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Covid-19 Face Mask Detection and People Count

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Abstract: ***During this pandemic the problems faced was shortage of testing services, vaccines and poor medical care all these lead to lockdown for a long run which affected our daily lives. During this pandemic the problems faced were shortage of testing services, vaccine and poor medical care all these lead to lockdown for the long run which affected our daily lives. The prevention for this problem was to wear masks in public areas. Facemask detection had seen remarkable growth in the image processing and deep learning domain. Facemask detection is already an existing concept in which they had used different algorithms and techniques to show better results. The proposed system in this project is developed to avoid mask-less people from entering the desired places by detecting face-mask, and sending a signal to an Arduino device that connects to the sensors and counts the people while entering and exiting. This helps to maintain the social distancing inside those places and limit the Total number of persons. If the total number of people count increases, the Arduino microcontroller will give the buzzer alarm to notify the person. In This project, we use live detection and identify either the person wears a mask or not. Therefore, this proposed approach will make a significant change in the public healthcare system.***

Keywords: Deep Learning, Sensors, Computer Vision, Convolutional Neural Networks (CNNs), public Safety, face mask detection, OpenCV, COVID-19.

I. INTRODUCTION

The World Health Organization has asserted the coronavirus affliction 2019 a universal. An all-encompassing matched work is wanted to stop the further spread of the virus. A universal is delimited as "happening over an expansive terrestrial field and moving an unusually extreme fraction of the society. The last universal stated in the experience was the H1N1 infirmity universal in 2009.

Corona virus affliction (COVID-19) is a catching ailment precipitated by one SARS-CoV-2 bacterium. Most populations contaminated accompanying the virus will occur temperate to moderate respiring ailment and restore outside needing distinctive situation.

However, few will enhance the critically ill and demand healing consideration. The older crowd and those accompanying latent healing environments like heart failure, diabetes, incessant respiring ailment, or tumor are more inclined to expand weighty disease. Anyone can fall victim to accompanying COVID-19 and enhance critically ill or expire at some age.

To prevent disorientation accompanying the ailment SARS, the WHO consistently refers to SARS Covid 2 as "the COVID-19 virus " honestly fitness route. The virus has exacted a lot of lives across the sphere in many habits e.g., concerning matters, with regard to the welfare of mankind, politically. Compared to MERS and SARS, COVID-19 has had: considerably bigger transmissibility; worst post-improvement associations; frequent mutations (from the primary SARS-CoV-2 strain) superior to larger mortalities and unrestrained resentment. The dispassionate proofs concerning this particular bacterium has shown harmful impacts on plans apart from the respiring structure e.g. intellect, hematological order, liver, kidneys, endocrine method, etc. accompanying no hopeful something soothing to date. Lack of danger situations and deficiency of growth-conditional drugs has advanced the re purposing of existent cure in addition to the rise of vaccines accompanying the linked works of physicists and technical masters in this short span.

Transmission can happen more surely in the “Three C’s” (the risk of COVID-19 extended is larger in places place these “3Cs” overlay):

1) Crowded places accompanying many populations nearby;
2) Close-contact backgrounds, exceptionally place community have dialogues very familiar each one;
3) Confined and encircled scopes accompany weak act of providing or changing the air.

The aim of this paper is to precariously resolve the sanctioned rule to wear guarding masks all along with the COVID-19 situation from a healing position.

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II. RELATED WORKS

In previous articles, they have used KNN, k-nearest neighbors algorithm is a simple, supervised machine learning algorithm that can be used to solve classification and regression problems. Simple to implement and understand, but the main disadvantage is that it slows down as the amount of data used increases. Texture Analysis Using the Gray-Level Co-Occurrence Matrix (GLCM).

The GLCM functions typify the consistency of an figure by wily by means of what frequently pairs of pixels distinguishing principles and in a particularized dimensional connection happen in an figure, building a GLCM, and therefore gleaning mathematical measures from this form. Heat map reversion has enhanced the prevailing methods for deep education-located pertaining to syntax milestone localization. Though heat map reversion is strong due to abundant differences in pose, light, and obstruction, it generally endures from a substitute-pel localization question.

YOLO is an invention that uses affecting animate nerve organs networks to determine original-opportunity object discovery. It has existed second hand in differing requests to discover traffic signals, community, parking meters, and mammals etc.

In other related articles, they use Multiple Sensors like Body Temperature, Cough Rate, Respiratory and Blood oxygen level over cloud policy or carrying the dossier through Lora a Wireless Communication Transceiver. Two Modes have existed Tested Either the dossier is uploaded to the cloud principle for Further Prediction and study and Lora further experience as depressed capacity use located long range dossier ideas tool.

III. PROPOSED WORK

In Proposed System, it has now been proved that not wearing a mask will not only affect our health but will also affect others health if they come in close contact with us and as per World Health Organization and Indian Govt Laws to protect others and ourselves this proposed model will use the camera to monitor if people are wearing a mask or not to maintain the limited crowd in the venue we are using people count, this will restrict the maximum number of people in a desired place. This process is designed in Python and connected to an Arduino UNO microcontroller via USB. Must have PySerial, a Python API module for reading and writing serial data from an Arduino or other Microcontroller. Scope of our proposed work is due to the prevailing situation facemask detection has high scope in almost every industry. The similar field of work can be used in the chemical industry also.

IV. METHODOLOGY

A. Face Mask Detection

In this work, a Machine Learning located model for detecting masks over faces honestly places to decrease the spread of Corona virus is bestowed. The projected model capably handles variable types of occlusions in thick positions by making use of collections of sole and two stage detectors. The ensemble approach not only helps in accomplishing extreme veracity but also raises discovery speed significantly. The model is 98.2% correct at mask discovery.



Fig 1. Different Types Of Face Masks

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Although abundant scientists have dedicated exertions in crafty effective algorithms for face discovery and acknowledgment, skilled lies an essential distinctness middle from two points 'discovery of the face under mask' and 'discovery of mask over face'. As per vacant history, very little research is tried to discover masks over face. Thus, our work aims to evolve a method that can correctly discover masks over the face honestly regions (to a degree airports. railroad stations, cramped markets, transport stops, etc.) to decrease the spread of Coronavirus and provide public health care.

B. Algorithm

CONVOLUTIONAL NEURAL NETWORK (CNN) Deep Learning should be a top-selling subdivision of machine intelligence on account of allure's extreme level of depiction across many types of dossier. An excellent habit to use deep education to categorize concepts is to search out and build a convolutional interconnected system (CNN). TheKeras book repository in Python creates it pretty plain to build or forecast utilizing CNN.Computers visualize concepts utilizing pixels. Pixels in countenances are customarily accompanying. For instance, the group of pixels can mean an interference in the figure or additional pattern. Convolutions use this to help recognize representations. A loop multiplies the origin of pixels accompanying a refined forge or 'seed' and sums up the duplication principles. Then the spiral slides over to the next pel and repeats the unchanging process just before all the concept pixels have existed concealed.



FIG 2. How To Wear A Mask

Inception Layer is a mixture of all those tiers (that is to say, 1×1 Convolution coating, 3×3 Convolution tier, 5×5 Convolution coating) accompanying their crop percolate banks concatenated into a distinct manufacturing heading making the recommendation of the next stage.

Along with the indicated tiers, skilled are two important adjoin-follow in the original beginning coating:

1) 1×1 Convolution coating before asking another coating, that is for the most part secondhand for range decline.

2) A parallel Max Pooling tier, that determines another alternative to the beginning coating.

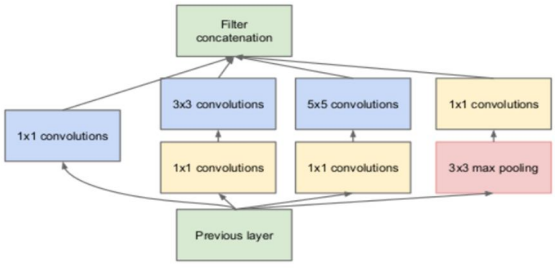


Fig 3. Inception Layer

This is the place, beginning tier meets expectations in the front. It admits within coatings to select that permeate content will pertain to discovering the necessary facts. So even though the content of the face in the concept is various (as visualized in the countenances beneath), the tier everything together to acknowledge the face. For the first figure, it would possibly take a bigger penetrate content, while it'll take a lower individual for the second concept.

C. Average Pooling 2d

Average combining includes manipulating the average of each patch of the feature outline. This way that each 2×2 square of the feature drawing is below sampled to the average profit in the square Pooling tiers are used to humble the ranges of the feature maps.

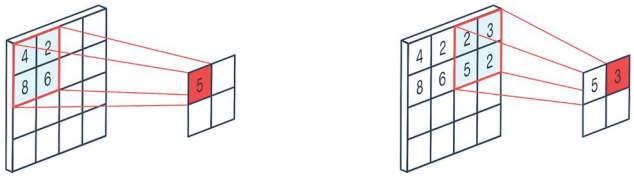


Fig 4. 2D Average Pooling Block

V. I.NETWORK ARCHITECTURE

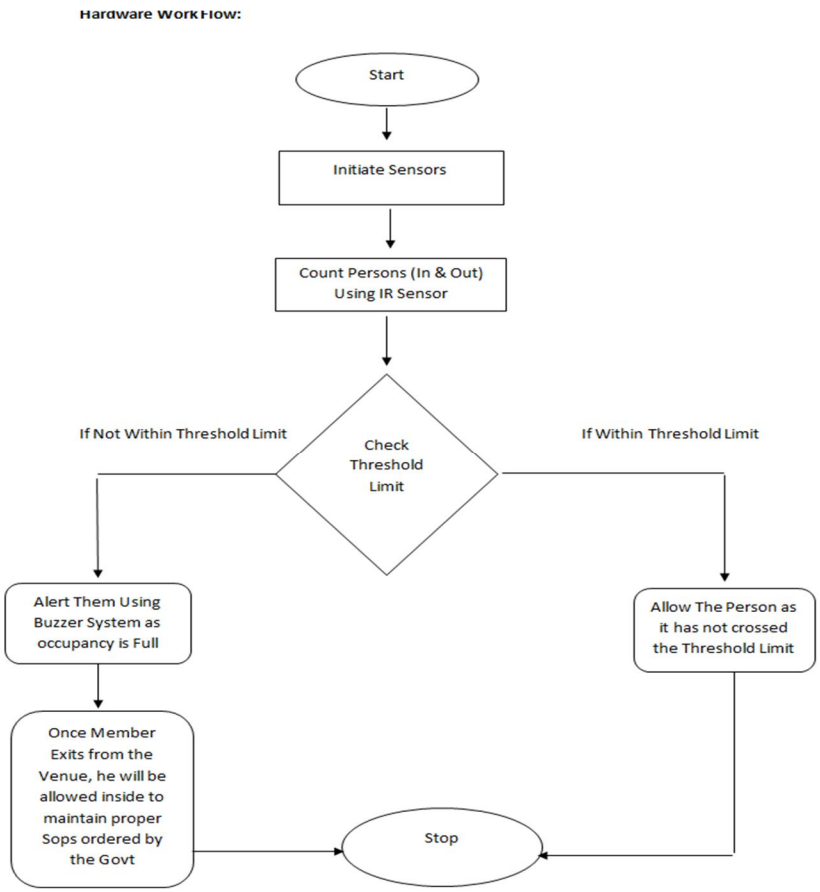


Fig 5. Hardware Workflow

A. Architecture Components

We Have Used Arduino Uno as Our Microcontroller as it is Open Source and User Friendly for us to Program,2 IR Sensors are connected to the Micro controller to Detect the Entry and Exit of the People to view the Status we have also integrated 16 * 2 LCD Display to View No of People present inside the room, Python Face mask Detection is Integrated with Hardware so the Logic Work in the following way,

First Face Mask Is Detected if the Person is Masked and if the Entry is Available the IR Sensors Counts the Person as 1 similarly if the person is masked but if the Threshold limit is Full the person will hear the Buzzer Alert Sound that the Entry is Full, Final Scenario if the Person is Not Masked then again the Buzzer alert is Provided for him to wear the Mask. A Cable is Used to Dual Purpose in our Project one to Transmit Serial Data from Python to the Micro controller and it is also used as the Common Power Supply. This Way all the Components are integrated with Micro controllers and this is how the system works together in tandem.

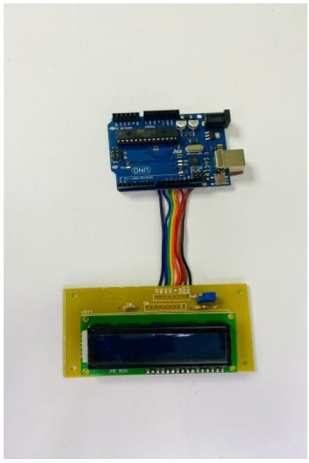


FIG 6. Soldering Is Done



FIG 7.IR SENSORS, LCD DISPLAY, BUZZER, ARDUINO

First Face Mask Is Detected if the Person is Masked and if the Entry is Available the IR Sensors Counts the Person as 1 similarly if the person is masked but if the Threshold limit is Full the person will hear the Buzzer Alert Sound that the Entry is Full, Final Scenario if the Person is Not Masked then again the Buzzer alert is Provided for him to wear the Mask. A Cable is Used to Dual Purpose in our Project one to Transmit Serial Data from Python to the Micro controller and it is also used as the Common Power Supply. This Way all the Components are integrated with Micro controllers and this is how the system works together in tandem.

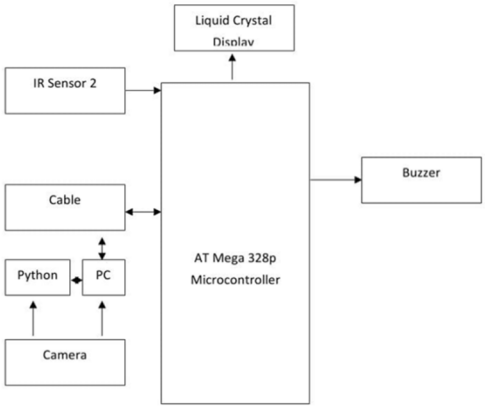


FIG 8. Block Diagram Of Network Architecture

VI. EXPERIMENT AND RESULTS

A. *Dataset*



FIG 9. Without Mask

1) This is an open-source dataset . It consists of 3833 images including with and without masks. To cover more real-world scenarios allowing us to obtain the maximum accuracy. The images in the dataset were taken from the internet.

The disadvantage of the dataset is that it is taken from all over the internet and it doesn't have a proper resource. This dataset is used to obtain the maximum accuracy. Also, this dataset gives a balance to use it across the world. The images used in the dataset consist of surgical masks which are by default used by the people**.**

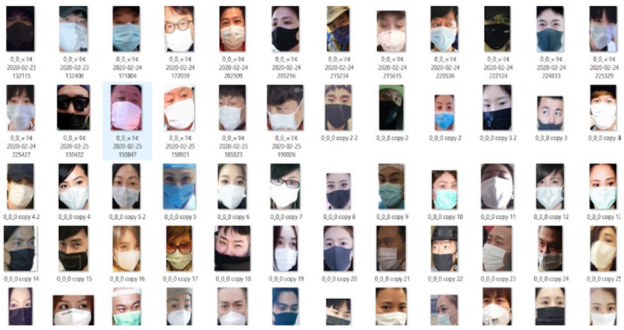


FIG 10. WITH MASK

Implementation

2) Training Face Mask Detector

The first step is to Load the Dataset ,initializing the initial learning rate, number of epochs to train and batch size . Take the list of images in the dataset directory, initialize the list of data (I.e., images) and class images. Then perform one hot encoding on the labels, construct the training image generator for data augmentation. The model we use in our project is InceptionV3 for training the image size, shape etc. Then making predictions for training and testing data.

3) Applying Face mask Detector and detecting people count

For software part, Load the trained Face Mask Detector model from Disk, then detect live face to Extract the Region of Interest (ROI) to check whether the person is wearing mask or not. For hardware part, Initiate the Sensors, Count Persons (In & Out) Using IR Sensor, Check Threshold Limit, If Not Within Threshold Limit, Alert Them Using Buzzer System as occupancy is Full. If Within Threshold Limit, Allow the Person as it has not crossed the Threshold Limit

with_mask	0.99	1.00	0.99	383
without_mask	1.00	0.99	0.99	384
accuracy			0.99	767
macro avg	0.99	0.99	0.99	767
weighted avg	0.99	0.99	0.99	767

TABLE 1. MAKE PREDICTIONS

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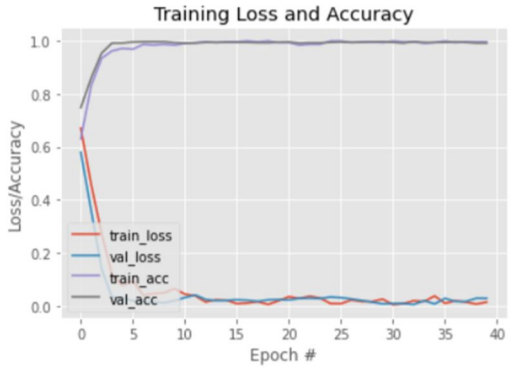


Fig 11. Training Loss And Accuracy

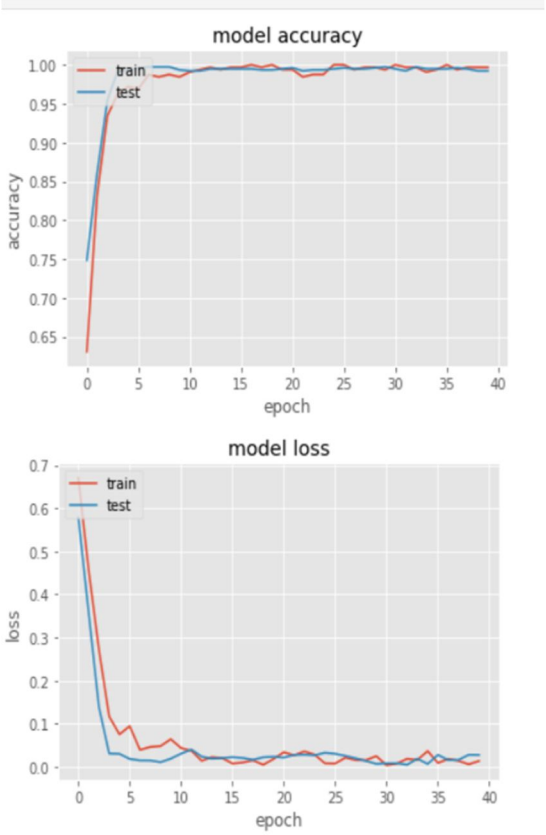


Fig 12. Model Accuracy and Model Loss

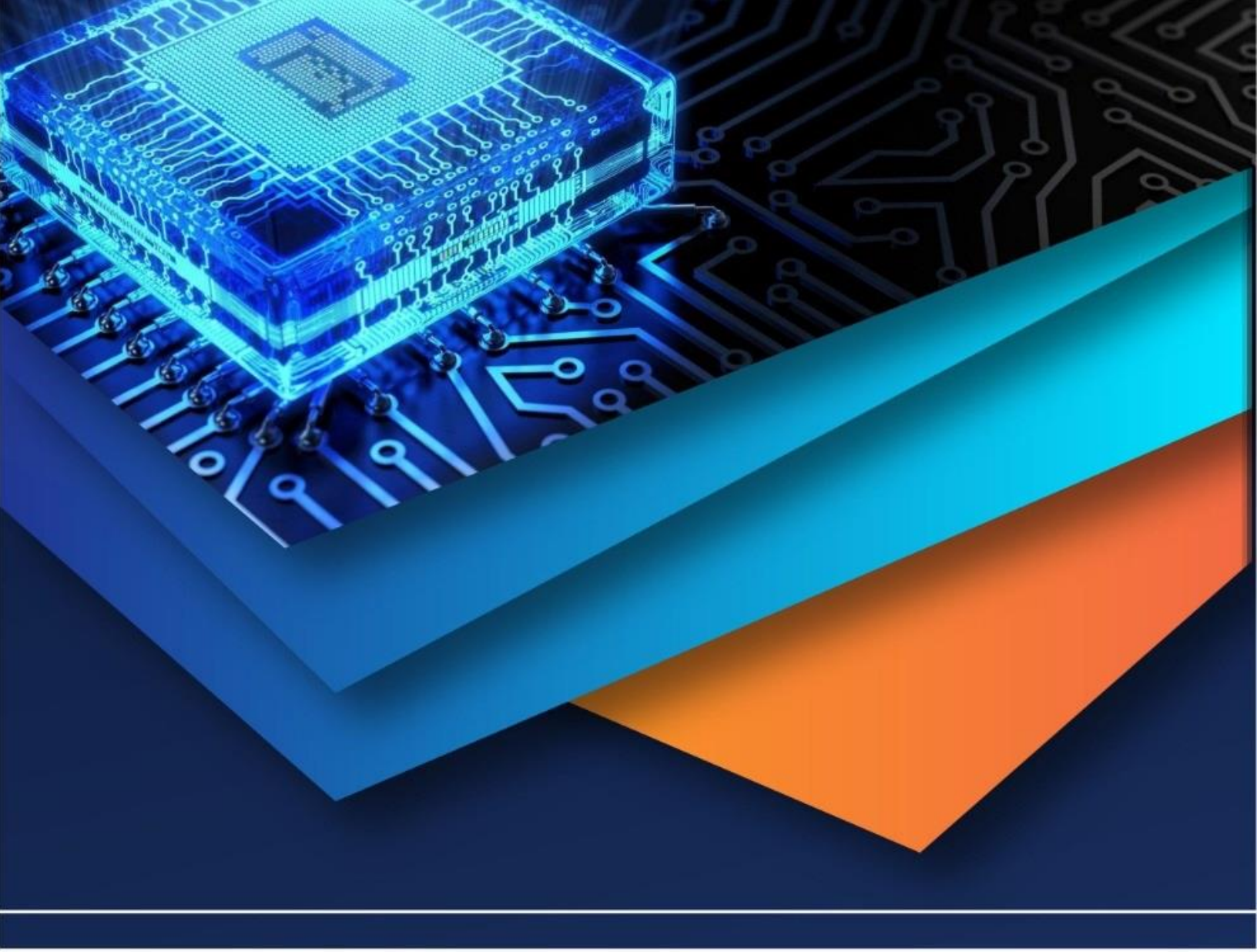
VII. CONCLUSION

In this project we proposed a novelty of work to the existing system which is efficient in this pandemic and also it requires less hardware equipment on a small scale. To overcome the existing difficulties in our base paper i.e., obscuring enough of our face the face mask cannot be applied so we are using the live detection method. In this proposed system we are using CNN algorithm as it excels in the field of image processing. Among these we are using Inception v3 model Average pooling2D. The model is used for pretraining the dataset. Average pooling 2d is used for calculating the multidimensional(height*width).Both this methodology is used for training the dataset. Also to count the number of people in the desired place we had used hardware people count detection which counts the number of people in the venue and display it on LCD(Liquid Crystal Display) if the number of people cross the threshold limit it will alert us via a buzzer sound. In future work we would like to work on the dataset with different types of masks and also work on the social distance between the people.

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REFERENCES

[1] XINQI FAN , MINGJIE JIANG, AND HONG YAN," A Deep Learning Based Light-Weight Face Mask Detector With Residual Context Attention and Gaussian Heat map to Fight Against COVID-19 " vol. 27, no. 2, pp. 1–4, Mar. 2020.
[2] SEYED SHAHIM VEDAEI, AMIR FOTOVVAT , MOHAMMAD REZA MOHEBBIAN , GAZI M. E. RAHMAN , (Graduate Student Member, IEEE), KHAN A. WAHID , (Senior Member, IEEE), PAUL BABYN , HAMID REZA MARATEB , MARJAN MANSOURIAN , AND RAMIN SAMI ," COVID-SAFE: An IoT-Based System for Automated Health Monitoring and Surveillance in Post-Pandemic Life " vol. 4, no. 8, pp. 78–82, 2020,
[3] Yuzhen Chen, Menghan Hu , Member, IEEE, Chunjun Hua, Guangtao Zhai , Senior Member, IEEE, Jian Zhang, Qingli Li , Senior Member, IEEE, and Simon X. Yang , Senior Member, IEE ," Face Mask Assistant: Detection of Face Mask Service Stage Based on Mobile Phone " c., vol. 323, no. 15, pp. 1502–1503, 2020.
[4] J. A. Lewnard and N. C. Lo, ‘‘Scientific and ethical basis for social- distancing interventions against COVID-19,’’ Lancet Infect. Dis. , vol. 20, no. 6, pp. 631–633, 2020
[5] S. Woolhandler and D. U. Himmelstein, ‘‘Intersecting U.S. epidemics: COVID-19 and lack of health insurance,’’ Ann. Internal Med., vol. 173, no. 1, pp. 63–64, Jul. 2020
[6] L. Lan et al., “Positive RT-PCR test results in patients recovered from COVID-19,” J. Amer. Med. Assoc., vol. 323, no. 15, pp. 1502–1503, 2020.
[7] H. A. Hussein, R. Y. A. Hassan, M. Chino, and F. Febbraio, “Point-of- care diagnostics of COVID-19: From current work to future perspectives,” Sensors, vol. 20, no. 15, p. 4289, Jul. 2020.
[8] R. Girshick, J. Donahue, T. Darrell, and J. Malik, ‘‘Rich feature hierarchies for accurate object detection and semantic segmentation,’’ in Proc. IEEE Conf. Comput. Vis. Pattern Recognit., Jun. 2014, pp. 580–587.
[9] Junfeng Zhang, "Robust Landmark Detection via Heatmap offset Regression",vol 29,April2020
[10] Muhammad Nazrul Islam," A Systematic Review on the Use of AI and ML for fighting the covid-19 Pandemic", vol.1, December 2020.



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