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Deep Learning on Security Hazards of Two Wheelers

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Abstract:
Every year in India a large number of losses of lives occur due to road accidents. The data statistics of the survey from WHO is that there are 1.25 million deaths every year due to traffic accidents. The large number of accidents occurs to motorcyclists, especially motorcyclists who are not wearing standard helmet, the drivers who consume alcohol, rash driving and violation of traffic rules etc. The helmet is the motorcyclist's main barrier. For that reason, many countries makes it indispensable to wear the helmet, but still offense occurs which leads to the loss of life and bruise the environment. In order to overcome this issue, we propose one such security systems that make it mandatory for the user to wear a protective guard before riding a two wheeler. This system reduces the probability of a severe injury or death during an accident. The people who are driving without a helmet will be identified by the vehicle number and given a penalty for violating the rules.

1. Introduction

The growth of machine learning and deep learning applications have helped to solve many problems faced by the human beings. These technologies are applied in many fields to provide assistance and helping to take wiser decisions by the humans [19,20,23]. Deep learning used in many facial recognization and emotion detection [21]. Deep learning contains a large number of hidden layers to learn things from the available data called as supervised learning method and it employs the transfer learning scheme to make the learning faster. Previously neural networks, recurrent networks, SVM etc are used for classification and prediction and they proved well [24], but since there is an increase in the data size the demand has increased for a better networks to deal with it giving rise to an increased interest in these fields. In the field of IoT also deep learning and machine learning played a key role in analyzing the data and giving out a output helping the doctors to act on the patient making easier for the doctors to take a decision regarding the diagnosis of the diseases[22]. This technology is now applied to reduce the road accidents and assist the traffic police to react quickly on the defaulters such as not wearing helmet and triple raids can be minimized thereby the accidents can also be reduced. Since bikes are sheltered and a normal type of transport, there has been a fast increment in bike crashes because of the way that most motorcyclists don't wear a protect that makes going by cruiser an ever-present peril each day[15],[16].The majority of gun deaths in collisions over the last several years alone are because of wounds in the head [17]. Due to this wearing protective safeguard is mandatory and according to the guidelines of traffic, disregard of which gets firm punishments. In acknowledgment of that, countless motorcyclists are not adhering to the standard. Every single significant city have as

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of now connected enormous video reconnaissance system to watch out for a wide range of dangers.Utilizing such previously existing framework will thusly be a hazard viable arrangement, these tasks therefore include a lot of individuals whose profitability isn't steady over delayed periods. Various examinations have demonstrated that humanobservation is inadequate, as the span of video tracking expands, security breaches also increase [18].

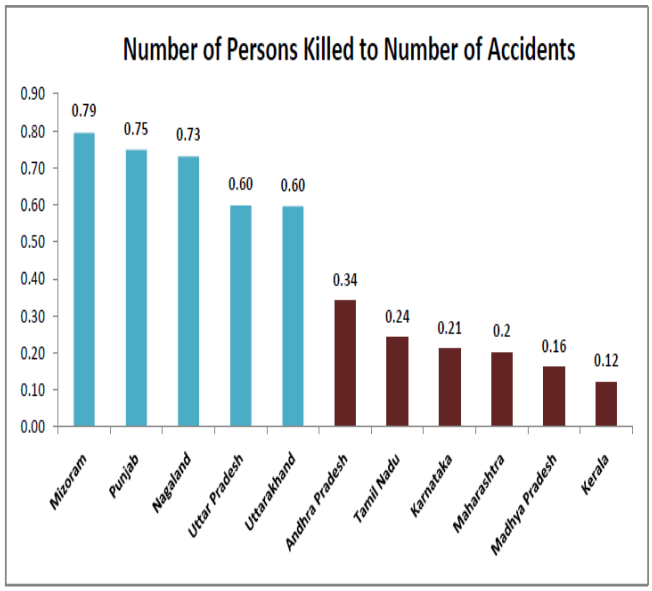

Fig 1: The rate of road accidents

So many researchers [15],[16] have so far tried to overcome the challenge of spotting pedestrians without a helmet Using of different strategies but could not pinpoint bikers without having a helmet adequately Under conditions as demanding as these deformation, visibility, Misvideo resolution, shifting weather forecasts, etc. The use of least racially discriminatory analysis for image identification as well as the assessment of unrelated structures against the task of spotting motorcyclists lacking safety is a significant reason for the low performance of traditional methods. The latest frameworks also only provide use of handmade apps.

2. Literature Review

J. Cheverton [25] prepared a model such that Each vehicle on the roadway will be examined and the attacker log will be produced in high definition. Furthermore, such that any cyclist who does not wear a helmet will be charged, and public concern will be enhanced.He used canny edge detector. The classifier used by him is SVM (Support Vector Machine).

Authors in [3] order to improve efficiency a region of interest has been used. Using an SVM classifier, the moving object was labelled into two classes. It classifies motor bikes and helmets using YOLO (you live only once), and Open ALPR is the technology used for license plate recognition (Automatic License plate Recognition). Convolutional neural network is used in order to classify the images.

In addition to this, a specialized training data set The Algebraic Flowing has been optimized for an adult riding a motorcycle and a helmet. Using network trimming was captured to distinguish single helmet the program tries to cross different photos with various kinds of helmet.At first a person will be detected riding a bike that will define a bounding box. Techniques for classifying the images were used [18].

3. BACKGROUND AND RELATED WORK

The moto of this proposal is to prevent accidents by using the Deep Learning methods.The current work that solves the problem using image processing solutions uses techniques such as HOG[2], LBP[4]. The proposed system isolates the bikes from the images and the most likely region where helmet may be present by approximation crops, and then feeds them to the extraction and matching feature system.

Cheverton proposed using circular arc to identify the helmet into a video feed, it has very low accuracy. Nevertheless, given the number of vehicles on the speed at a given moment, the calculation necessary is very heavy and consumes a lot of resources. This method can recognize any

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circular object around the bike rider as a two-step Real Time Automatic helmet for Bike Riders ' Helmet Detection two steps have been used to detect helmets. In the first step, there was determination of moving objects where cross line was specified[3]. Whether or not it is a motorbike is then tested. A region of interest was used in the second phase to improve the efficiency.Using an SVM classifier, the moving object was classified into two classes. Geometric, periodic, and tree based were used in three classification families. Videos were shot at 25 fps, and 1280x720 image resolution. Talks about a program that is very similar to the one introduced in this paper that detects bike riders without a helmet and records the number plate of all offenders in a database. It classifies motorcycle and helmet using YOLO (you live only once), and Open ALPR (Automatic License Plate Recognition) is the technology used to classify license locations. Both devices charge monthly fees and are not economically feasible as such.

3.1 OVERVIEW OF DEVELOPED SYSTEM

This paper's basic goal is to implement a system in which it detects the bike riders under video surveillance and thus provides number plate information whenever a driver drives without a helmet using databases. Therefore, these repositories will be useful for future research by police authorities.

This paper aims at continuous helmet detection through the constant recording of videos in all public places. A video camera will be mounted so that that video camera records the entire area. The frames will eliminate the background, except for the moving objects, where the pedestrians and other objects of the real world are subtracted. Then a trained model must evaluate or define the moving objects, and test them. The objects are classified using the COCO (Common Objects in Context) model.

In addition to this, a special training dataset It was designed using Tensor flows ideas for a person riding a motorcycle and helmet.With the aid of internet resources, a lot of photos with different types of helmets were collected to recognize every helmet the system comes across. First a motorcyclist will be observed riding a motorcycle which will create barreling boxes and then start the further phase.

The region to be scanned will be limited to that particular bounding box that was previously identified. The machine will then search for the existence of a helmet in that particular bounding box. The box will be removed, if the helmet is identified.The retained boxes (people not wearing helmet) will be identified and processed by the subsystem that checks the number plate. The text i.e. the vehicle number on the license plate will be noted and punished using the technique OCR (Optical Character Recognition) [5].A new entry will be made in the database for the place and time of the incident, the illustration of the barrelling boxes as evidence; and the license plate number will be entered into the database as a new record of offence. System process flow is given in Fig.2.

3.1.1 Elimination process:

The Initial procedureis to determine the interested zonei.e. more importance will be given to the 1/3rd part from top to test whether or not the individual wears a helmet. The moving objects on the road will be marked by logically combining the specific object in the background model and the built model (trained model with an image dataset).The model This paper recommends the analysis of the commercial world concept (organization)for ' person riding bike. ' Anything other than the person who is riding a bike is eliminated. Therefore a lot of computing to do will be reduced.

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Fig.2. Moving Object Detection.

3.1.2 Helmet Check Process:

Upon extraction of the interested zone, Structures inside it will be named by component detection and appropriate operations. In some cases the drivers can wear safety protection on the structure of the bike or hold it with their hands, and not wear it on the head. In such cases the human face, labeled as a male, will be found along with helmet.It will therefore lead to a condition of offence.

A CNN (Convolutional Neural Network) model has been Selected for all the available hazards on the marketplace, in addition not to hesitate to distinguish any type of offence regardless of the type of helmet the rider wears.

Fig.3. Helmet detection

3.1.3 Number Plate Identification Process:

Using tesseract, the OCR is used to classify the licence plate. Upon acknowledgement, a database schema declaration will be made and a new violation log will be inserted to the system, and the mechanism for the corresponding images will continue[13].

Fig.4. Number Plate Extraction

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3.1.4 PROCESS FLOW DIAGRAM

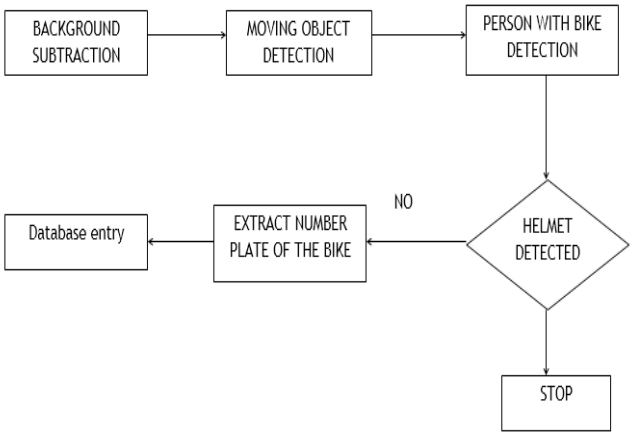

Fig. 5: Process Flow diagram.

4. WORKING PROCESS

To ensure bike riders safety, we have designed this project. Many projects have beendesigned so far but they all are concentrated more on four wheelers. Very less importance was given to motorbikes. Today accidents caused by motorbikes are more than cars. Thus in this project safety of bike rider is major concern.The project consists of 3 parts:

1. **Elimination Process**: To identify the real world object [9].
2. **Helmet check process** :To ensure that the Motorcyclist [12] wears a safeguard.
3. **License Plate Identification**: To identify the number plate [10] of the respective bike [7].

TheOutcome obtained Is displayed in feature 7 and feature 8. In this first frame all objects apart from a motorcyclist who doesn't even wear a helmet are dropped. On the other side, Figure 7 indicates successfully separating number plate.

Fig. 7: ROI determined Fig. 8: License plate extracted

5. CONVOLUTIONARY NEURAL NETWORKS

We can use a profoundly convolutionary neural network and long-term memory for confession of the license plate and eradication of character. The current epidemic dominance of convolutionary neural nets lies in their ability to secure interdependent portrait feedback;i.e. location of highly sensitive picture elements to other pixels. They use a CNN for posting of license plates. They use two approaches for analysis and recognition. The first is the definition of character analysis based on image binarization, linked component analysis and character recognition. The second is a sequence characterization based approach using CNNs and recurrent neural networks (RNNs). To the outshine of our awareness, the CNNs are mainly used in image classification and object detection. The structure of the CNNs is shown in fig 6.

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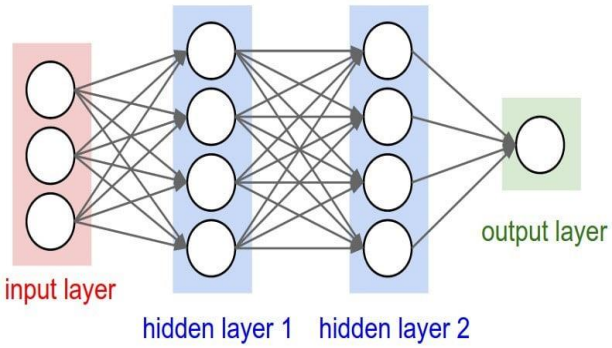

Fig 6: The convolutional neural network

6. RESULTS & DISCUSSION

We presented the test brings about this segment, and address the reasonableness of the best performing portrayal and model over the others. Our model's engineering depends on AlexNet [14], comprising of 4 convolution layers with 5 ReLU initiation units, 2 drop-out max-pooling layers, and 2 completely associated thick layers, with last tmax softs for order into two gatherings.

The 5-overlap cross approval is utilized to direct examinations with the end goal of having the exhibition of the proposed approach genuinely approved. Table I abridges the discoveries of the examinations for the 'Motorcyclist' versus 'Non-motorcyclist' order utilizing the proposed CNN and the present methodology utilized for correlation for both datasets. For differentiate, we see just HOG-SVM as the most noteworthy yield of every other technique depicted in [1].

Table I. Execution (%) of the identification using CNN.

DataSet:Feature	Fold1	Fold2	Fold3	Fold4	Fold5	Avg.(%)
IITH_Helmet_1:CNN	99.06	99.34	99.39	99.15	99.28	**99.24**
IITH_Helmet_1:HOG	97.93	99.59	98.35	99.38	99.17	98.88
IITH_Helmet_2:CNN	91.81	91.79	91.84	91.85	91.78	**91.81**
IITH_Helmet_2:HOG	81.83	81.58	81.97	81.23	82.59	81.84

The accuracy is 99.24 per cent with a low false alarm rate less than 0.5 per cent on the IITH Helmet 1 dataset and 91.81 per cent with a low false alarm rate less than 0.5 per cent on the IITH Helmet 2 dataset. The proposed method using CNN outperforms the classification performance of the existing HOG-SVM with a margin of 0.36 percent on the dataset IITH Helmet 1 and 9.97 percent on the dataset IITH Helmet 2, as shown in Fig. 10.

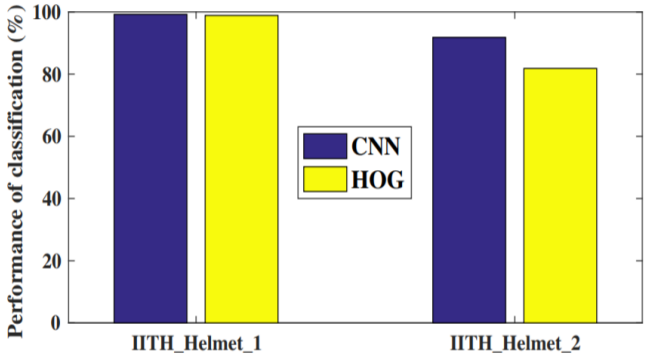

Fig. 10. Efficiency comparison (percent) in the proposed method [1];

We also used 5-fold cross validation for second classification to check the proficiency of the proposed and current techniques. Table II abridges the aftereffects of the characterization tests ' Helmet ' versus ' Non-Helmet ' utilizing the new CNN and the present framework used to look at both datasets. For correlation, we see HOG-SVM just as the most elevated yield among all the techniques portrayed in [1]. Examinations show that the exactness of the IITH Helmet 1 data set is 98.63 percent with a low bogus alert pace of under 0.5 percent, and 87.11 percent with a low bogus caution pace of under 0.5 percent with the IITH

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Helmet 2 informational collection. The proposed technique utilizing CNN beats the order productivity of the present HOG-SVM with a 4.83 percent IITH Helmet 1 dataset edge and a 29.33per cent IITH Helmet 2 dataset, as shown in Figure. 11. 11. That's Okay.

Table II. Execution (%) for the Identification OF 'POSITIVES' VS 'NEGATIVES'.

Dataset:Feature	Fold1	Fold2	Fol
IITH_Helmet_1:CNN	98.73	98.65	98.(
IITH_Helmet_1:HOG	90.12	95.06	93.8
IITH_Helmet_2:CNN	87.28	86.85	87.3
IITH_Helmet_2:HOG	56.88	55.50	63.7

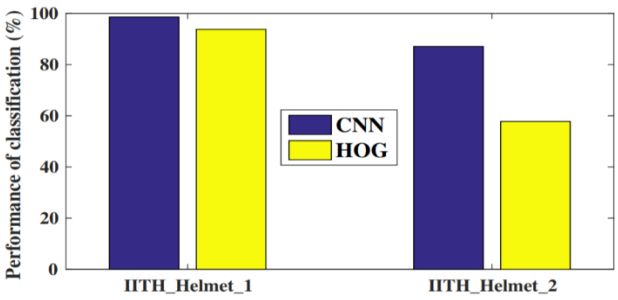

Fig.11.Performance comparison of results for positive as well as negative vials[1].

The ultimate result for the above test assessment appears that utilizing algorithm improves the characterization execution for both the grouping assignments and along these lines prompts increasingly solid discovery of neglecters riding without head protectors. This significant improvement is practiced for the gathering of 'Head protector' Vs 'Head injurer'.

7. CONCLUSION

The main target of this journal is to give a suggestion about statistics of traffic culprits in a particular area. TheDatabase generated will give information about bike riders not wearing a helmet along withsnapshot for proof.The technologies we used are tensor flow, open CV and tesseract to make thesoftware less expensive.The system used was tested to get fool proof results.The process donewill give awareness to general public which results a good impact to the system.

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