HELMET AND LICENSE PLATE DETECTION

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ABSTRACT

The incidence of fatal motorcycle crashes has increased rapidly in many countries over the years, but the most important piece of motorcycle safety equipment is the helmet, which many riders neglect to use. The primary purpose of a helmet is to protect the motorist's head in the case of an accident. In the case of an accident, if the motorcycle's rider is not utilizing it, it might be lethal. This study aims to develop a method for recognizing motorbike riders who do not wear helmets. The system incorporates motorbike detection, classification of helmet use vs. no helmet use, and motorbike registration plate identification. CNN detects the motorcycle and decides whether or not the person riding it is wearing a helmet.

1.INTRODUCTION

According to a World Health Organization study titled "The word World Situation Review on Safety on the Road in the Year 2018," 50 million people are wounded and 1.35 million individuals are killed in traffic accidents globally each year. It's tough to imagine that pedestrians, bikers, and motorcyclists all share the same burden. According to this study, a thorough action plan is required to save lives. The reality that India ranks top in terms of road deaths is disturbing. According to a specialized study, a few of the explanations of this trend involve increasing industrialization and an absence of usage of harnesses, helmets, and other driving safety procedures. When India joined the Rio Declaration on Highway Safety in 2015, it vowed to cut highway fatalities in half by 2020. The incidence of motorbike fatalities has steadily increased in several countries over the years. A helmet is the most important piece of safety equipment for motorcycle riders. However, many drivers do not use it. The helmet’s primary role in an accident is to protect the driver's head. It could prove fatal if the rider is in a position like this and does not have a helmet. It is not possible for traffic officers to track every motorbike and detect riders who do not wear helmets. There was a need to present a computerized device that monitors motorbikes and recognizes whether or not the riders have on helmets, as well as a system that detects license plates. Road accidents are becoming more common in India, and more people are dying as a result of head injuries since many individuals fail to use helmets. To avoid such activities, there is a requirement to have an algorithm that automatically recognizes persons who are not wearing helmets, as well as a technology that detects motorcycle number plates and derives the vehicle number, which would aid in locating

the biker who should be penalized. By doing so, we hope to minimize the number of accidents and save many lives.

2.LITERATURE SURVEY

This paper provides a method for instantaneously recognizing motorbike riders wearing helmets in surveillance film. CNN11's Automatic Helmet Detection is used by a few motorbike riders in India. The capacity to screen vehicles in real time. Because of the abundance of people in cities, it is one of the more common modes of transport. According to studies, the vast majority of motorcycle riders do not wear helmets when riding on city sidewalks or other public roadways. In the case of a collision, the majority of motorists and safety standards are now monitored by a highway video surveillance camera system, allowing for the monitoring of regulations even when they are disobeyed. The approach described in this study may be used to confirm the presence of a single motorbike passenger, or "twin," as the researchers define them, or to track their movements when a person—in this case, a motorcycle rider—enters the scene at the beginning of the experiment. The existence of an object might then be determined using YOLO. Even employing a method known as patterns that match and area detection, the second neural network design, Convolutional Net, is being created for the recognition of motorbike riders. As a consequence, the findings validate the hypothesis that CNN traffic films are more revealing than those from other models. The most recent technology, YOLO3, will be utilized to examine the starting line. Because the recent surge in motorcycle use has made it more difficult to maintain the highways clear, collisions and fatalities have increased. One of the primary reasons for this has to do with that the rider did not have a headgear at the time. Someone should do an in-person check or have CCTV photos of an individual and the intersection from those given by the agency by those examined under law, a good approach to locate them.

Communique Engineering Jaypee Institute of records generation Noida, India," Helmet Detection using MI. & IoT. It additionally facilitates offering a personalized experience for imposition expenses. car recognitions begin and car times are initially set up on the captured traffic using first-in-one-first-out (FIFO) or satisfactory-in first order, and-out-first (FIR) 52% 81% 2/5 techniques, and the differences are eventually made the usage of two-in-two-out (TIR) or least-recent-in-first-out (LFO) method. After checking whether the riders and passengers are gifted within the car, it computes if the pillion riders or the motorcycle is without a helmet with OpenCV. With a helmet, a motorcycle may be digitally photographed and its whereabouts tracked. After obtaining the car's plate number, an excellent will be created, and all information will be forwarded to the individual whose identity was specified, as well as a short SMS sent to the vehicle's owner. The consumer may be granted entry to a bank (by means of an app or web) to pay their court expenses. It helped me come up with a wonderful idea. One of humanity's characteristic impulses, especially when we are a people, is to discover links between causes and consequences, dismiss what is related to the past and has little significance on the present, and detect defects in items that aren't intrinsically defective. Helmets and other protective equipment are provided as a vital safety precaution for those who are aware of the causes of the majority of fatal car accidents and choose to stay at home. Sustainability should feature that it is insignificant that few to no people are regularly using it, or perhaps that no one has struck to ensure it is operational in the past prevention has to remain within limits and increase capability; monitoring should be implemented. It is physically impractical for a police officer to be a part of the waft

when he is imposing the rules of the road successful mission of a massive task will be made viable with the aid of a constrained institution of people, and plenty of could be needed to assist them. In this example, the range on the helmet has to be factored in: people from the pile of plates are in all likelihood to emerge, that is to ensure higher identification of cars, as opposed to the other excessive, that's based on expediency, where multiple numbers from more than one resources are registered at the equal automobile might be discarded, watchful wait-and out the situation using Exant's technique to discover automobiles that wearing of helmet camera pictures as well as having a car variety plate reader readers, we will then expand the search to the collection of unlicensed cars to discover certain vehicles not with the latter.

Many studies have demonstrated that wearing a helmet while riding a motorbike minimizes the risk of head and brain injuries in the event of a collision. Most traffic and safety standards are now monitored by a traffic video surveillance camera system, which allows for today's violations to be observed. When someone (a motorcyclist, for example) when the rider enters the scene at the start of the experiment, YOLO will be used to determine whether or not an object is there. To study the starting point YOLOV3, state-of-the-art will be used. Convolutional Net is the second neural network architecture. Using a technique called pattern matching and edge detection, a system for detecting motorcyclists has been developed.
In this research, we provide a method for detecting motorbike riders without helmets in real time using surveillance videos. With the usage of heritage subtraction and object segmentation, the proposed technique first recognizes motorbike surveillance video. The machine then uses visual features and a binary classifier to pick out whether or not the motorbike rider is sporting a helmet or not long. We also provide a consolidation strategy for violation reporting, which helps to improve the suggested approach's reliability. To assess our technique, we compared the effectiveness of three frequently used feature representations for classification. Circle is a detection method supported by Hough’s redesign mixture of picture process and Optical person reputation to locate automobile variety plate underneath totally exceptional background but it is labored on static Le non-transferring Images in Malaysia.

3.SYSTEM DESIGN

Software design sits at the technical kernel of the software engineering process and is applied regardless of the development paradigm and area of application. Design is the first step in the development phase for any engineered product or system. The designer‘s goal is to produce a model or representation of an entity that will later be built. Once system requirement has been specified and analyzed, system design is the first of the three technical activities -design, code, and test required to build and verify software. The importance can be stated with a single word ―Quality‖. Design is the place where quality is fostered in software development. The design provides us with representations of software that can assess quality. Design is the only way that we can accurately translate a customer‘s view into a finished software product or system. Software design serves as a foundation for all the software engineering steps that follow. Without a strong design, we risk building an unstable system – one that will be difficult to test, one whose quality cannot be assessed until the last stage. The purpose of the design phase is to plan a solution to the problem specified by the requirement document. This phase is the first step in

moving from the problem domain to the solution domain. In other words, starting with what is needed, design takes us toward how to satisfy the needs. The design of a system is perhaps the most critical factor affecting the quality of the software; it has a major impact on the later phase, particularly testing, and maintenance. The output of this phase is the design document. This document is similar to a blueprint for the solution and is used later during implementation, testing, and maintenance. The design activity is often divided into two separate phases System Design and Detailed Design. System Design also called top-level design aims to identify the modules that should be in the system, the specifications of these modules, and how they interact with each other to produce the desired results. At the end of the system design all the major data structures, file formats, output formats, and the major modules in the system and their specifications are decided. During, Detailed Design, the internal logic of each of the modules specified in the system design is decided. During this phase, the details of the data of a module are usually specified in a high-level design description language, which is independent of the target language in which the software will eventually be implemented.

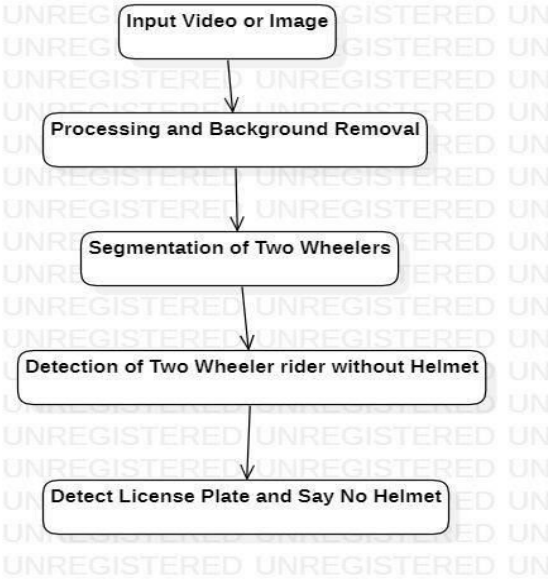


Fig 1: Block Diagram

4.IMPLEMENTATION

Python

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built-in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development and for use as a scripting or glue language to connect existing components. Python's simple, easy-to-learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms and can be freely distributed.Python is omnipresent, and people use numerous Python-

powered devices on a daily basis, whether they realize it or not. There are billions of lines of code written in Python, which means almost unlimited opportunities for code reuse and learning from well-crafted examples. What's more, there is a large and very active Python community, always happy to help. AI researchers are fans of Python. Google TensorFlow, as well as other libraries (sci-kit learn, Keras), establish a foundation for AI development because of the usability and flexibility it offers Python users. These libraries, and their availability, are critical because they enable developers to focus on growth and building. The Python Package Index (PyPI) is a repository of software for the Python programming language. PyPI helps users find and install software developed and shared by the Python community. There are many modules in Python, some of the modules that we used in our project are

CV Module

OpenCV (Open Source Computer Vision Library) is an open-source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in commercial products. Being an Apache 2 licensed product, OpenCV makes it easy for businesses to utilize and modify the code. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high-resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc.

OS Module

In Python, the Zilches module has functions for interfacing with the working machine, the usual mileage modules in Python encompass Zilches. This module allows you to apply running machine-structured functionality in a portable style. several features to interface with the railway machine are to be had within the Zilch and Zilches, course modules. As a Python programmer, we don't want to navigate our mouse to the folders to complete our tasks. What do we want? We want to type a command and have it perform all of the tasks easily and efficiently. So here comes the idea of using the OS module, which will allow us to operate and interact with the system more simply. This module helps users by giving methods to interact with the directories/folders within the script and allowing us to do various operations on the directory such as creating the directory, removing the directory, retrieving the content, identifying the directory, and so on.

NumPy Module

NumPy is a Python library that adds support for huge, multi-dimensional arrays and matrices, as well as a vast variety of high-position fine functions to manipulate these arrays. NumPy is the fundamental package for scientific computing in Python. It is a Python library that provides a multidimensional array object, various derived objects (such as masked arrays and matrices), and an assortment of routines for fast operations on arrays, including mathematical, logical, shape manipulation, sorting, selecting, I/O, discrete Fourier transforms, basic linear algebra, basic statistical operations, random simulation and much more. At the core of the NumPy package, is the array object. This encapsulates n-dimensional arrays of homogeneous data types, with many

operations being performed in compiled code for performance. There are several important differences between NumPy arrays and the standard Python sequences: NumPy arrays have a fixed size at creation, unlike Python lists (which can grow dynamically). Changing the size of an array will create a new array and delete the original. The elements in a NumPy array are all required to be of the same data type, and thus will be the same size in memory. The exception: one can have arrays of (Python, including NumPy) objects, thereby allowing for arrays of different-sized elements.

Imutils Module

With OpenCV and both Python2.7 and Python 3, a set of convenience methods that make bike image processing operations including restatement, gyration, resizing, skeletonization, and presenting Matplotlib pictures easier. A series of convenience functions to make basic image processing functions such as translation, rotation, resizing, skeletonization, displaying Matplotlib images, sorting contours, detecting edges, and much easier with OpenCV and both Python 2.7 and Python 3.

Python Libraries

The modules used in this project belong to the data science packages of Python. Following are the modules used in this project

NumPy

NumPy is the fundamental package for scientific computing in Python. It is a Python library that provides a multidimensional array object, various derived objects (such as masked arrays and matrices), and an assortment of routines for fast operations on arrays, including mathematical, logical, shape manipulation, sorting, selecting, I/O, discrete Fourier transforms, basic linear algebra, basic statistical operations, random simulation and much more. At the core of the NumPy package, is the array object. This encapsulates n-dimensional arrays of homogeneous data types, with many operations being performed in compiled code for performance. The NumPy library contains a multidimensional array and matrix data structures (you'll find more information about this in later sections). It provides an array, a homogeneous n-dimensional array object, with methods to efficiently operate on it. NumPy can be used to perform a wide variety of mathematical operations on arrays. It adds powerful data structures to Python that guarantee efficient calculations with arrays and matrices, and it supplies an enormous library of high-level mathematical functions that operate on these arrays and matrices.

OpenCV

OpenCV is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel, it was later supported by Willow Garage then It is the library is cross-platform and free for use under the open-source Apache 2 License. OpenCV-python is a library of Python bindings designed to solve computer vision problems. OpenCV-python makes use of NumPy, which is a highly optimized library for numerical operations with MATLAB-style syntax. All the OpenCV array structures are converted to and from the NumPy array.

TensorFlow

TensorFlow is an end-to-end open-source platform for machine learning. It has a comprehensive, flexible ecosystem of tools, libraries, and community resources that lets researchers push the state-of-the-art in ML and developers easily build and deploy ML-powered applications.

TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks. TensorFlow was developed by the Google Brain team for internal Google use in research and production. The initial version was released under the Apache License 2.0 in 2015. Google released the updated version of TensorFlow, named TensorFlow 2.0, in September 2019. TensorFlow can be used in a wide variety of programming languages, including Python, JavaScript, C++, and Java. This flexibility lends itself to a range of applications in many different sectors.

Keras

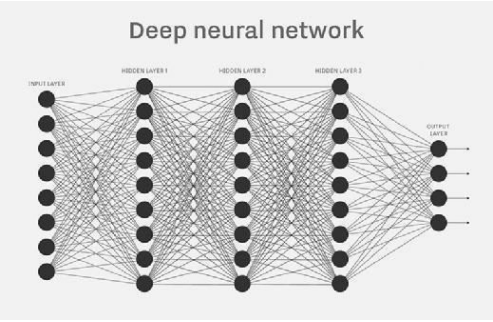
Keras is an API designed for human beings, not machines. Keras follows best practices for reducing cognitive load: it offers consistent & simple APIs, it minimizes the number of user actions required for common use cases, and it provides clear & actionable error messages. It also has extensive documentation and developer guides. Keras is the most used deep learning framework among the top-5 winning teams on Kaggle. Because Keras makes it easier to run new experiments, it empowers you to try more ideas than your competition, faster. And this is how you win. Keras is the high-level API of TensorFlow 2: an approachable, highly-productive interface for solving machine learning problems, with a focus on modern deep learning.

Algorithms

Some of the algorithms used in our project are

- CNN
- YOLO

CNN Algorithm: CNN: Deep Learning has proven to be a particularly useful technique in recent decades due to its capacity to manage massive volumes of data. Hidden layers have eclipsed traditional approaches in popularity, particularly in pattern recognition. Convolutional Neural network (CNN) is a Deep learning approach that makes use of an picture as enter to assign 39 significance (learnable weights and bases) to special components/objects in the photograph. In comparison to other classification methods. There are other types of neural networks in deep learning, but for identifying and recognizing objects, CNNs are the network architecture of choice. This makes them highly suitable for computer vision (CV) tasks and for



applications where object recognition is vital, such as self-driving cars and facial recognition

Fig 2: Convolutional Neural network

YOLO Algorithm YOLO is an algorithm that uses neural networks to provide real-time object detection. This algorithm is popular because of its speed and accuracy. It has been used in various applications to detect traffic signals, people, parking meters, and animals. This article introduces readers to the YOLO algorithm for object detection and explains how it works. It also highlights some of its real-life applications. What is YOLO? YOLO is an abbreviation for the term 'You Only Look Once'. This is an algorithm that detects and recognizes various objects in a picture (in real-time). Object detection in YOLO is done as a regression problem and provides the class probabilities of the detected images. YOLO algorithm employs convolutional neural networks (CNN) to detect objects in real-time. As the name suggests, the algorithm requires only a single forward propagation through a neural network to detect objects. This means that prediction in the entire image is done in a single algorithm run. The CNN is used to predict various class probabilities and bounding boxes simultaneously. The YOLO algorithm consists of various variants. Some of the common ones include tiny YOLO and YOLOv3.

5.RESULTS

Residual blocks First, the image is divided into various grids. Each grid has a dimension of S x S. The following image shows how an input image is divided into grids. In the image above, there are many grid cells of equal dimension. Every grid cell will detect objects that appear within them. For example, if an object center appears within a certain grid cell, then this cell will be responsible for detecting it. Bounding box regression A bounding box is an outline that highlights an object in an image. Every bounding box in the image consists of the following attributes: Width (bw), Height (bh), and Class (for example, person, car, traffic light, etc.)- This is represented by the letter c. Bounding box center (bx,by). 42 The following image shows an example of a bounding box. The bounding box has been represented by a yellow outline. YOLO uses a single bounding box regression to predict the height, width, center, and class of objects. In the image above, represents the probability of an object appearing in the bounding box. Intersection over union (IOU) Intersection over union (IOU) is a phenomenon in object detection that describes how boxes overlap. YOLO uses IOU to provide an output box that surrounds the objects perfectly. Each grid cell is responsible for predicting the bounding boxes and their confidence scores. The IOU is equal to 1 if the predicted bounding box is the same as the real box. This mechanism eliminates bounding boxes that are not equal to the real box. The following image provides a simple example of how IOU works. 43 In the image above, there are two bounding boxes, one in green and the other one in blue. The blue box is the predicted box while the green box is the real box. YOLO ensures that the two bounding boxes are equal.

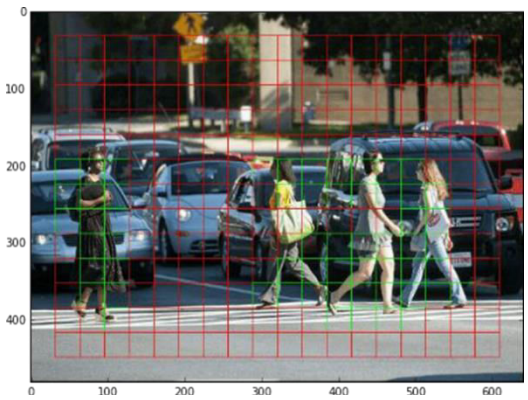


Fig 3: Residual blocks

First, the image is divided into grid cells. Each grid cell forecasts B bounding boxes and provides their confidence scores. The cells predict the class probabilities to establish the class of each object. For example, we can notice at least three classes of objects: a car, a dog, and a bicycle. All the predictions are made simultaneously using a single convolutional neural network. Intersection over union ensures that the predicted bounding boxes are equal to the real boxes of the objects. This phenomenon eliminates unnecessary bounding boxes that do not meet the characteristics of the objects (like height and width). The final detection will consist of unique bounding boxes that fit the objects perfectly. For example, the car is surrounded by the pink bounding box while the bicycle is surrounded by the yellow bounding box. The dog has been highlighted using the blue bounding box.

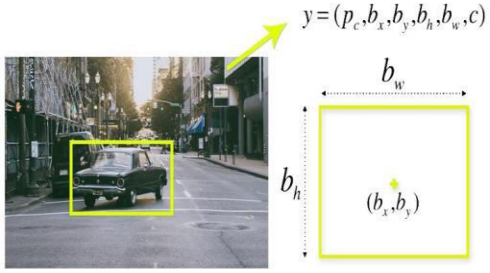


Fig 4 :Bounding Box Regression

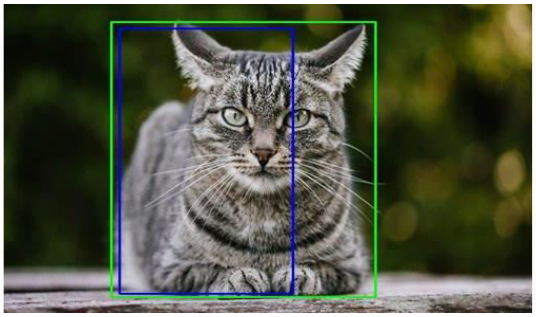


Fig 5: Intersection of Union

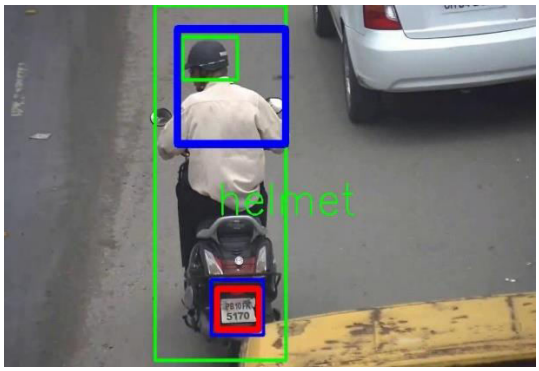


Fig 6: Result

6.CONCLUSION

In this study, we offer a framework for detecting traffic law offenders on motorcycles who do not use a helmet in real-time. The proposed framework will also aid traffic cops in finding such violators in unusual weather situations, such as hot sun. In Python, our project was successfully tested. We also looked at the project's uses and future scope. Our solution can be linked to traffic cameras, and with minimal tweaking, it can be used to detect helmets in real time. We can also combine the automatic license plate detection algorithm with a system that generates challans for people who do not wear helmets.

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