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Helmet and Age Detection System

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ABSTRACT: Motorbikes are the most widely used vehicle in India. Deaths due to road accidents throughout the world, especially in India are significantly high. Two wheeled motorcycles being an obvious choice as convenient transportation mode, it has a major contribution to road accident casualties and injuries. Despite the government traffic regulation, people still avoid using helmet and go against the law for people under the age of 18 to drive a vehicle. This project is an effort to create awareness in a society by endorsing strict use of helmet and lead people to safety.
The project helps the traffic police in identifying the violations without interrupting the traffic. Nobody would ever try to disobey rules. The project works on concept called Machine learning. The object detection algorithm used here is YOLOv5. The project using feature detection (which is the concept of object detection) tries to find the persons without helmet and recognize the face whether the rider is under age or not and captures their photo.

I.INTRODUCTION

The global population has been steadily increasing, leading to a surge in the number of vehicles on the road. India, with a population of 1.3 billion as of 2018, has observed a significant preference for two-wheelers among commuters for short distances. Consequently, there has been an exponential increase in the number of two-wheelers on the road, with approximately 21 million sold in 2019 alone. Due to the difficulty in manually enforcing road safety regulations, there is a pressing need to automate the process to ensure efficient enforcement.

Helmets have been proven to be highly effective in preventing fatalities and severe injuries. Despite this, some riders still choose not to wear helmets, assuming that it is safe. Additionally, some riders are underage, making the likelihood of them being caught significantly lower. To avoid being penalized, some riders even speed past traffic police. The only way to catch and penalize traffic violators in such cases is by manually identifying and catching them. Therefore, automating this process has become necessary, and object detection on video is one possible method of achieving this.

II.LITERATURE REVIEW

Helmet and age detection system is an active research area in the field of Machine Learning. With the increasing number of motorcycle accidents and fatalities, there is a growing need for developing effective solutions for enforcing helmet usage and age restrictions for motorcycle riding. Recent studies have focused on using computer vision techniques, such as deep learning-based object detection algorithms, to detect helmets and estimate the age of riders in real-time. These systems have shown promising results in controlled environments, with high accuracy and efficiency.

Aditya Mandeep Vakani [1] has discussed about "Automatic License Plate Recognition of Bikers with No Helmets" uses YOLO with the pre-trained weights on the COCO dataset to detect a bike, followed by the detection of a person and then checking if they overlap in order to confirm that the detected person is on the respective motorcycle. Further, a 5-layer CNN structure inspired from YOLO- LITE is used to classify the top one fourth region into helmet or non-helmet. A working prototype of the system that can detect bikers who are violating traffic rules by not wearing helmets and

endangering their own safety by doing so, has been made. A system like this can actively help in reducing the number of people not following traffic rules. Benefits of YOLO is Fast, Good for real-time processing.

Parasa Teja Sree [4] has discussed about "Real Time Automatic Detection of Motorcyclists with and Without a Safety Helmet" which is a machine learning based approach positioned to identify the helmet usage among motorcyclists. Video frames attained from surveillance footage, the object detection-based algorithm is trained to spot motorcycles and their helmet. Through various tools and methods corresponding to Open CV and support vector classification, the desktop interface application is made possible to visualize the live streaming traffic surveillance footage which uses Support Vector Machine (SVM) and CNN. This system has an accuracy of 87%. Advantage is Greater accuracy generating image classification and recognition algorithms such as CNN will prove to be more beneficial. The only subsidiary due to the usage of CNN is the requirement for larger data processing units and increases the corresponding time taken for training the model.

Gil Levi and Tal Hassner [6] has discussed about age estimation are based on calculating ratios between different measurements of facial features. Once facial features (e.g., eyes, nose, mouth, chin, etc.) are localized and their sizes and distances measured, ratios between them are calculated and used for classifying the face into different age categories according to hand-crafted rules. More recently, uses a similar approach to model age progression in subjects under 18 years old. As those methods require accurate localization of facial features, a challenging problem by itself, they are unsuitable for in-the-wild images which one may expect to find on social platforms. On a different line of work are methods that represent the aging process as a subspace or a manifold. A drawback of those methods is that they require input images to be near-frontal and well-aligned. These methods therefore present experimental results only on constrained data-sets of near-frontal image. Again, as consequence, such methods are ill-suited for unconstrained images.

No.	Paper Title	Author Name	Key Points	Remark
1	Automatic License Plate Recognition of Bikers with No Helmets	Aditya Mandeep Vakani, Ashwin Kumar Singh, 2020	The system is designed as a working prototype, which has the potential to reduce the number of people not following traffic rules and improve road safety.	It is important to note that while the prototype shows promising results, further testing and refinement will be necessary before implementing the system on a larger scale.
2	Real Time Automatic Detection of Motorcyclists with and Without a Safety Helmet	G. Krishna Kishore, Parasa Teja Sree, 2020	The system uses tools and methods such as OpenCV and Support Vector Machine (SVM) and Convolutional Neural Network (CNN) for classification and visualization of live streaming traffic surveillance footage.	The combination of these powerful tools allows for the accurate detection and classification of traffic-related objects and behaviors in realtime, making it a valuable asset for enhancing road safety.
3	Age and Gender Classification using Convolutional Neural Networks	Gil Levi and Tal Hassner, 2015	The limited size of available data-sets for age and gender estimation from realworld social images leads to overfitting, especially with deep convolutional neural networks.	This highlights the importance of collecting and curating diverse and large-scale datasets for training accurate age and gender estimation models in real-world applications.

This paper proposes an end-to-end model for helmet and age detection systems that can significantly enhance road safety.

The model integrates the YOLO object detection algorithm and machine learning algorithms to accurately identify helmets and age violations from image or video input. By combining both systems, the proposed model provides a comprehensive solution that can help enforce compliance with regulations and reduce the number of accidents and casualties caused by road accidents, particularly involving motorcycles. The system's ability to use image or video input for processing makes it convenient for traffic authorities to identify and take action against violators.

III.METHODOLOGY OF PROPOSED SURVEY

The Helmet and Age detection system utilizes a combination of computer vision techniques and deep learning algorithms to detect whether a motorcycle rider is wearing a helmet and predict their age. The input video is captured using either an IP camera or a webcam, and the background of the motorcycle and rider is detected from photographs. The head region of the rider is then identified, and the system classifies whether or not the rider is wearing a helmet.

To achieve this, the system uses a Convolutional Neural Network (CNN) with multiple convolutional layers that are responsible for detecting and classifying the object present in the image. The CNN is trained using a large dataset of images containing riders wearing helmets and riders without helmets. The trained model is then utilized to predict whether a rider is wearing a helmet or not with high accuracy.

The age detection system uses a similar CNN architecture to predict whether the age of the rider is below 18 or not. Both videos are processed, and the bikers' performance with a helmet and no helmet is identified. If the rider is detected as not wearing a helmet or is underage, necessary actions can be taken.

To make the system accessible to end-users, a Python Flask web application is developed to provide a user-friendly interface. The system's output is displayed on the web application, and warnings are issued if necessary. The system can monitor the roads in real-time, and the captured images or video footage can be used for educational purposes to promote awareness about road safety.

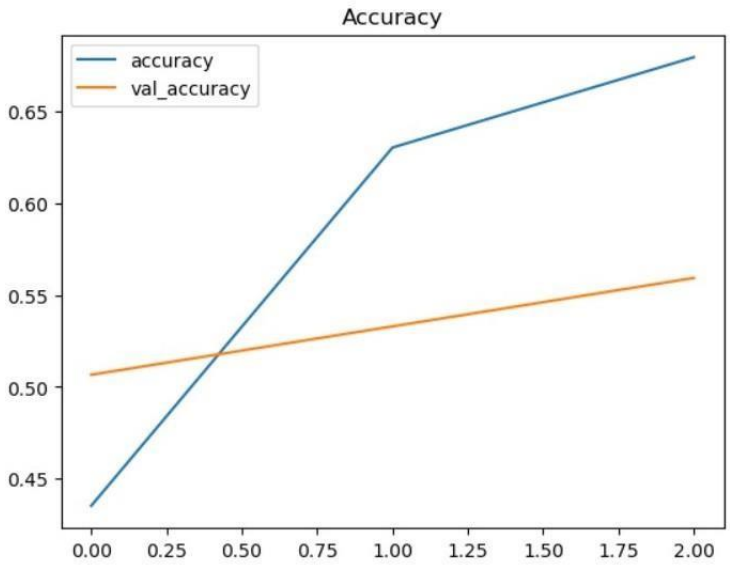

Figure 1: Accuracy graph of Helmet Detection

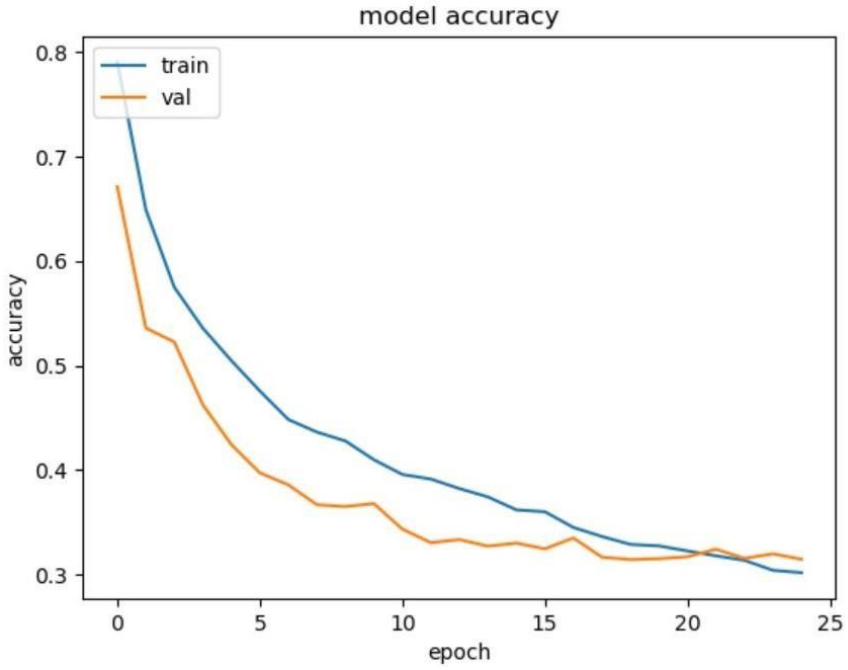

Figure 2: Accuracy graph of Age Detection

IV.CONCLUSION AND FUTURE WORK

The YOLO object detection algorithm and the proposed end-to-end model have demonstrated high accuracy and efficiency in identifying helmets and age violations from image or video input. The age detection system employs machine learning algorithms to accurately identify the age of riders and distinguish between adults and minors, making it an essential tool for enforcing age regulations. By integrating both helmet and age detection systems, the proposed model provides a comprehensive solution to enhance road safety. The system can be used to monitor roads and enforce compliance with regulations without interrupting traffic, which can lead to efficient traffic management. Future work for the proposed helmet and age detection system could include further refining the model's accuracy by training it on larger and more diverse datasets. This could help address issues related to overfitting and improve the system's ability to accurately identify violators. Additionally, the system could be integrated with other technologies such as traffic signal control systems to further improve traffic management and reduce the likelihood of accidents.

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