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ENHANCED HELMET DETECTION AND NUMBER PLATE IDENTIFICATION USING AMAZON REKOGNITION

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ABSTRACT

Ensuring motorcyclist safety remains a paramount concern for traffic authorities, particularly in enforcing helmet usage for accident prevention. However, a concerning trend has emerged during recent times where individuals prioritize wearing masks over helmets, potentially compromising safety and violating traffic regulations. To address this issue, we have undertaken a project aimed at identifying and penalizing riders without helmets through automated detection systems.This project integrates AWS Rekognition for helmet detection and number plate recognition using a Faster R-CNN model for object detection in images. AWS Rekognition identifies helmets by generating bounding boxes around them, providing spatial and proportional data relative to the rider's position. This approach enables accurate determination of helmet usage. Additionally, the system leverages Easy OCR to capture motorbike license plate numbers from image or video footage.

Index Terms: Motorcyclist safety, helmet detection, traffic regulation enforcement, AWS Rekognition, Faster R-CNN, object detection, number plate recognition.

I.INTRODUCTION

We have seen countless cases when motorcyclists have been badly wounded because they did not wear safety helmets. This carelessness has put countless innocent people in danger. Despite severe traffic restrictions, many continue to disregard the significance of wearing a helmet. In addition, since humans are fallible and extensive humanitarian aid is needed for the current monitoring system. Thus it is really desirable to automate this system. We are working with awide range of motorcycle riders, each of them having unique clothing colors, helmet designs, and riding stances.

To do this, we need a deep neural network that can reliably identify the motorcycle rider. Our primary goal is to compile a database of all riders who have broken the law. Identifying helmet wearers and distinguishing between bikers and pedestrianswas one of the main issues we encountered. The Amazon Rekognition service detects helmets in photos using a deep learning based object detection algorithm. The algorithm is trained on a huge collection of annotated photos containing both pedestrians and bike riders. The model is capable of distinguishing between pedestrians and bike riders based on the features and characteristics that it has learned during the training process. In the context of helmet detection using AWS Rekognition service, the service provides two separate bounding boxes: one for the helmet and another for the rider. These bounding boxes provide information about the location and proportion of the detected helmets in the image. In summary, the AWS Rekognition service uses separate bounding boxes for the helmet and the rider to provide information about their location and size. In conclusion, the information from both bounding boxes is used to determine whether the helmet is present. Similarly, the Easy OCR service uses the bounding box for the number plate to retrieve the text from the license plate.

II.LITERATURE SURVEY

- Meharchand Dasgupta, Oishila Bandyopadhyay and Sanjay Chatterjee proposed an automated detection of traffic rule violators is an essential component of any smart traffic system. In a country like India with high density of population in all big cities, motorcycle is one of the main modes of transport. It is observed that most of the motorcyclists avoid the use of helmet within the city or even in highways. Use of helmet can reduce the risk of head and severe brain injury of the motorcyclists in most of the motorcycle accident cases. Today violation of most of the traffic and safety rules is detected by analysing the traffic videos captured by surveillance camera. This paper proposes a framework for detection of single or multiple riders travel on a motorcycle without wearing helmets. In the proposed approach, at first stage, motorcycle riders are detected using YOLOv3 model which is an incremental version of YOLO model, the state-of-the-art method for object detection. In the second stage,

Convolution Neural Network (CNN) based architecture has been proposed for helmet detection of motorcycle riders. The proposed model is evaluated on traffic videos and the obtained results are promising in comparison with other CNN based approaches.

- Fahad A Khan, Nitin Nagori and Dr. Ameya Naik proposed in today's world, the increasing use of Motorcycles has prompted increment in road accidents and injuries. Helmet not used by the motorcycle rider is one of the major causes. Currently, one procedure is to physically check use of helmet at the pavement junction or through the CCTV footage video, which requires human intervention to detect motorcyclists without helmet. The proposed framework presents a computerization machine structure to distinguish the motorcycle rider with or without helmet from images. The system extracts objects class based on feature extracted. The system uses You Only Look Once (YOLO)-Dark net deep learning framework which consists of Convolution Neural Networks trained on Common Objects in Context (COCO) and combined with computer vision. YOLO's convolution layers are modified to detect specified three classes and it uses a sliding window process. The map (Mean Average Precision) on validation dataset achieved 81% by using training data.
- Dikshant Manocha, Ankita Purkayastha and Yatin Chachra proposed about detecting twowheeler riders without helmet with the help of machine learning and provides them with a user interface to pay challan. The proposed approach first captures the real time image of road traffic and then differentiates the two wheelers from other vehicles in the road. It then processes to check whether the rider and pillion rider are wearing helmet or not using OpenCV. If any one of the riders and pillion rider found not wearing the helmet, their vehicle number plate is processed using optical character recognition (OCR). After extracting the vehicle registration number, a challan will be generated against respective vehicle and all the details of the challan will be sent via E-mail and SMS to the concerned person. A user interface (an app and a website) will also be provided to pay their challan.
- Sri Harshini Popuri, Gottam Gowtam sai Sankar and Tejesh Chandra Kuppili proposed : Numerous reasons lead to

dangerous accidents. Lack of helmet is one of the major reasons for death during accidents. People are negligent regarding helmet usage. This needs to be controlled by proper surveillance. The present traffic control system is mostly based on human power. A police officer cannot manage the whole traffic and look out for rule-breakers. It would be a very tough job and will need a lot of human power to cover all the areas. This can be solved through our new automated system where two-wheelers with no helmets will be recognized through yolov2 and the respective frames are taken from the video from which the number plate of the particular vehicle is extracted and the fine for disregarding traffic rules. This fine detail will be updated over the server and message is sent to the phone number registered along with number plate. This paper is about an automated system where traffic surveillance videos are scavenged for vehicles, where extraction of number plates of vehicles with no helmet and generation of electronic fine management system takes place.

- Bhavin V Kakani, Divyang Gandhi and Sagar Jani proposed Significant research and development of algorithms in intelligent transportation has grabbed more attention in recent years. An automated, fast, accurate and robust vehicle plate recognition system has become need for traffic control and law enforcement of traffic regulations; and the solution is ANPR. This paper is dedicated on an improved technique of OCR based license plate recognition using neural network trained dataset of object features. A blended algorithm for recognition of license plate is proposed and is compared with existing methods for improves accuracy. The whole system can be categorized under three major modules, namely License Plate Localization, Plate Character Segmentation, and Plate Character Recognition. The system is simulated on 300 national and international motor vehicle LP images and results obtained justify the main requirement.

III.EXISTING SYSTEM

- Currently, traffic police personnel issue fines to violators of traffic laws by hand. However, due to ignorance or other considerations, they are occasionally able to avoid paying a fee even after breaking a traffic rule. The automation

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of this procedure will reduce such instances and, as a result, raise the severity of actions taken against them.

IV.PROPOSED SYSTEM

AWS Rekognition Service uses various deep learning mod- els and advanced algorithms to classify and perform object detection. Furthermore, it outperforms other detection models in terms of accuracy, scalability, and flexibility since it's a cloud-based service. AWS Rekognition has been found to be highly accurate in many cases, especially for detecting common objects and faces. In the 2019 National Institute of Standards and Technology (NIST) Face Recognition Vendor Test (FRVT), AWS Rekognition achieved a top-three ranking for both 1:N (one-to-many) and 1:1 (one-to-one) face recognition tasks.AWS Rekognition's image analysis capabilities are powered by models that use CNNs. These models can detect objects in images. Rekognition uses RNNs to analyze video content. These models can track and analyze motion in videos. R-CNN is an algorithm for detecting objects that uses a regional network to generate potential object regions in an image, which are then classified using a CNN in ourcase it checks for the location of the helmet compared to the biker. Firstly, we have created an AWS S3 bucket and added the required policies and roles for Amazon recognition service. And we have also added the AWS SNS service to send a notification if a motorcyclist is found not wearing a helmet or if a vehicle's number plate is not recognized. We have also created a front-end user interface that enables users to upload images or videos and view the results of helmet detection which is integrated with the AWS API which isused for real-time detection. We created a database using MySQL and Django frameworks to store and retrieve the user's details using our service. And for the images that show the helmet not found notification will be uploaded to another model for number plate recognition. This model will capture the text from the number plate using the Easy OCR algorithm approach. The resolution and quality of the image or video may also affect the accuracy of helmet detection, so it is important to use high-quality videos with good lighting and minimal motion blur.

V.SYSTEM ARCHITECTURE

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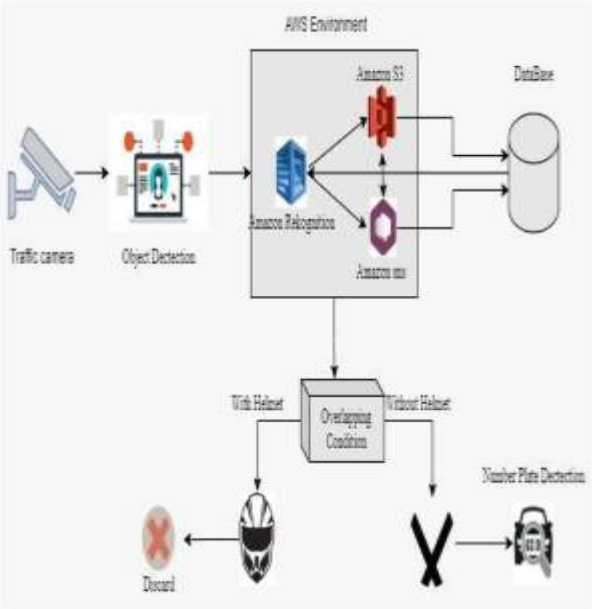

Figure.1 System Architecture

VI.IMPLEMENTATION

We have designed a user interface such that users can register and log in using their credentials to use this service. This part of the implementation consists of the modules namely User Register and Login, Detect from image, Detect from video and Number Plate Recognition.

1) **Register and Login:**

The registration form includes fields for the user's name, mail id, mobile, and password. As the user fills out the form, the data will be sent to the server, which will then store the information in a database. Once the user has registered, the login form should ask for the user's email address and password. Upon submission, the user will be directed to the dashboard. The dashboard provides options like detect from image and detect from video.

2) Detect from image:

Once the user selects detect fromthe image, the user will be asked to upload the image. When an image is uploaded, the backend code will use the AWS Rekognition service to detect objects in the image. Once the Rekognition service has processed the image, it will return a visual representation of the image with bounding boxes of helmet with respect to the biker with accuracy percentages If there is no helmet in the image then the AWS SNS servicesends a notification that displays "Helmet Not Found".

3) **Detect from video:**

4) Once the user selects detect from video, the user will be asked to upload a video. AWS Rekognition analysis depends on a variety of parameters like the number of frames in the video and the video's resolution. The video must contain enough frames to enable the algorithm to detect and track the helmet across multiple frames.

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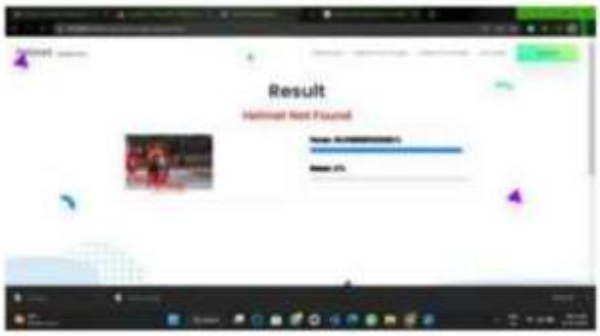
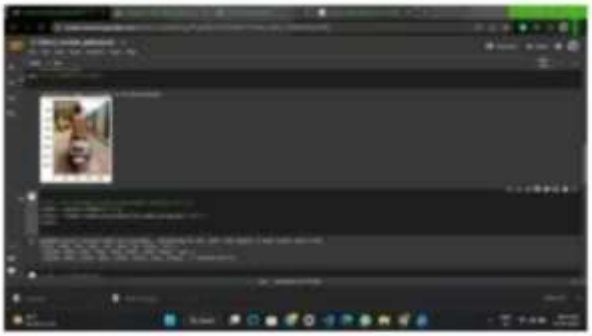
Therefore it is best to use videos that show the helmet in multiple frames since it improves model accuracy and recognizes the presence of the helmet.

4) Number Plate recognition: The images that show the pop up notification ”Helmet Not Found” will then be uploaded to another model for number plate recognition. Easy OCR uses Convolutional Neural Networks (CNNs) to recognize text in images. In this model, the Easy OCR algorithm detects thetext from the numberplate.

VII.RESULTS:





VIII.CONCLUSION:

The conclusion for helmet detection using the AWS Rekog- nition service project is that the AWS Rekognition service can be used effectively for detecting helmets in images and videos. The project involves training the AWS Rekognition service to recognize the specific features of helmets and then using it to detect helmets in real-time video footage or images. The project can be beneficial for industries such as con-struction, manufacturing, and transportation, where helmetsare required for safety purposes. Overall, the helmet detection using AWS Rekognition service project demonstrates the capabilities of the AWS Rekognition service in object detection and highlights its potential to be used in various industries for different use cases.

IX.FUTURE ENHANCEMENT

In the future, there is significant potential to enhance the helmet detection project using

AWS Rekognition. Key areas for development include improving detection accuracy and performance under various conditions, integrating with IoT devices for real-time alerts, expanding to multi-class object detection beyond helmets, and enhancing cloud integration for scalability and data management. Customization options tailored to specific industry needs, compliance with safety standards, and mobile application development for field use also represent promising avenues for further exploration. These advancements aim to bolster safety measures across industries while showcasing the versatility of AWS Rekognition in object detection.

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