# Deep Learning and IoT Based Driver Helmet Detection and Bike Ignition

Kanegonda Ravi Chythanya[1], Sudhan Jee Racharla[2], Archana Barigela[2]

[1]*SR University, Warangal, India*
[2] *Department of Computer Science Engineering, SREC, Warangal*

[1]*chythu536@gmail.com*
[2]*rsudhanjee@gmail.com*
[2]*archanabarigela242@gmail.com*

**Abstract.** We don't prioritize safety. "An estimated 44,660 people died from not wearing helmets. The WHO claims that correct helmet use can reduce the risk of fatal injuries by 42% and head injuries by 69%. Our idea is to detect riders without helmets in order to overcome this problem. The purpose of this paper is to propose a framework for detecting motorcycle riders without helmets in real-time. This methodology identifies motorcycle rider using the camera, which was placed in the motorcycle. It checks whether the motorcycle rider was wearing a safety helmet or not using image classification techniques. If the rider is not wearing the helmet then the internal circuits of the motorcycle will not be closed and the rider will not be able to start the motorcycle.

## INTRODUCTION

Motorcycle is a basic transport used by public in different countries. The main aim behind purchasing a motorcycle is low cost and less operation cost compared to other vehicles.In recent years there has been a rapid increase in innovating new motor cycles, which has been a way for the increase in road accidents, causing fatal injuries. Riding a motorcycle always thrills riders on open road. The chief reason for the road crash deaths is the motorcycle rider ignores safety measures like wearing helmet while driving. While there are certain rules, many bikers disregard them and use their vehicles without wearing safety equipment. The policeman tried to control the problem manually, but it was ineffective.

The number of people who die in traffic accidents each year is approximately 1.3 million. There are many people who suffer non-fatal injuries, resulting in disabilities. People, their families, and nations around the world suffer economic losses as a result of road accidents. These losses include the cost of treatment as well as the lost in productivity. Riders who are disabled need a family member, who quit their work or school to take care of them. Approximately 3% of the gross domestic product of most countries is lost to road accidents.

The occurrence of accidents cannot be controlled, but we can prevent life-threatening injuries by wearing helmets. Helmets are the first line of defence against injuries due to road accidents for motorists. The most important thing of wearing helmet is to protect riders head. Ensures that rider's head is free from any major impact during an unfortunate traffic incident.

In India 70-85% deaths of motorists, due to accidents, happen because of not wearing a helmet. People don't wear helmets in India because of their uncompromising attitude - They prefer elegance over safety. Thus, the problem is overcoming the stubborn attitude of people and ensuring their helmets are always worn. Developing

an automatic detection system that can recognize this kind of problem without human intervention is the ideal solution.

## LITERATURE REVIEW

There are various proposed models to decrease the road accidents. We have prepared a short analysis of the papers we researched. Yange Li [1] proposed a system for the automatic detection of safety helmets using on convolutional neural networks. A safety helmet is detected using the SSD-MobileNet algorithm in this model. The findings of the trial show that the technique may be used to identify safety helmets that construction workers are wearing on the job site.

Felix [2] proposed a system to detect motorcycle helmet based on deep learning. This model will check whether the motorcycle rider is wearing safety helmet or not. The errors they faced were when the camera is covered with fog and when it's raining the model was unable to identify the helmet.

Pramod [3] proposed a system to detect helmet. This model makes use of a YOLO-based deep learning architecture. This deep learning architecture combines computer vision and convolutional neural networks to create a potent deep learning system. This model detects and tracks motorbikes, identify motorbike registration plate and classify whether the driver is wearing a helmet or not.

Philip [4] proposed a system to control motorcycle engine. With this design, the motorcycle's engine may be started or stopped by SMS, and its location can be monitored in real time. Based on the elevation results, the functionality obtained the highest mean score of 4.77. The device is resistant to the effects of high use, pressure, or heat. It was able to tolerate severe degradation.

## PROPOSED METHODOLOGY

The current model can determine whether or not the rider is wearing a helmet. Proposed system ensures, for a safe ride, the rider has to wear a helmet to start a motorcycle. This project aims developing an AI model which checks whether the driver of the motorcycle is wearing a helmet or not. This AI model is controlled using a raspberry pi which is connected to the motorcycle and its function is to act like a kill switch. The detection model in this module finds the helmet. If the driver wears the helmet then the internal circuits of the motorcycle will be closed and the driver will be able to start the bike. And if the driver is not wearing a helmet then the internal circuit will not be closed and driver cannot start the bike. From the camera we get the visuals of the driver and based on the visuals the ML model works. This model ensures that the driver follows the safety measures and at the time of accident the helmet will be the first line of defence from having head injuries or death.

## Algorithm

The model is trained using a convolutional neural network (CNN), a deep machine learning approach. The model is trained using a dataset including 1300 photos. The customized CNN model will take driver image as input and location of the head of the driver is determined. At that location the driver's head is examined to classify whether he/she is wearing helmet or not.

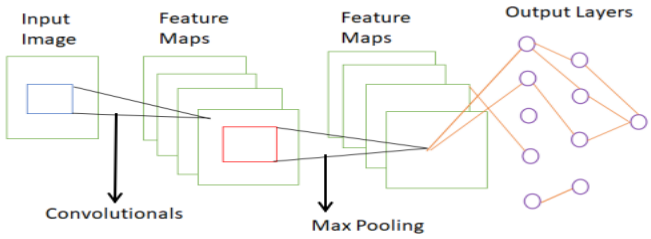


**Fig 1:** CNN model

## Working

The device's block diagram is seen in Figure 2. The procedure begins when the motorcycle's ignition is turned on. The camera will capture the image of the rider and sends it to the raspberry pi and the ML model will classify the image. If the rider is wearing a helmet then the servo motor will be rotated so that the internal connections of the motorcycle will be closed. And if the rider is not wearing a helmet then there will be no change in the servo motor thereby not closing the internal circuit. The camera will send the next frame to the raspberry pi.

If the rider removes the helmet while riding the motorcycle then the buzzer will be alarmed for 10 seconds. If the rider puts back the helmet then the motorcycle engine will not turn-off otherwise the motorcycle will turn-off.

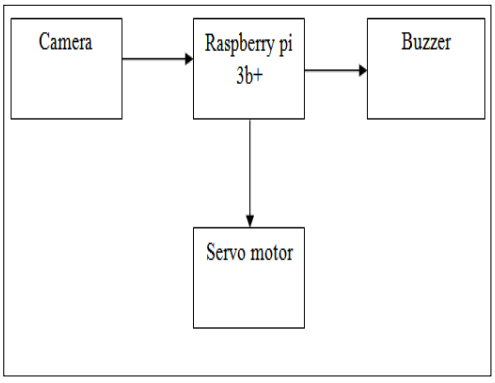


**Fig 2:** Block Diagram

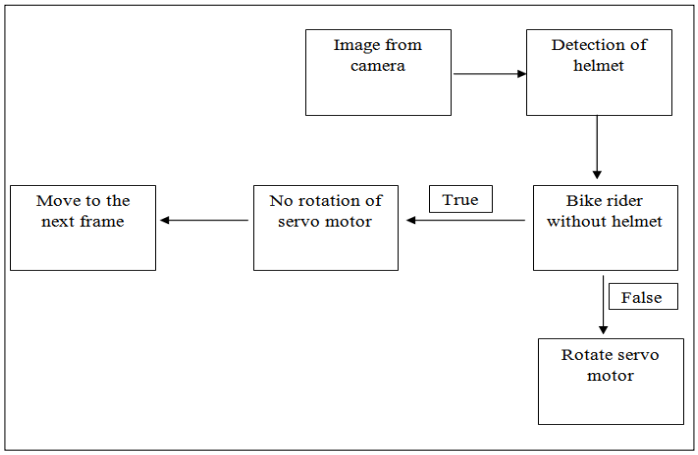


**Fig 3:** Framework of the system

## Implementation

The model's outcomes are displayed as follows:

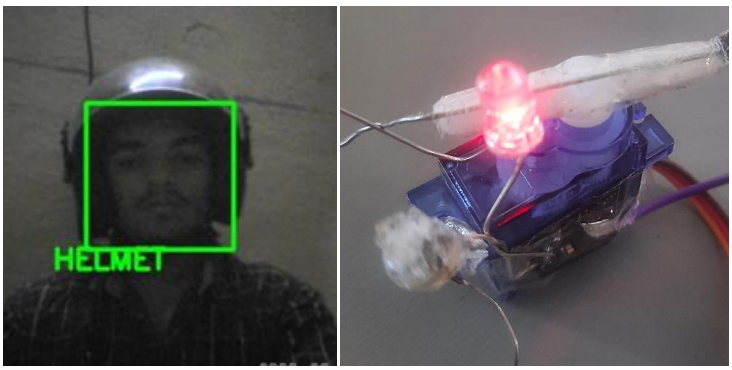


**Fig 4:** Detection of helmet

Since the motorcyclist is wearing a helmet in Figure 4, the servo motor will rotate and close the circuit. The glow in LED shows that the internal circuit of bike is closed and the rider can start the bike.

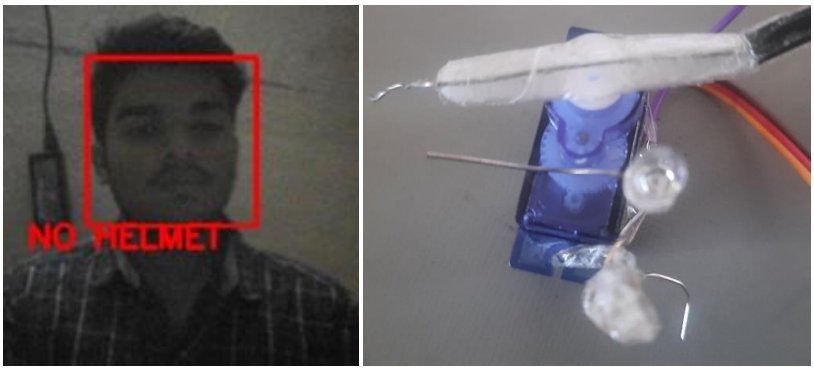


**Fig 5:** No helmet detection

The servo motor won't alter since Figure 5 depicts the cyclist is not wearing a helmet. Therefore the internal circuit of bike is open and bike will not start.

## CONCLUSION AND FUTURE SCOPE

The following conclusions were reached based on the study's goals and the evaluation's findings:

1. The device will be able to open and close the internal circuits of the motorcycle based on the safety followed by the driver.
2. The motorcycle can be turned on only when the driver is wearing a helmet.
3. The device ensures that the driver follows safety rules and thereby decreasing the probability of death in an accident.

We suggest two strategies to enhance the model's performance for upcoming work. First, the algorithm can be replaced with faster-RCNN since it has more accuracy and precision. Second, the hardware equipment i.e., the servo motor can be replaced with electromechanical switch or relay. We can overcome the fluctuations in servo motor by using relay.

## REFERENCES


1. Yange Li, Han Wei, Zheng Han,"Deep Learning-Based Safety Helmet Detection in Engineering Management Based on Convolutional Neural Networks"

2. Felix Wilhelm Siebert, Hanhe Lin, "Detecting motorcycle helmet use with deep learning"

3. Prof.Pramod Salunkhe, Ms.Tejashree Kakade, Ms.Supriya Wabale, Ms.Amisha Vasaikar,Ms.Pratiksha Mogale, "HELMET DETECTION USING ARTIFICIAL INTELLIGENCE"

4. Philip D. Geneta, George Adrian L. Cay, Hazel Joy B. Magnaye, Bryan H. Oliverio, "Motorcycle Engine Shut-off Device"

5. Romuere R. V. e Silva, Kelson R. T. Aires, "Detection of helmets on motorcyclists"

6. Kunal Dahiya, Krishna Mohan Chalavadi, Dinesh Singh, "Automatic Detection of Bike-riders without Helmet using Surveillance Videos in Real-time"

7.https://www.researchgate.net/publication/272175660_Raspberry_Pi_as_Internet_of_Things_hardware_Performances_and_Constraints

8.https://www.researchgate.net/publication/308598611_SMART_SURVEILLANCE_CAMERA_USING_RASPBERRY_PI_2_AND_OPENCV

9. https://www.digikey.in/en/maker/blogs/2021/how-to-control-servo-motors-with-a-raspberry-pi

10.https://www.researchgate.net/publication/285164623_An_Introduction_to_Convolutional_Neural_Networks

11.https://www.researchgate.net/publication/332826568_Convolutional_Neural_Network_CNN_for_Image_Detection_and_Recognition

12.https://www.researchgate.net/publication/350540333_OpenCV_and_Machine_Learning_Implementation_for_the_Vehicles_Classification_and_Calculation_in_the_Parking_Tax_Monitoring_System_at_the_Bantul_Regency_Regional_Financial_and_Asset_Agency_BKAD