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# HELMET DETECTION AND NUMBER PLATE RECOGNITION USING DEEP LEARNING

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## ABSTRACT

In current situation, we come across various problems in traffic regulations in India which can be solved with different ideas. Riding motorcycle/mopeds without wearing helmet is a traffic violation which has resulted in increase in number of accidents and deaths in India. Existing system monitors the traffic violations primarily through CCTV recordings, where the traffic police have to look into the frame where the traffic violation is happening, zoom into the license plate in case rider is not wearing helmet. But this requires lot of manpower and time as the traffic violations frequently and the number of people using motorcycles is increasing day-by-day. What if there is a system, which would automatically look for traffic violation of not wearing helmet while riding motorcycle/moped and if so, would automatically extract the vehicles' license

plate number. Recent research have successfully done this work based on CNN, R-CNN, LBP, HoG, HaaR features,etc. But these works are limited with respect to efficiency, accuracy or the speed with which object detection and classification is done. In this research work, a Non-Helmet Rider detection system is built which attempts to satisfy the automation of detecting the traffic violation of not wearing helmet and extracting the vehicles' license plate number. The main principle involved is Object Detection using Deep Learning at three levels. The objects detected are person, motorcycle/moped at first level using YOLOv2, helmet at second level using YOLOv3, License plate at the last level using YOLOv2. Then the license plate registration number is extracted using OCR (Optical Character Recognition). All these techniques are subjected to predefined conditions and constraints, especially the

license plate number extraction part. Since, this work takes video as its input, the speed of execution is crucial. We have used above said methodologies to build a holistic system for both helmet detection and license plate number extraction.

**Keywords**—helmet detection; number plate recognition; computer vision; machine learning; convolutional neural networks; transfer learning

## 1.INTRODUCTION

### 1.1 Overview

Currently, in practice, Traffic Police are entrusted with the task of ensuring that motorcycle riders wear helmet. But, this method of monitoring motorcyclists is inefficient due to insufficient police force and limitations of human senses. Also, all major cities use CCTV surveillance based methods. But, those require human assistance and are not automated. Due to the increasing number of motorcycles and the concern for human safety, there has been a growing amount of research in the domain of road transport. The system proposed in this paper automates the task of monitoring motorcyclists. The system detects motorcyclists not wearing helmets and retrieves their motorcycle number plate in

real time from videos captured by CCTV cameras at road junctions by making use of Machine Learning and Computer Vision techniques. Classifiers are built using Convolutional Neural Networks.

### 1.2 Objective

Helmet reduces the chances of skull getting decelerated, hence sets the motion of the head to almost zero. Cushion inside the helmet absorbs the impact of collision and as time passes head comes to a halt. It also spreads the impact to a larger area, thus safeguarding the head from severe injuries. More importantly it acts as a mechanical barrier between head and object to which the rider came into contact. Injuries can be minimized if a good quality full helmet is used. Traffic rules are there to bring a sense of discipline, so that the risk of deaths and injuries can be minimized significantly. However strict adherence to these laws is absent in reality. Hence efficient and feasible techniques have to be created to overcome these problems. Manual surveillance of traffic using CCTV is an existing methodology. But here so many iterations have to be performed to attain the objective and it demands a lot of human resource. Therefore, cities with millions of population having so many vehicles running

on the roads cannot afford this inadequate manual method of helmet detection. So here we propose a methodology for full helmet detection and license plate extraction using YOLOv2, YOLOv3 and OCR. Basically helmet detection system involves following steps such as collection of dataset, moving object detection, background subtraction, object classification using neural networks.

### 1.3 Project Formation

Due to the increasing number of motorcycles and the concern for human safety, there has been a growing amount of research in the domain of road transport. The system proposed in this paper automates the task of monitoring motorcyclists. The system detects motorcyclists not wearing helmets and retrieves their motorcycle number plate in real time from videos captured by CCTV cameras at road junctions by making use of Machine Learning and Computer Vision techniques. Classifiers are built using Convolutional Neural Networks.

### 1.4 Scope

Most of the existing systems for this problem statement use classifiers built on handcrafted features on the images/frames in video. Coming up with really good

handcrafted features is a difficult task. This is why, deep Convolutional Neural Networks (CNNs) [14] have become popular in recent years for the job of image classification. CNNs learn rich feature representations from a broad range of images which often outperform handcrafted features and lead to more accurate and efficient image classification. Thus, implementation of system for this problem statement is done using CNN classifiers. One CNN classifier is used to classify between motorcyclist and non-motorcyclist and another CNN classifier is used to classify between helmet and non helmet.

### 1.5 Feasibility

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are

- ECONOMICAL FEASIBILITY
- TECHNICAL FEASIBILITY
- SOCIAL FEASIBILITY
- 

### **1.5.1 ECONOMICAL FEASIBILITY:**

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

### **1.5.2 TECHNICAL FEASIBILITY:**

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

### **1.5.3 SOCIAL FEASIBILITY:**

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

## **2. EXISTING SYSTEM**

Existing system monitors the traffic violations primarily through CCTV recordings, where the traffic police have to look into the frame where the traffic violation is happening, zoom into the license plate in case rider is not wearing helmet. But this requires lot of manpower and time as the traffic violations frequently and the number of people using motorcycles is increasing day-by-day. What if there is a system, which would automatically look for traffic violation of not wearing helmet while riding motorcycle/moped and if so, would

automatically extract the vehicles' license plate number. Recent research have successfully done this work based on CNN, R-CNN, LBP, HoG, HaaR features,etc. But these works are limited with respect to efficiency, accuracy or the speed with which object detection and classification is done

### 3. PROPOSED SYSTEM

In this project we are detecting whether two wheeler rider wearing helmet or not, if he is not wearing helmet then we are extracting number plate of that two wheeler. To extract number plate we have YOLO CNN model with some train and test images and if you want to add some other images then send those images to us so we can include those images in YOLO model with annotation to extract number plate of those new images.

To implement above technique we are following or implemented below modules

1. First image will be upload to the application and the using YOLOV2 we will check whether image contains person with motor bike or not, if YOLO model detect both person and motor bike then we will proceed to step 2.
2. In this module we will use YOLOV3 model to detect whether object wear helmet or not, if he wear helmet then

application will stop hear itself. If rider not wear helmet then application proceed to step 3.

3. In this module we will extract number plate data using python tesseract OCR API. OCR will take input image and then extract vehicle number from it.

### 4. OUTPUTSCREENS

#### Home Page



#### Upload Image



#### Detect Motor Bike And Person

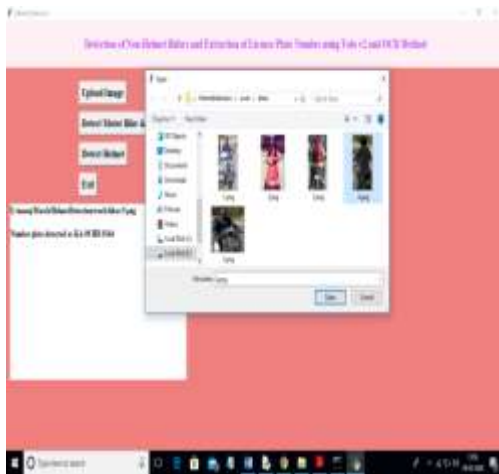


### Detect Helmet



### Upload Image

Now we will check with helmet image



### Detect Motor Bike And Person



### Detect Helmet

## 5. CONCLUSION

In the paper, we have described a framework for automatic detection of motorcycle riders without helmet from CCTV video and automatic retrieval of vehicle license number plate for such motorcyclists. The use of Convolutional Neural Networks (CNNs) and transfer learning has helped in achieving good accuracy for detection of motorcyclists not wearing helmets. The accuracy obtained was 98.72%. But, only detection of such motorcyclists is not sufficient for taking action against them. So, the system also recognizes the number plates of their motorcycles and stores them. The stored number plates can be then used by Transport Office to get information about the motorcyclists from their database of licensed vehicles. Concerned motorcyclists can then be penalized for breach of law.

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