This paper includes described a system for the automatic detection of CCTV footage shows motorbike riders without helmets, retrieval of a motorcycle rider's licence plate automatically. using convolutional neural networks Detecting motorbike riders who are not wearing helmets with a high degree of accuracy will be made possible with the use of a convolutional neural network (CNN) and transfer learning, but merely finding these riders does not mean that you can take action against them. As a result, the system will also detect and store their motorcycle licence plates. The transport office can then use the saved numberplates to access the motorcycle rider's details from their licenced vehicle database. The concerned motorbike rider may then face punishment. (Lokesh allamaki) In this paper, we take the annotated images as an input to YOLO v3 model to train for the custom classes, here the weights are generated after training are used to load the model once this is done, an image is given as an input, the model detects all the five classes that are trained from this we obtain the information regarding the person driving motorbike if the person is not wearing the helmet we can easily extract the other class information of the rider. And this can be used to extract the license plate. This is done by finding whether the coordinates of the no element class lie inside the person class or not.

Dnyaneshwar Kokare In this research, we present a system for automatically identifying motorcycle riders without helmets in CCTV footage and automatically retrieving their licence plate numbers. Convolutional neural networks (CNN) and transfer learning were used in this case to recognise motorbike riders who were not wearing helmets with a high degree of accuracy. Although the accuracy here was 96.7, it is not enough to take action against such motorcyclists just by detecting them. The device also reads and saves the motorcycle's licence plate.

(Ajith R) Since everyone's health is a priority, accidents that result from injuries sustained while driving can sometimes be lethal, killing individuals. In this paper, deep neural networks are primarily used for image recognition of the person in the input provided in the form of video or image, and the system recognises the rider and the pillion for wearing the helmet or not. Additionally, using optical character recognition, the number plate details are read and stored in databases, which saves many lives by requiring riders to wear helmets while riding two-wheelers.

Distant Padalia These days, motorbike accidents on the road frequently result in fatalities. The rider not wearing a helmet is one of the most serious causes of fatality in motorbike accidents. Even though there are several rules requiring helmet use by two-wheeler drivers, many motorcycle riders still disobey them. The existing mechanisms are incredibly ineffective. In this study, a workable framework for identifying non-helmeted motorcyclists is suggested. Number plate characters are recovered using optical character recognition and stored in a database, allowing the concerned riders to be fined.

### IV. ALGORITHM USED

#### YOLO

Object Detection in YOLO is treated as a regression problem; it requires only a single forward propagation to predict bounding boxes and classes on the image. The method employs a single end-to-end trained neural network that receives an image as input and directly predicts bounding boxes and labels. The model divides the image into grid cells, where each cell is responsible for predicting K bounding boxes. Each bounding box can be described using five descriptions, class probability (pc), the centre of the

box (bx, by), width (bw), height (bh) and value c corresponding to the class of the object. Confidence scores reflect the presence or absence of an object in the bounding box. IoU is intersection over union; it calculates the overlap of predicted and ground truth bounding boxes. IoU is the ratio of area of intersection to the area of union of the ground truth and predicted bounding box .

#### OCR(optical character recognition)

OCR, or Optical Character Recognition, is a process of recognizing text inside images and converting it into an electronic form. These images could be of handwritten text, printed text like documents, receipts, name cards, etc., or even a natural scene photograph. OCR has two parts to it. The first part is text detection where the textual part within the image is determined. This localization of text within the image is important for the second part of OCR, text recognition, where the text is extracted from the image. Using these techniques together is how you can extract text from any image.

#### ALPR API

ALPR API stands for Automatic License Plate Recognition API. It is a software application programming interface (API) that allows developers to integrate automatic license plate recognition functionality into their applications.

ALPR technology uses optical character recognition (OCR) to identify and read license plate numbers from digital images or videos of vehicles. The ALPR API provides developers with access to a pre-built ALPR engine, which can be used to recognize license plates from images or video streams captured by cameras.

ALPR APIs typically require access to a large database of license plate numbers and related information, such as vehicle make and model, registered owner, and registered address. This data can be sourced from government databases, private companies, or a combination of both.

Overall, ALPR APIs provide a powerful tool for automating license plate recognition

## V. IMPLEMENTATION

Procedure Involved In Execution of Project Create an anaconda environment. The command conda activate hnpdr activates the hnpdr environment, which means any subsequent commands will use the Python version and packages installed in this environment. Provide the video path to the program. Capture the screenshot of the image and upload to website in order to detect the number in the number plate. Start the React Server and generate an E-challan.



Fig 1 : Detection of Number Plate



Fig 2: Detection of Helmet

We will use the application's API (application programming interface) and then upload the photo to the flask-powered website. The api will then provide a response in json format, from which the number plate number can be retrieved.



Fig 3 : Number Plate Detection website  
Image Classifier

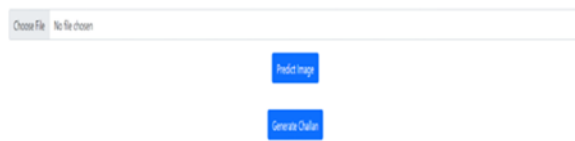


Fig 4: Challan Generation Website



Fig 5 : Generated Challan

## VI.. CONCLUSION AND FUTURE SCOPE

In this project by taking live photos, we built a system for number plate recognition and helmet identification in this research. Deep Learning for Licence Plate Recognition and Helmet Detection. This project uses deep learning methods to identify licence plates on moving vehicles and detect helmets on motorcycle riders. The Yolo Algorithm is used by the system to recognise helmets, and optical character recognition (OCR) is used to identify licence plates. An online application that displays the outcomes of the detection and recognition processes is also part of the project.

Additionally, it will produce a challan for the offending bike rider. In upcoming upgrades, we'll create an app with a database of all the bike licence plates and integrate it with real-time CCTV. The email and message will be sent to the respective person who violated the traffic rules.

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