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Automated License Plate Recognition and Helmet Violation Detection Using YOLOv3 and OCR

Garapati Mary[1,a)],Boyina Ramanjaneyulu[2,b)],

[1]Asst. Professor, Department of Master of Computer Applications,Tirumala Institute of Technology and Sciences ,Satuluru-522601, Narasaraopet, Andhra Pradesh, India
[2]MCA student, Department of Master of Computer Applications , Tirumala Institute of Technology and Sciences ,Satuluru-522601, Narasaraopet, Andhra Pradesh, India

*Correspondence E-mail: [a)]marygarapati12@gmail.com
[b)]ramanjiboyina8@gmail.com

Abstract **- India has several traffic control problems right now that can be fixed using several approaches. Riding a motorbike or motorbike in India without a helmet has caused more traffic accidents. The present system mostly tracks traffic violations. several approaches Within India These initiatives, however, have limited success, precision, and speed at which objects are classified and identified. This work aims to design a Non-Helmet Motorbike Tracking system capable of automatically acquiring the motorcycle's number plate number and detecting traffic offences including neglect of wearing safety gear. This work aims to design a non-helmet motorcycle detection system that will automatically recognise traffic violations including helmet neglect and extract the number plate number of the offending vehicle. The main method used is detection using Deep Learning at three levels. Level one YOLOv3 finds a person, a motorbike, and a helmet. At stages 2 and 3, YOLOv3 spots a licence plate. The number plate registration then is acquired using OCR. (optical character recognition). Every one of these activities is subject to set limits and constraints, especially with regard to the number plate number extraction. Given that this activity depends on video as an input, its speed is quite important. We created a thorough method based on the above mentioned methodologies for headgear identification and number plate number extraction..**

Keywords: Protective cap Detection, Convolutional Neural Network, Tesseract OCR, License Plate Extraction

I. INTRODUCTION

According to a World Health Organization report titled "The Global status report on road safety 2018," approximately 1.35 million people die annually and 50 million are injured in road accidents. It is hard to imagine that motorcyclists, cyclists, and pedestrians each shoulder this responsibility differently. In order to save lives, a comprehensive action plan must be developed, according to this report. India is at the top of the list when it comes to deaths from car accidents. Experts' analysis indicates that this trend is caused by a number of factors, including a lack of helmets, seat belts, and other safety measures while driving. In 2015, India signed the Brasilia Declaration on Road Safety, in which it pledged to cut the number of people killed in traffic accidents by half by 2020. Before halving the number of people killed in car crashes, policymakers in India must first acknowledge the issues that remain. The rider is thrown out of a two-wheeler during an accident caused by a sudden acceleration. If the head hits anything, it stops moving, but the brain, which is its own mass, keeps moving until the object hits the inside of the skull. This kind of head injury can sometimes result in death. When this occurs, the helmet saves the day. Because a helmet prevents the skull from decelerating, head motion is virtually eliminated. The head comes to a halt over time as the cushion inside the helmet absorbs the impact of the collision. Additionally, it disperses the impact over a larger area, protecting the head from severe injuries. In addition, it serves as a mechanical barrier between the rider's head and the object with which they came into contact. Using a high-quality full helmet can reduce injuries. The purpose of traffic laws is to enforce discipline and significantly reduce the likelihood of fatalities and injuries. Anyway severe adherence to these regulations is missing in all actuality. As a result, effective and practical solutions to these issues must be developed. A method for manually monitoring traffic using CCTV is already in place. However, in this case, numerous iterations are required to achieve the goal, requiring a significant amount of human resources. As a result, cities with such a large population and a large number of parked vehicles cannot afford this ineffective manual method of helmet detection. Therefore, using YOLOv3, YOLOv3, and OCR, we propose a method for full helmet detection and license plate extraction.

II. LITERATURE SURVEY

J.Chiverton,Head protectors are essential for a bike rider's wellbeing, yet upholding cap use is a tedious and work serious assignment. Accordingly, a framework for consequently characterizing and following bike riders wearing and not A wearing protective caps is portrayed and tried. The framework utilizes support vector machines that have been prepared on histograms created from head locale picture information of cruiser riders, just as individual picture outlines from video film. The learned classifier is utilized in a global positioning framework that utilizations foundation subtraction to automatically segment motorcycle riders from video data. The riders' heads are segregated, and the trained classifier is used to classify them. Each motorbike rider creates a track, which is a series of areas in neighbouring time frames. The individual classifier outputs are then averaged to classify the tracks as a whole. The classifier can accurately distinguish whether riders are wearing helmets or not on static pictures, according to tests. The categorization approach's validity and utility are also demonstrated by tests on the tracking system.

Dharma Raj KC, Aphinya Chairat, Vasant among, Matthew N. Dailey, Mongkol Ekpanyapong, The rider's primary method of protection is a motorbike helmet. Motorcycle riders are required to wear helmets in most nations, although many people do not comply for a variety of reasons. We discuss the development of a system that uses photo handling and deep CNNs to detect motorcyclists who are not

wearing safety hats. The framework requires cruiser identification, a protective cap vs no-head protection arrangement, and cruiser tag recognition. We give the system a score based on its precision and quickness. The system has been placed in a number of locations in Bangkok and Phuket, Thailand, since 2016. According to preliminary data, motorcycle helmet laws are being followed more closely.

Yogiraj Kulkarni, Shubhangi Bodkhe, Amit Kamthe, Archana Patil, Traffic officers manually display motorcyclists at street crossings or via CCTV photos and penalise these who do no longer put on a helmet. It does, however, demand human involvement and effort. This find out about provides an automatic method for detecting non-helmeted motorcyclists in CCTV pictures and gathering their motorcycle licence plates. To get transferring items, the counseled method first gets rid of the video's background. Motorcyclists and non-motorcyclists are then classed as shifting objects. For categorised motorcyclists, the head issue is labeled as both a helmet or a non-helmet.

Balasubramanian, P., Jaganathan, R., & Kumar, V. A. In most motorcycle accident scenarios, wearing a helmet can lower the likelihood of a biker suffering a head or severe brain injury. As a result, a technology for automatically detecting helmets is required for road safety. As a result, using a CNN-based algorithm (YOLOv1), custom object detection models are built. The License Plate is retrieved and the License Registration number is recognized using an OCR whenever a Helmetless rider is detected. This project aims to develop a CNN-based automated detection system for helmet identification utilizing custom-trained models and datasets that will aid police departments in enforcing the law for the greater good of society.

Madhuchhanda Dasgupta, Oishila Bandyopadhyay, Sanjay Chatterji 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 are 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 YOLOv2 model which is an incremental version of YOLO model, the state-of-the-art method for object detection. In the second stage, a Convolutional 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.

III. PROPOSED METHODOLOGY

The authors counseled a function extraction approach primarily based on HOG and Hough seriously change descriptors, as properly as LBP-based hybrid descriptors. Xinhua Jiang et al., on the different hand, extracted facets the use of a gray stage co-occurrence matrix and LBP. Various sorts of objects can be detected and categorised the use of the YOLOv3 and COCO datasets. The supposed pursuits are motorcycles, motorcyclists, pedestrians, and employees. A motorcycle's helmet and tyres have a number of colors that can be used to notice it. combining a microcontroller and an accelerometer to realize two-wheeler accidents Pedestrians are regularly the actual victims of site

visitors accidents, so their safety is crucial. Jie Li and his buddies A approach based totally on histograms of oriented attitude highlights was once proposed for recognising pedestrians the use of SVM (HOG). Cap discovering is the ultimate advancement. To differentiate caps, Hough modifications primarily based on shading and circle Hough adjustments are used, as properly as HOG descriptors. Perceiving shading highlights is any other option. Shade spacing alternate and shading spotlight segregation had been used to discover the cap. To make it less complicated to realize head protectors.

We are figuring out whether or not a two-wheeler rider is sporting a helmet or no longer in this project, and if he is now not carrying a helmet, we are retrieving the two-number wheeler's plate. We have the YOLO CNN mannequin with some teach and check images to extract the variety plate, and if you favor to add extra images, supply them to us so we may also combine them in the YOLO mannequin with annotation to extract the wide variety plate of these new photographs.

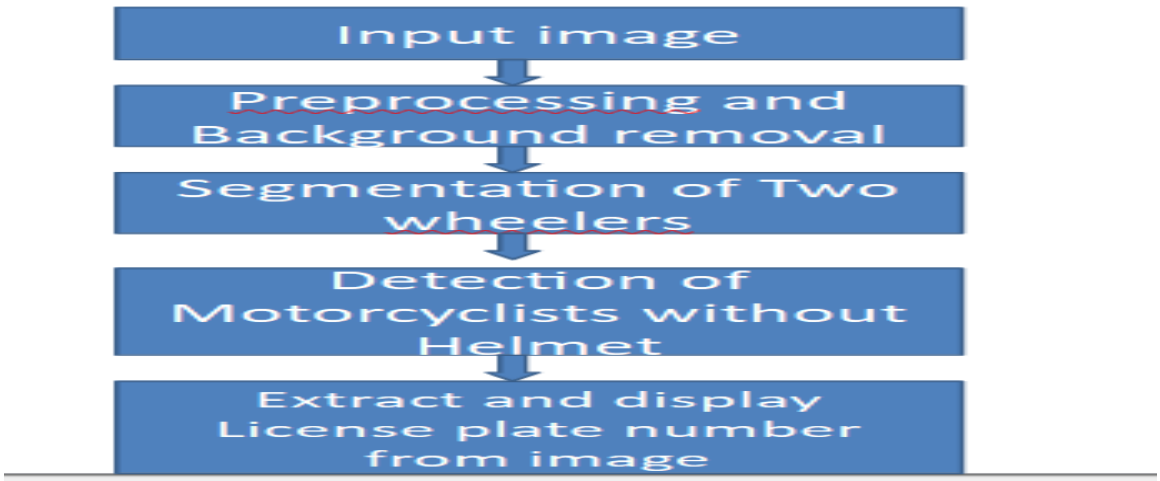
We are the use of or imposing the following modules to put into effect the above strategy.

The first image will be uploaded to the application and using YOLOV3 we will check whether the image contains a person with a motorbike or not if the YOLO model detects both person and motorbike then we will proceed to step 2.

In this module, we will use the YOLOV3 model to detect whether the object wear helmet or not, if he wears a helmet then the application will stop hearing itself. If the rider does not wear a helmet then the application proceeds to step 3.

In this module, we will extract number plate data using python Tesseract OCR API. OCR will take the input image and then extract the vehicle number from it.

IV. SYSTEM ARCHITECTURE



V. METHODOLOGY

In this project we have built CNN model to detect HELMETS and number plates from 25 different images and we can detect more images but we don't have sufficient dataset to train CNN model so our application can detect presence of helmet from 25 different images and if helmet not present then it will identify number plate and if helmet detected then it will not identify number plate.

1.Data Collection

Gather images and videos of motorcycles with and without helmets**.**
Collect number plate images from various angles.
Use existing datasets like COCO (Common Objects in Context) and Open Images Dataset or manually annotate custom datasets.

1.1.Data Annotation

Use tools like LabelImg or Roboflow to annotate:
Motorcycle riders
Helmet presence or absence
License plates

Save annotations in YOLO format (bounding box coordinates and class labels)**.**

1.2.Data Augmentation

Apply transformations (rotation, flipping, brightness adjustment) to improve model generalization.
Normalize image pixel values for faster model convergence.

2.Deep Learning-Based Object Detection Using YOLOv3

2.1.Train YOLOv3 for Helmet Detection

Download pre-trained YOLOv3 weights trained on COCO.
Fine-tune the model using the annotated helmet/no-helmet dataset.
Modify YOLOv3' s configuration (yolov3.cfg) to match custom dataset classes.

Train the model using Darknet or TensorFlow implementation of YOLOv3.

2.2.Train YOLOv3 for Number Plate Detection

Use a dataset containing license plates from different locations.
Train the YOLOv3 model separately for license plate recognition**.**

2.3.Model Testing

Validate the model on test images/videos.
Adjust confidence thresholds and Non-Maximum Suppression (NMS) to improve accuracy.

3.License Plate Extraction Using OCR

3.1.Apply OCR (Optical Character Recognition)

Use Tesseract OCR to extract the text from detected number plates.
Preprocess images by:
Grayscale conversion
Noise removal using Gaussian Blur
Edge detection using Canny Edge Detector

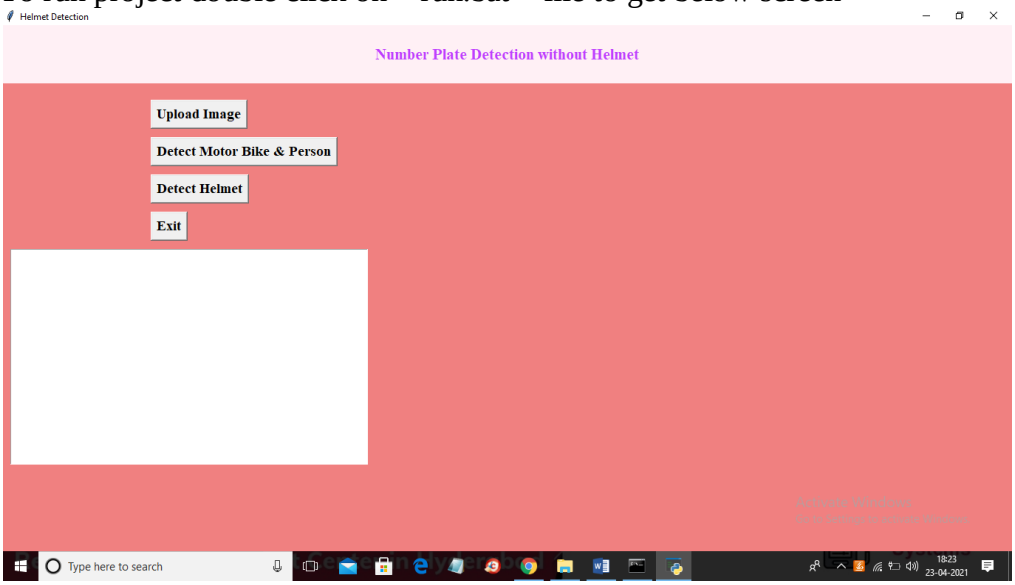
3.2.Validate OCR Output

Implement post-processing techniques to correct misread characters**.**

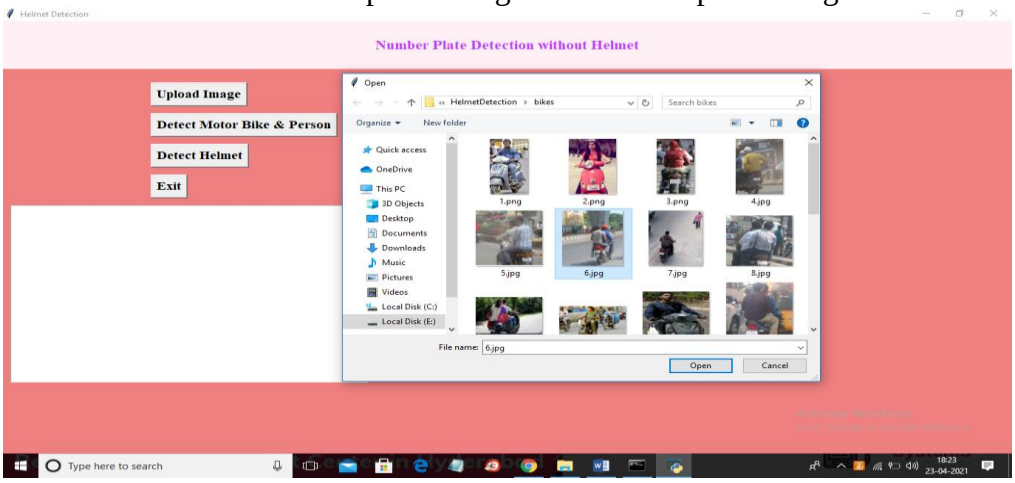
Compare extracted text with a database of registered vehicles for verification.

RESULT

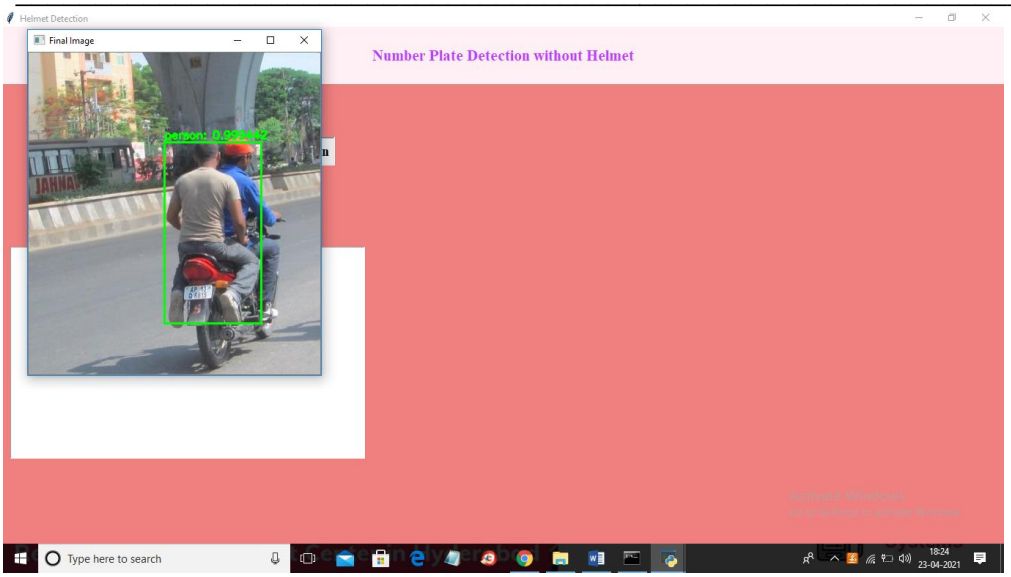
To run project double click on ' run.bat' file to get below screen



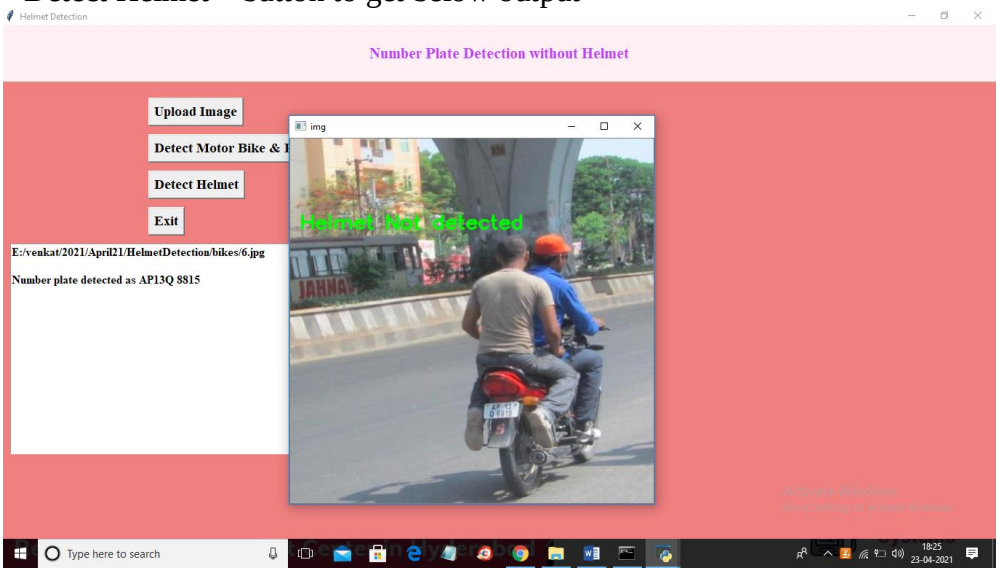
In above screen click on ' Upload Image' button to upload image



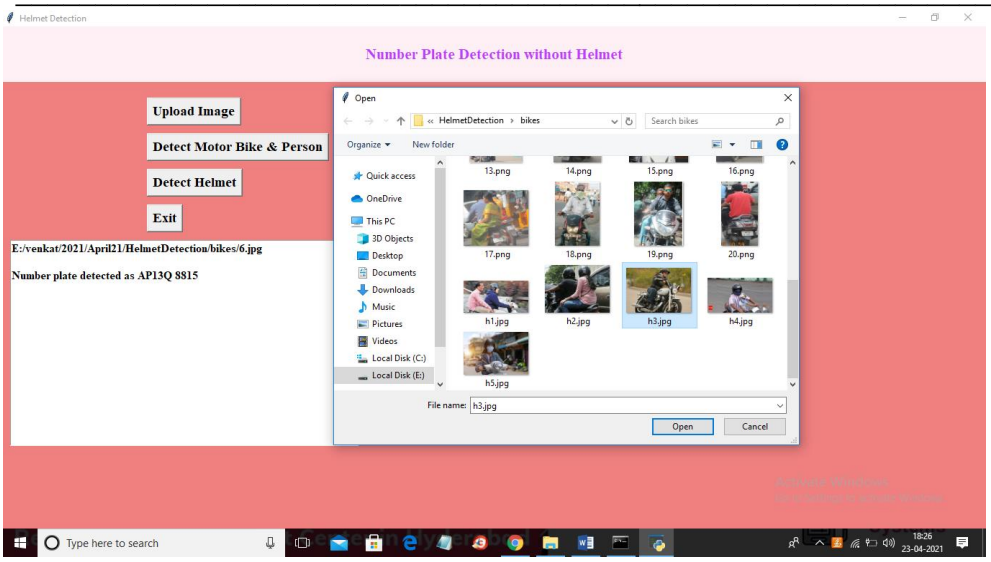
In above screen selecting and uploading ' 6.jpg' file and then click on Open' button to load image and then click on ' Detect Motor Bike & Person' button to detect whether image contains person with bike or not



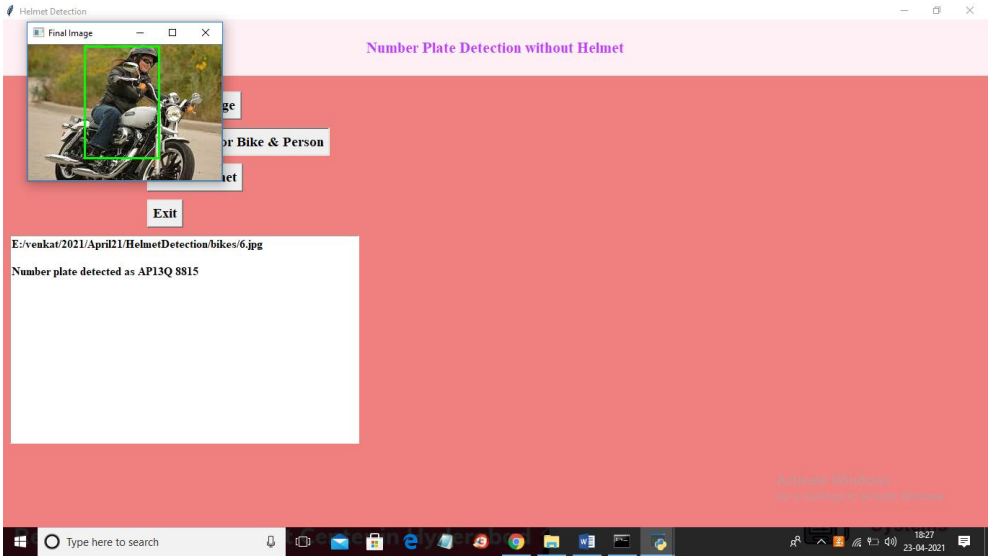
In above screen if person with bike detected then it put bounding box and then click on ' Detect Helmet' button to get below output



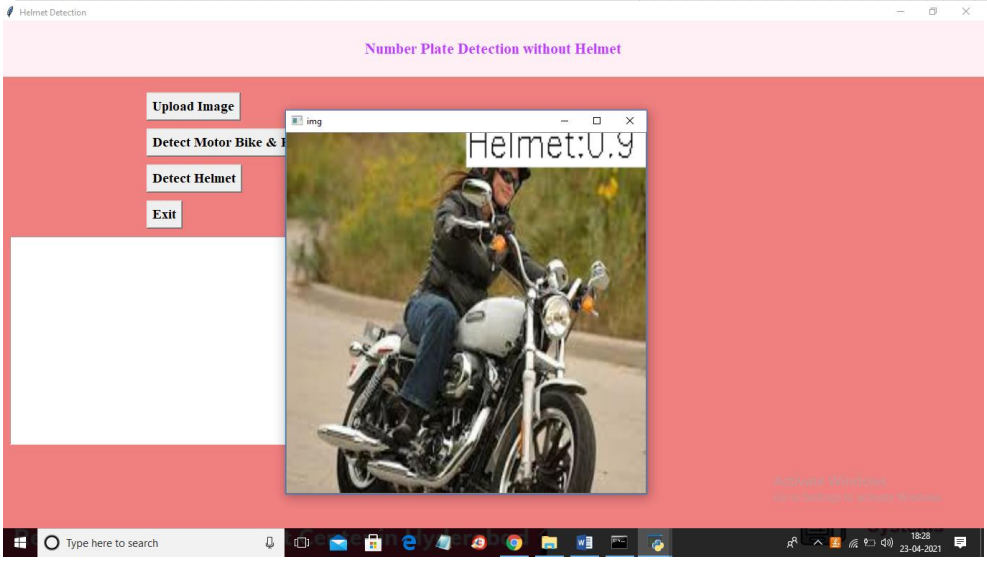
In above screen we can see helmet not detected and then application identify number plate and display on the text area as ' AP13Q 8815'. Now try with other image by uploading it



In above screen selecting and uploading ' h3.jpg' file and then click on Open' button then click on ' Detect Motor Bike & Person' button to get below result



In above screen person with motor bike detected and now close above image and then click on ' Detect Helmet' button to get below result



In above screen application detected helmet with helmet matching score as 0.90%. Similarly you can upload other images and test

VI. CONCLUSION

A video file is used to advance a Non-Helmet Rider Detection system. The licence plate wide variety of the bike in the digital camera clip is retrieved and displayed if the rider is no longer carrying a helmet. The object detection method of the YOLO structure is utilised to recognize motorcycles, people, helmets, and registration plates. If the rider is no longer carrying a helmet, the licence plate quantity is extracted the usage of optical persona cognizance (OCR). Not solely are the characters extracted, however the body from which they are extracted is additionally extracted and reused. All of the project's desires have been met successfully.

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