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COVID-19 FACE MASK DETECTION WITH DEEP LEARNING AND COMPUTER VISION

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Abstract: The corona virus COVID-19 pandemic is causing a worldwide fitness disaster so the powerful safety techniques is wearing a face masks in public regions according to the arena HealthOrganization The COVID-19 pandemic forced governments internationally to impose lockdowns to prevent virus transmissions. Reports indicate that carrying face mask whilst at work simply reduces the hazard of transmission. An efficient and economic technique of using AI to make a secure surroundings in the course of a production setup. Using this newly released technique we are able to assist many to hit upon and convey safety precautions , by means of the usage of this method many fitness and social employees will be able to discover the COVID-19 affected patients . In order that they may be privy to this and hold a distance from the individual to reduce the unfold of coronavirus disease. This machine now not only works at web sites however this approach can also be helpful for the home enterprise to discover the affected customers. A hybrid version using deep and classical system studying for mask detection are going to be provided. A mask detection dataset consists of with masks and without masks pictures, We have become to apply OpenCV to try to to real-time face detection from a stay circulate thru our webcam. we will use the dataset to create a COVID-19 masks detector with pc vision the use of Python, OpenCV, and Tensor flow and Keras. Our intention is to identify whether the character on photograph/video movement is sporting a masks or no longer with the help of computer vision and deep gaining knowledge of.

KeyWords: Deep Learning, Computer Vision, OpenCV, Tensorflow, Keras.

1. INTRODUCTION

The fashion of wearing face mask in public is growing due to the COVID- 19 corona virus epidemic everywhere in the international. Earlier than Covid-19, humans used to wear masks to protect their health from air pollutants. while different humans are self-aware of their seems, they conceal their feelings from the general public via hiding their faces. Scientists proofed that wearing face mask works on impeding COVID-19 transmission. COVID19 (known as corona virus) is the state-of-the-art epidemic virus that hit the human fitness within the remaining century. In 2020, the fast spreading of COVID-19 has forced the world health agency to claim COVID- 19 as a global pandemic. extra than five million instances had been infected by using COVID-19 in much less than 6 months throughout 188 international locations. The virus spreads through close touch and in crowded and overcrowded regions. The corona virus epidemic has given rise to an exceptional diploma of global medical cooperation. Artificial Intelligence (AI) based totally on machine getting to know and Deep gaining knowledge of can help to combat Covid-19 in many ways. Machine mastering lets in researchers and clinicians examine full-size quantities of data to forecast the distribution of COVID-19, to function an early warning mechanism for potential pandemics, and to categorise susceptible populations. The provision of healthcare desires investment for rising era which include artificial intelligence IoT, large records and machine gaining knowledge of to address and expect new diseases. With a purpose to higher understand infection prices and to trace and quick discover infections, the AI's energy is being exploited to cope with the COVID-19 pandemic. Humans are compelled by laws to put on face masks in public in many nations. those guidelines and legal guidelines have been developed as an motion to the exponential boom in cases and deaths in many areas. however, the procedure of monitoring big corporations of people is becoming more tough. The monitoring procedure involves the detection of absolutely everyone who isn't sporting a face mask. here we introduce a masks face detection version this is primarily based on laptop vision and deep getting to know. The proposed model may be incorporated with surveillance cameras to impede the COVID-19 transmission with the aid of allowing the detection of individuals who are wearing masks now not wearing facemasks. The version is integration between deep learning and classical gadget learning techniques with opencv, tensor waft and keras. we've got used deep switch leering for function extractions and mixed it with 3 classical

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machine getting to know algorithms. We added a evaluation between them to discover the maximum appropriate algorithm that carried out the highest accuracy and ate up the least time within the procedure of schooling and detection.

2. LITERATURE REVIEW

i. The Face Mask Detection For Preventing the Spread of COVID-19 at Politeknik Negeri Batam.

The spread of COVID-19 is increasingly worrying for everyone in the world. This virus can be affected from human to human through the droplets and airborne. According to the instruction from WHO, to reduce the spread of COVID-19, every people need to wear face mask, do social distancing, evade the crowd area and also always maintain the immune system. Therefore, to protect each other, every person should wear the face mask properly when they are in outdoor. However, most of selfish people won't wear the face mask properly with so many reasons.[1]

ii. Face Mask Detection Using OpenCV.

COVID-19 had a massive impact on human lives. The pandemic lead to the loss of millions and affected the lives of billions of people. Its negative impact was felt by almost all commercial establishments, education, economy, religion, transport, tourism, employment, entertainment, food security and other industries. According to WHO(World Health Organization), 55.6 million people were infected with Coronavirus and 1.34 million people died because of it as of November 2020. This stands next to black death which almost took the lives of 60 percent of population in Europe in the 14th century. After the person gets infected, it takes almost fourteen days for the virus to grow in the body of its host and affect them and in the meantime, it spreads to almost everyone who is in contact with that person. So, it is extremely hard to keep the track of the spread of COVID-19.[2]

iii. Face Mask Detector

Single Shot Detector architecture is used for the object detection purpose. In this system face mask detector can be deployed in many areas like shopping malls, airports and other heavy traffic places to monitor the public and to avoid the spread of the disease by checking who is following basic rules and who is not.It takes excessive time for data loading in Google Colab Notebook. It did not allow the access of webcam which posed a hurdle in testing images and video stream.We have modeled a facemask detector using Deep learning. We are processed a system computationally efficient using MobileNetV2 which makes it easier to Extract the data sets. We use CNN architecture for better performance.We can fix it in any kind of cameras.[3]

iv. Face detection techniques: a review,Artificial.

Human beings have not tremendous ability to identify different faces than machines, so automatic face detection system plays an important role in face recognition,head- pose estimation etc.It has some problems like face occlusion,andnon uniform illumination.We use Neural Network to detect face in the Live video stream. Tensor flow is also used in this system. In existing they use Adaboost algorithm, we are using mob net CNN Architecture model in our proposed system.We will overcome all these problems in this paper.[4]

v. Multi-Stage CNN Architecture for Face Mask Detection.

This system consists of a dual-stage (CNN)architecture capable of detecting masked and unmasked faces and can be integrated with pre-installed CCTV cameras.This will help track safety violations, promote the use of face masks and ensure a safe working environment.Datasets were collected from public domain along with some data scraped from the internet.They use only pretrained datasets for detection. We can use any cameras to detect faces.It will be very useful for society and for peoples to prevent them from virus transmission. Here we use live video detection using open cv(python library).[5]

3. PROBLEM STATEMENT

- Many people have come up with creative ideas for detecting face-masks (like putting artificial mask images on top of non-mask people images) but the authors found that most of them solved this issue using simple CNN models considering it as a binary classification problem.
- This problem needs to be handled using object detection models for detecting multiple people in the frame, then putting bounding boxes of particular colour around them depending on whether they are wearing masks or not, and analysing the ratio of people wearing masks.
- There was a need for a dataset with labels and annotations. So, the authors have generated a small custom dataset manually, carefully provided labels, and used transfer learning to achieve this task.

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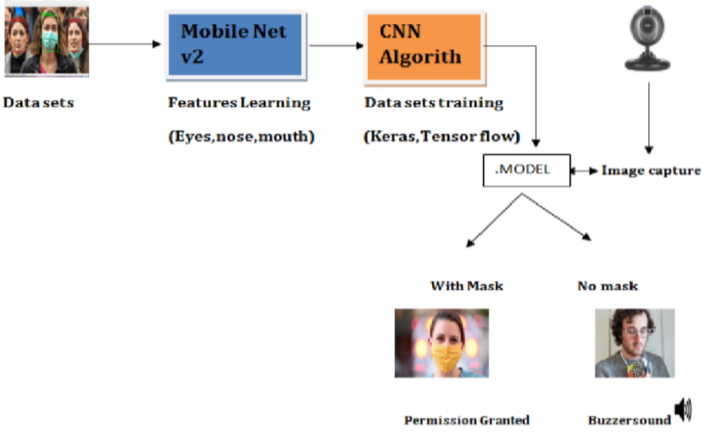
- They have also used some datasets available on the web and provided their description. We trained both our models on the same dataset of ~7500 images.
- Each face in every image was labelled with carefully prepared bounding boxes. Annotation records containing all the data about bounding boxes, image names, and labels are prepared in the various formats as required by both the models considered in this work.

4.OBJECTIVES

1 The main objective is to reduce the risk of transmission.
2 By Using this newly launched technique it can help many to detect and bring safety precautions.
3 By using this technique many health and social workers will be able to identify the COVID-19 affected Patients .
4 To identify the person on image/video stream wearing face mask with the help of computer vision and deep learning algorithm.

5. BLOCK DIAGRAM

The major requirement for implementing this project using python programming language along with Deep learning ,Machine learning , Computer vision and also with python libraries. The architecture consists of Mobile Net as the backbone, it can be used for high and low computation scenarios.We are using CNN Algorithm in our proposed system.



6. METHODOLOGY

Maching Learning*:* Machine learning (ML) is the look at of computer algorithms that enhance automatically thru enjoy. it's miles visible as a subset of artificial intelligence. gadget studying algorithms construct a mathematical version based totally on sample statistics, called "education data", to be able to make predictions or choices with out being explicitly programmed to do so. device studying algorithms are used in a extensive variety of packages, together with e mail filtering and laptop vision, where it's miles hard or infeasible to increase traditional algorithms to carry out the wanted obligations. device learning is carefully associated with computational records, which focuses on making predictions using computers. The observe of mathematical optimization can provide methods, idea and alertness domain names to the sphere of system mastering. records mining is a associated area of take a look at, that specialize in exploratory data analysis thru unsupervised studying. In its application across enterprise problems, device learning is likewise called predictive analytics.

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Fig 6.1 : Machine Learning

Machine Learning studying tactics are historically divided into three extensive classes, depending on the nature of the "sign" or "feedback" available to the getting to know machine:

Supervised learning: The computer is supplied with example inputs and their preferred outputs, given through a "instructor", and the aim is to learn a general rule that maps inputs to outputs.

Unsupervised learning: No labels are given to the learning algorithm, leaving it on its personal to locate structure in its input. Unsupervised learning can be a goal in itself (discovering hidden styles in facts) or a means in the direction of an end (characteristic getting to know).

Reinforcement learning: A computer application interacts with a dynamic environment wherein it should carry out a positive intention (including driving a car or playing a sport in opposition to an opponent). as it navigates its problem area, the program is supplied comments that is analogous to rewards, which it attempts to maximize. Different procedures had been developed which do not healthy neatly into this 3-fold categorization, and from time to time multiple is used by the identical system getting to know device.
Computer Vision: computer imaginative and prescient is an interdisciplinary medical field that offers with how can benefit excessive-stage knowledge from virtual snap shots or motion pictures. From the perspective of engineering, it seeks to understand and automate obligations that the human visible gadget can do, pc imaginative and prescient obligations encompass methods for acquiring, processing, reading and understanding virtual pix, and extraction of highdimensional records from the real world for you to produce numerical or symbolic information.

Fig 6.2 : Computer Vision

Deep Learning : Deep getting to know strategies intention at getting to know feature hierarchies with features from higher stages of the hierarchy fashioned by way of the composition of decrease degree capabilities. mechanically mastering functions at multiple levels of abstraction allow a machine to study complicated functions mapping the enter to the output at once from information,without relying completely on human-crafted functions.

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Fig 6.3 : Deep Learning

OpenCV : OpenCV (Open source computer imaginative and prescient Library) is an open source pc vision and machine learning software program library. OpenCV became constructed to provide a commonplace infrastructure for computer imaginative and prescient applications and to boost up the use of machine belief in the commercial merchandise. Being a BSD-certified product, OpenCV makes it clean for groups to make use of and alter the code.

TENSORFLOW : TensorFlow is a loose and open-supply software program library for dataflow and differentiable programming throughout a number responsibilities. it's far a symbolic math library, and is also used for gadget getting to know applications along with neural networks. it is used for each studies and manufacturing at Google, TensorFlow is Google mind's 2d-era device. model 1.0.zero was launched on February 11, whilst the reference implementation runs on single devices, TensorFlow can run on multiple CPUs and GPUs (with non-compulsory CUDA and SYCL extensions for trendy-purpose computing on photographs processing devices). Tensor waft is available on 64-bit Linux, macOS, home windows, and mobile computing platform inclusive of Android and Ios.

KERAS: Keras is an API designed for human beings, no longer machines. Keras follows first-rate practices for lowering cognitive load: it offers constant & simple APIs, it minimizes the range of person movements required for common use instances, and it gives clear & actionable errors messages. It also has massive documentation and developer publications. Keras carries numerous implementations of normally used neuralnetwork building blocks including layers, objectives, activation features, optimizers, and a bunch of equipment to make working with image and text statistics less difficult to simplify the coding vital for writing deep neural community code. The code is hosted on GitHub, and community assist boards consist of the GitHub issues page, and a Slack channel. Keras is a minimalist Python library for deep studying which can run on pinnacle of Theano or Tensor float.

PyTorch : PyTorch is an open source machine mastering library based totally on the Torch library, used for packages together with pc imaginative and prescient and natural language processing, on the whole evolved with the aid of Face ebook's AI research lab (honest). it's far free and open-source software launched beneath the modified BSD license. despite the fact that the Python interface is extra polished and the primary focus of development, PyTorch also has a c++ interface. Tensor computing (like NumPy) with strong acceleration through graphics processing devices (GPU).

7. HARDWARE COMPONENTS

As shown in the above circuit model we are using here rasberry pi 3 b+ model which consist of inbuilt hdmi port inbuillt cpu, usb connection which works similar as computrt system after this we are using here pi-camera which will capture the image of the person and this image will next go under processing which can be detected by the system.
In this covid-19 face mask detection technique we are using the below listed component.

1. Rasberry-Pi
2. 2. Pi-Camera.
3. Monitor System.
4. Buzzer.

Lets come to know about function of each component used in this system.

1. Rasberry-Pi

The Raspberry Pi is a credit card-sized computer with an ARM processor that can run Linux. This item is the **Raspberry Pi 3 Model B+**, which has 1 GB of RAM, dual-band WiFi, Bluetooth 4.2, Bluetooth Low Energy (BLE), an Ethernet port, HDMI output, audio output, RCA composite video output (through the 3.5 mm jack), four USB ports, and 0.1″-spaced pins that provide access to general purpose inputs and outputs (GPIO).

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The latest Raspberry Pi 3 Model B+ has a faster 64-bit 1.4GHz quad core processor, 1GB of RAM, faster dual-band 802.11 b/g/n/ac wireless LAN, Bluetooth 4.2, and significantly faster 300Mbit/s ethernet.
A significant change on the Pi 3 B+ compared to the Pi 3 is the inclusion of a new faster, dual-band wireless chip (CYW43455) with 802.11 b/g/n/ac wireless LAN and Bluetooth 4.2.
The dual-band 2.4GHz and 5GHz wireless LAN enables faster networking with less interference (although the higher bandwidth has less range), and the new PCB antenna technology should allow better reception.
Bluetooth allows you to use a wireless keyboard/trackpad without extra dongles, keeping things nice.

2. Pi-Camera

The **Pi camera module** is a portable light weight camera that supports Raspberry Pi. It communicates with Pi using the MIPI camera serial interface protocol. It is normally used in image processing, machine learning or in surveillance projects. It is commonly used in surveillance drones since the payload of camera is very less. Apart from these modules Pi can also use normal USB webcams that are used along with computer.

3. Monitor System.

Software monitors occur more commonly, sometimes as a part of a widget engine. These monitoring systems are often used to keep track of system resources, such as CPU usage and frequency, or the amount of free RAM. They are also used to display items such as free space on one or more hard drives, the temperature of the CPU and other important components, and networking information including the system IP address and current rates of upload and download. Other possible displays may include the date and time, system uptime, computer name, username, hard drive S.M.A.R.T. data, fan speeds, and the voltages being provided by the power supply.

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4. Buzzer.

A **buzzer** or **beeper** is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of **buzzers** and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

8. RESULT ANALYSIS.

So in the figure below you can observe the output of the system . The given figure 8.1 shows that the person wearing No mask will be detected by the system and stores the data and it will inform the main monitoring system . After this operation it will alert the system and the buzzer will operate automatically .

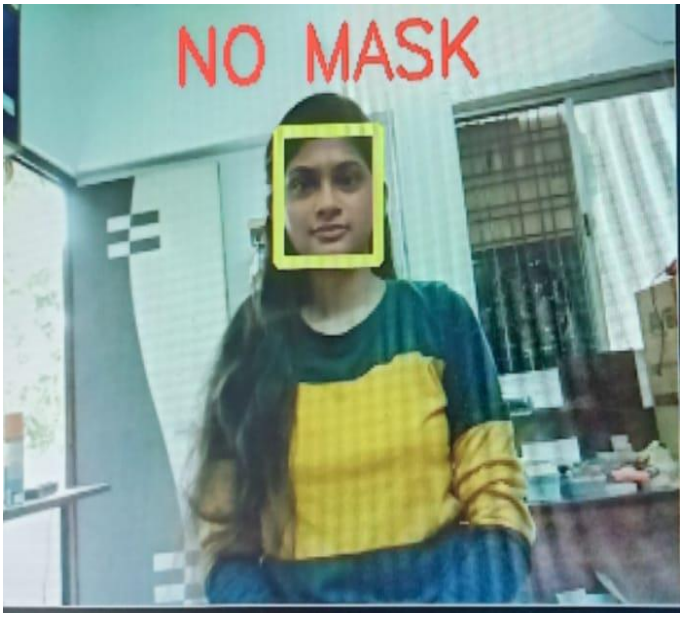

Fig 8.1 : No Mask Detection

The below figure 8.2 shows person wearing mask with the 100% of accuracy the image will store in the system and display on the monitor .

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Fig 8.2 : Mask Detection

5. CONCLUSION

This study looks at the problem of conducting accurate vehicle overspeed identification in an urban environment using IoT technology to aid evolving automotive applications. The Smart Vehicle Over Speeding Detector detects the driving conditions to achieve good detection accuracy. Over speeding vehicles are tracked and reported to the relevant authority using the proposed device., thus avoiding accidents.

6. FUTURE SCOPE

The following are the future enhancement that may be done into the proposed system through developing hardware implantations, interfacing sensors and software algorithms:-

- Solution for emergency vehicle's speed control.
- Solution for Rash-Driving.
- People will follow the traffic rules
- People will not able to argue with the police because of the truth evidence.

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