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Automatic Motorcyclist Helmet Rule Violation Detection using TensorFlow & Kera's in OpenCV

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ABSTRACT

Traffic accidents are now rapidly increasing in numerous countries over the years, due to motorcyclists' international disregard for traffic safety, which has resulted in accidents and fatalities. To combat this issue, most nations have regulations requiring two-wheeler motorcyclists to wear helmets, thus it is critical for bikers to realise the dangers of driving outside without. Motorcyclists who don't even wear a helmet are all at the biggest danger of catastrophic brain damage; whether they are injured in an incident without covering, the skull is vulnerable to a severe hit. In India, there is indeed a rule that requires riders to wear helmets, and not riders. Someone riding a motorbike without even a helmet risks being involved in a crash or suffering head trauma. Everybody, even kids, should indeed be recommended to carry a helmet. As a result, we designed a system with in computer vision that is founded on TensorFlow and Keras. Including in real time, the system can detect not just whether riders are wearing helmets. If some of them seem to be there without a helmet, the technology will closely evaluate the incident and issue a compliance report. The technology, which may be used in mall, workplaces, super markets, schools, and colleges, allows users to enter only once a helmet is detected by an automatic barrier. It will undoubtedly have an impact on the use of helmets which will save people's lives.

Keywords: Motorcycle, helmet, Computer Vision, TensorFlow, Kera's, barrier.

1.INTRODUCTION

A helmet reduces the danger of major death or severe damage by absorbing overall impact of a pressure or accident to the skull, but motorcycle riders should take extra care to safeguard their bodies. Helmet-wearing drivers and passengers have a significantly higher chance of survival than non-helmet-wearing people. Every biker is required by law to wear a helmet when riding a motorbike. Nevertheless, some riders disregard this warning and ride without even any protective gear. [1-2]. This same police officer attempted to solve the matter physically, however his efforts

were insufficient in light of the current situation. Despite the fact that helmets has just become compulsory, people continue to drive without them [3]. The amount of fatalities on motorcycles has already been increasing year after year, particularly in emerging nations because helmet are the most important piece of protective gear for both riders and passengers, yet many motorists do not use helmets [4]. The most reliable approach to decrease brain accidents and illnesses from motorbike and cycling incidents is to wear protective gear. Motorbike riders who don't even wear a helmet are much more likely to suffer brain trauma and die as a result of these wounds [5].

Problem Statement:

- Throughout this work, we must consider the circumstance in which we would are using. There seem to be various elements that influence the object recognition model's accuracy, particularly whenever that alone relates to images.
- This could include things like brightness, isometric view from which the picture is shot, image backgrounds and much more.
- The very first goal is to define the issue and consider possible solutions. We'll be able to go forwards with this training phase once we've completed everything.

Objectives:

- Developed a method depending on an RF transmission and reception to improve the helmet's features and give additional security in the case of an accident.
- This could raise the expense of helmets and therefore does not give solutions that would require all riders and non-riders to wear a helmet.
- Helmets were categorized to use a support vector machine and trained sequence data.
- The platform's precision is somewhat good, but that might not applied in a range of conditions, particularly those encountered in India, including the use of clothing over through the head, people without helmets, and so on.

Outcome:

This research focuses on detecting bikers who are not wearing helmets on public roadways. Vehicle separation and categorization, as well as identification of helmet wear, were presented as applications for a computerized image processing. In the phase of vehicular classification and segmentation, reasonable descriptor and classifier, as well as methods for backdrop computation and activity recognition, were used hit rates and low processing times were selected from the literature achievingan accuracy of 0.9778.

2. BACKGROUND STUDY(LITERATURE)

A. **Chill your head while riding bike with AC helmet:[6]**

Cycling a 2 wheeler in India might be exhausting because of the extreme temperature however student from the Indira Gandhi Engineer University's mechanical design division in Sagar, Madhya Pradesh, have devised a novel approach to keep fresh when biking. They've created a one-of-a-kind helmets at its research center that provides coolness comparable to an air conditioning unit for a fraction of the price.

B. **Helmet must for pillion riders in Karnataka from Jan 12:[7]**

The law would be enforced by traffic wardens, or first violation would be charged Rs100. If another motorbike rider doesn't really wear a helmet, a three degree murder may forfeit his or her driving permit. The regulation has been enforced after government was ordered by the Constitutional Court Commission on Traffic Safety to do so as soon as possible.

C. **Safeguarding of motorcyclists through helmet recognition:[8]**

In India, the motorbike is the most popular mode of transportation. The number of people killed or injured in traffic accidents in India is unusually high. Bikes are an apparent choice for a fast means of transportation, yet they contribute significantly to traffic accident fatalities and injuries. Due to government road laws, individuals continue to refuse to wear helmets. People's impatience or purposeful attitude may cause them to avoid wearing a helmet. The current technique is an attempt to raise societal awareness through encouraging the usage of helmets and guiding individuals to safety. This study suggests using an RF information exchange helmet recognition strategy to better impose helmets usage.

D. **Automatic Detector for Bikers with no Helmet using Deep Learning:[9]**

By use of a Convolutional Neural Network (CNN) or Learning Techniques to recognise and retrieve features from digital images has lately been recognised. Scholars have used similar strategies to solve a variety of challenges, including detecting traffic violations in surveillance cameras, particularly for motorcyclists who do not wear helmets. Many Neural networks were being used to handle these types of problems, however most of them needed image pre-processing.

Before employing CNN to categorise helmets, for identifying the Region of Interest (ROI) region inside the picture. Therefore in research, we propose using a new deep learning algorithm called Single Shot Multi Box Detector (SSD) to solve the helmet tracking problem. This is the province useful for identifying the boundary box region of a motorbike and its rider only using

one CNN network and then classify that biker is wearing or not wearing a helmet at the same time then categorize whether or not the rider is wearing helmets at the very same time. The study's outcomes were shockingly positive. The recognition rate of non-helmeted riders was incredibly high, as well as the ROI of a rider and bike with in picture may be detected simultaneously with the classification task.

E. **An intelligent motorcycle helmet for big bus intimation and collision avoidance[10]:**

We present the i-Helmet, a smart motorbike helmets that combines thermal cameras with a sensor and uses computer vision to distinguish large cars in the back. The image identification performance is high by using two sensor mode (day or night). The designed i-Helmet finally accomplished computer vision of the plate number of rear huge truck/bus, according to experimental data. The identification prediction accuracy ranges from 70percentage points (night) to 75percentage points (day) (day). As a result, the suggested i-Helmet can deliver associated intimations in real time to avert rear large truck/bus accidents.

- **Abbreviations and Acronyms**

CNN: Convolutional Neural Network

ROI: Region of Interest

SSD: Single Shot Multi Box Detector

3. METHODOLOGY

.

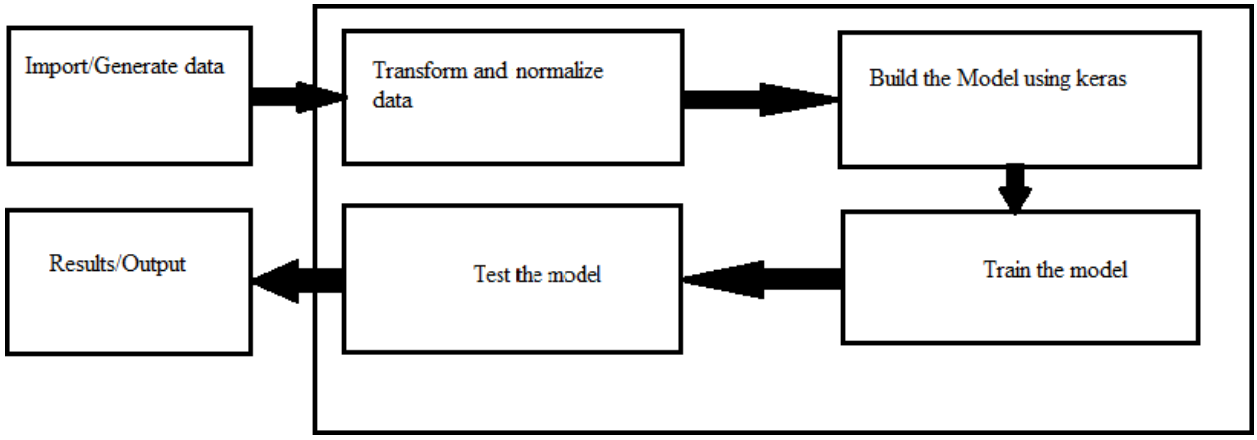

Fig 3.1 System Architecture

Existing system:

The true safety guidelines which should be observed by almost everyone [11]. There seem to be a

variety of scenarios in which the methodology can be applied to require the usage of a helmet unless the entrance is not permitted without one. This can be performed if the computer has a boundary which can only deploy if no violations have been identified [12-13]. It is possible that motorcyclists will be forced to wear helmets with the customers at all times [14]. For accurate evaluation and decisions, the suggested system can recognize heads with or without helmets. Even if the consequences for breaking the rules are increased, there may be no answers to the problem of individuals wearing helmets. [15-18].

Proposed system:

The presented scheme can distinguish between motorcycles with and without helmets. Tensor flow is used by the system to recognise helmets and motorcycles in real time with excellent accuracy [19-20]. Tensor flow is a Google Brain team-developed pre - compiled framework that can classify many items in single frames. The design also makes use of Kera's API, which is based on Tensor Flow. All these Tensor Flow and Kera are capable of working with Python. Keras also creates a model containing losses and optimization components, as well as a classification model with fitting. This system also can recognise the skull of a biker who is not wearing a helmet [21-24]. A biker does or doesn't wear helmets even if he's not riding for any riders, a motorcyclists seems not to have people wearing helmets, and a biker may hide his face with the cloth and also be regarded to be riding without a helmet. All of these scenarios could be managed by the suggested system with a high level of precision [25].

Helmet detection:

There is really no numerous skull or hat security model that can classify rule breakers, despite the fact that helmets are required for all two-wheeler drivers or non-riders who accompany the bicycles [26]. The system properly identified two-wheelers with and without headgear with only an efficiency of 86%. For photographing or identifying the bike, traffic cams at the intended place are used. The research draws boundary boxes across the two-wheelers and compresses the images, after which CNN is used to determine that whether rider is wearing a helmet or not. If a helmet is spotted, the system will treat the situation as non-violent. The mechanism has now been tested on a variety of helmets and bicycles. The model was used to locate anomalies in video frames. Since there is no instruction for identifying heads and helmets, the algorithm may become confused. [27-30].

Tensor flow:

The current technique can distinguish between motorcycles with and without helmets. The system recognises helmets and motorcycles in real time with great accuracy using tensor flow [31-

34]. Tensor flow is a Google Brain team-developed pre - compiled framework that can classify many items in a single frames. The system also makes use of Kera's API, which is based on Tensor Flow [35-39].

All Tensor Flow and Kera are capable of working using Python. Keras also builds a scenario with losses and optimization function, as well as a training procedure including fitting. The sensor can recognize the skull of a biker who is not wearing a helmet. A biker will or will not wear a helmet even if he's not riding for any riders, a motorcycle seems not to have commuters wearing helmets, as well as a biker could hide his mouth with a fabric and also be regarded to be riding without a helmet. All of these scenarios could be addressed by the suggested system with a high degree of quality [40-45].

Better prediction and decision making:

The true safety guidelines which should be observed by almost everyone. There are a variety of scenarios in which the methodology can be applied to require the usage of a helmets if the entrance is not permitted without one. This can be accomplished unless the technology does have a boundary which can only deploy if no violations have been identified. It is possible that motorcyclists will be forced to wear helmets alongside their riders at all times. For accurate evaluation and decision - making process, the suggested system can recognise heads either with or without helmets. Even if the penalties for breaking the rules are increased, there may be no answers to the problem of individuals wearing helmets.

Defense apparatus:

A helmets reduces the danger of major head and brain damage by absorbing the pressure of a pressure or accident to a skull, but motorcycle riders must pay special attention to safeguard their bodies. Helmet-wearing riders and riders have a significantly higher chance of survival than non-helmet-wearing people. Each biker is required by law to wear a helmet when riding a motorbike. The police officer attempted to solve the matter manually, but his efforts were insufficient in light of the current situation. Despite the fact that helmet had lately been compulsory, individuals keep driving without them. The number of fatalities on motorcycles has been increasing year after year, especially in developing nations, because helmet are the most important piece of protective gear for both riders and riders, yet many motorists do not wear them. The most appropriate approach to decrease head accidents and fatalities during motorbike and cycle crashes is to wear helmets. Motorcyclists who may not wear a helmet are much more likely to suffer head trauma and die as a result of them.

4. IMPLEMENTATION

Module Description:

TensorFlow:

The proposed method can distinguish between motorcycles with and without helmets. The system recognises helmets and motorcycles in actual time with great efficiency using tensor flow. TensorFlow is a Google Brain team-developed pre - compiled framework that can classify many items in a single shot. The system also makes use of Kera's API, which is based on TensorFlow. TensorFlow and Kera are two Python libraries that function well together. Keras additionally builds a scenario with losses and optimization components, as well as a training algorithm with fitting. The sensor can recognize the head of a biker who is not wearing helmets. A biker will or will not wear helmets even if he's not riding on any companions, a biker doesn't seem to have commuters wearing helmets, as well as a rider may hide his mouth with a fabric and also be regarded to be riding without a helmet. All of these scenarios can be addressed by the developed scheme with a high level of precision.

Helmet detection:

For photographing or identifying the bike, traffic cams at the intended place are used. The research draws boundary boxes from around 2 and compresses the images, after which CNN is used to determine whether the rider is wearing a helmet or not. When a helmet is spotted, the algorithm will treat the situation as non-violent. Multiple signals of helmet sands bike have been used to train the system. The Caffe model was utilized to locate anomalies in video frames. Whenever a rider arrives without the need for a helmet and with his garments covering his face, then system fails. Since there is zero instruction for identifying heads and helmets, the algorithm may become confused. There is also no numerous head and helmet identification method that can classify rule breakers, despite the fact that helmets are required for all two-wheeler users and non-riders who accompany the bicycles. The system properly identified two-wheelers with and without masks with such an efficiency of 86%.

Non helmet wearers:

A helmets reduces the danger of major brain damage by absorbing the pressure of a surge or collision to a brain, but motorcycle riders should take extra care to safeguard their bodies. Helmet-wearing motorcyclists and riders have a significantly higher chance of survival than non-helmet-wearing people. Each biker is required by law must wear helmets when riding a motorbike. However, many motorcyclists disregard this warning and ride with no protective gear. The police officer attempted to solve the matter manually, but his efforts were insufficient in light of the

current situation. Despite the fact that helmet had just been compulsory, individuals keep driving without them. The number of fatalities is already rising year after year, especially in developing nations, because helmets are the most important piece of protective gear for motorbike drivers and riders, but most do not wear it. The most effective strategy to decrease head accidents and illnesses from motorbike and bike crashes is to wear helmets.

Convolutional neural network:

The method utilizes a neural network as well as a background removal technique to emphasise riders who are wearing helmets. Helmets were identified to use a support vector machine using train sequence data. The program's precision is decent, and it may not applied in a range of conditions, particularly those encountered in India, like wearing clothing over one's face without a helmets. The researchers devised a CNN-based approach for detecting 2 wheelers with and without helmets. As previously stated, CNN is restricted in terms of sample size, and also most unique situations could be addressed with this method. Identifying several helmets and people's heads while riding a motorbike is a difficult endeavor.

Entire project mainly divided in 3 parts:

- Image detection
- Image detection in video
- Image and object detection in video

1. **Image detection:**

The algorithm has been developed with a variety of frames, including helmets, no helmets, heads, and heads with weft.

2. **Image detection in video:**

   Image identification is the task of detecting photographs and classifying them into one of numerous pre - defined categories.

   Image classification with localization – creating a boundary around in an item to illustrate where it is in a picture and putting an image in a specific class

   Image and object detection in video:

   Image or Object Detection is a computer technology that processes the image and detects objects in it..

   Object recognition is an area of computer vision wherein machines can identify, localise, and recognise visually detectable items in pictures and videos. A image is indeed a single example of a found naturally occurrence captured in a given sequence.

5. RESULT

Terms	**Correct Recognition**	**Incorrect Recognition**
Proposed	**49**	**1**
Total = 50		**Accuracy = 98 %**
Rohith C A [14]		**Proposed**
86 %		**98 %**

Table No. 5.1 Result Analysis & Comparison

This technology has been evaluated on a variety of frames, including helmets, no helmets, heads, heads with weave, and numerous heads or helmets. Between correct and wrong identification, the outcome is acquired and calculated. There really are 50 minimum travel categories that were tested, including 10 face pictures no weft for face identification without helmets, 10 skull pictures with weave for skull identification with headgear, and 10 head pictures with weave for skull identification with headgear. Pictures with weave for skull identification with or without helmet, 10 pictures with headgear for face shield identification, 10 pictures with motorcycle for motorcycle detection, plus 10 images with two people wearing helmets and not wearing helmets, respectively. The final score is 49 for accurate recognition and 1 for erroneous identification. In a frame when a woman is wearing weave without a helmets, a mistake has indeed been discovered.

6. CONCLUSION

The suggested method is extremely responsible for accurately recognising helmets in a variety of conditions. The method has been implemented with a variety of frames, as well as the outcome is efficient and has a low loss. Tensorflow and Keras are two major products that allow you to train a system under specific conditions that have a significant impact on performance. The recommended method can be applied in a variety of settings, including schools, colleges, workplaces, shopping malls, markets, and other public areas that need people to wear helmets alongside their friends and family for improved safety. The project can be upgraded in the approach by testing different sample and training this for other circumstances where legacy devices may falter.

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