Experimental Analysis using Deep Learning Techniques for Safety and Riskless Transport - A Sustainable Mobility Environment for Post Covid-19

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Abstract -Safety living in the society is the greatest challenge due to COVID-19. Transportation has a crucial role in ensuring the safety of society. To bring back the normality of the society after COVID-19, proper wearing of a mask and strict distancing can play a vital role in the solutions of environment and health. Hence the development of smart and riskless transport with active surveillance of passengers to enforcing the wear of mask and maintaining the social distance can be attained through deep learning algorithms (thermal imaging and sensor technologies). In this proposed work, the various image patterns have analyzed using deep learning algorithms. Passengers' health and count inside the bus are measured using sensor technologies. Hence the development of this model has capable of ensuring social distancing among the people and avoiding the crowd for riskless transport.

Keywords — *COVID-19; Deep learning; Sensor Technology; Thermal imaging; Riskless Transport; Smart Bus*

I. INTRODUCTION

Mobility of the people through transport is an important issue for the spread of COVID -19. Sudden behavioral change among people is not possible. But most of the people are adapted for the new constraints which mean people changed their routine life and consumption procedure of household. So purchasing in supermarkets is reduced to online shopping. Some of the people cultivate their own fruits and vegetables on the farm. But in this situation, governments are decided to relax the restrictions for their purposeful journey and reopen the supermarket's educational institutions and industries. So the role of transport for individual travel preferences is the crucial part. Here deep learning technology is incorporated for ensuring the proper wear of mask to ensure safety and social distancing. A separate web system was also developed with a counter to know about the location of the bus and passenger count inside the bus. This leads avoiding the unnecessary crowd and also enforcing the distance with safety precautions. This article mainly focuses on these problems, all Government has resumed operation of buses almost all routes. If there are more passengers in a bus without social distancing and there may be more cause of spreading covid-19 Some people do not use mask properly, due to that those who are using mask properly also can be infected There is a need for manpower interruption to monitor the passenger's safety. Human body temperature is set in Folaida sensor which measures the body temperature of passengers while entering the bus. With the help of temperature, the passengers can be filtered and then allowed inside the bus so that passengers can travel safely. The image processing camera detects the number of passengers inside the bus so that the protocols of social distancing are followed by limiting the number of passengers.

II. LITERATURE REVIEW

[1] A time-consuming and stressful job for drivers is looking for an available parking spot, which often contributes to massive quantities of fuel wasting. As the COVID-19 crisis steadily resolves, far from being fixed, foresee a increase in the use of private vehicles relative to public transport, which would further aggravate the issue. [2] This paper presents the complex modelling and control simulation of the robotic chair-arm of One Degree of Freedom (robotic arm attached with a special chair). The control structure is equipped with two-position and velocity control compensators. The results of

the simulation demonstrate that the proposed device has strong potential to provide automated recovery therapy for the lower limbs, especially for the range of motion exercises for the knee joint.

[3] A worldwide pandemic pestilence has been brought about by Coronavirus sickness 2019 (COVID-19), and transportation networks have assumed a critical job in the spread of COVID. Albeit not confined like a transport or a metro vehicle in a kept region, clients of bicycle sharing would be associated with the outside of the bicycle and face the challenge of transmission. Instructions to fulfill purchaser interest and quit spreading infections has been a significant issue for bicycle sharing during the COVID-19 pandemic. [4] The objective of this paper is to introduce an IoT risk examination and utilize a profound learning strategy to address digital inconsistencies, at that point test it by assessing its measurements. A changed rendition is utilized for the Stacked Autoencoder to improve the exactness of the location of the assaults distinguished, by utilizing the misfortune as a limit over the preparation results. Contrasted with past ones, our strategy offers an improved outcome that corresponds to 90 percent precision.

[5] In the type of agreeable wise vehicle frameworks (C-ITS), wired and self-sufficient driving is an arising territory in the field of exploration on vehicle frameworks. Availability by vehicle-to-vehicle and vehicle-to-framework (V2X) network presently takes into account contact and cooperation between entertainers' in-vehicle frameworks. Testing and evaluation are needed before the execution of C-ITS applications to guarantee the goals of C-ITS, which are more secure and more compelling vehicle frameworks. [6] Against the context of growing advancement in AI science, combined with the growth of AI technologies in decision-making processes, security-critical domains, as well as ethically related frameworks, a wide-ranging discussion has arisen across numerous disciplines on potential safety initiatives affecting corresponding long-term and short-term problems. In this context, one important subject discussed by numerous AI protection researchers is, for example, the AI alignment question for which no final consensus has been achieved.

[7] Decision-making and choice of action combine declining situational risks and operating restrictions to ensure protection. In that sense, neither current application-related safety requirements nor scenario simulation or information representation is commonly considered. This article presents an advanced technique known as Safety-Driven Behavior Control that centers on situation reenactment and the subject of the depiction of data in its sub-capacities in the light of situational hazards. [8] The steady properties of fluffy thinking and neural organizations are combined with FCM. A decent learning method for unaided instructing might be applied to deliver the disadvantages and to expand the presentation of FCM. A choice framework is recommended here with an FCM subject to human mastery and experience, taught utilizing a solo Non-direct Hebbian learning calculation. Through this work, to know the purposes behind the accident,

the Hebbian calculation on Non-straight units is utilized for preparing FCM. [9] An Intelligent Transportation System (ITS) is an impelled program that endeavors, without embodying data, to get ready new offices, to relate to the various vehicle and traffic the executives' strategies, and to permit recognized clients to be the best point by point and to make transport frameworks more steady, more arranged and that's just the beginning 'quicker witted' use. The machine comprises generally an On-Board Unit (OBU), a SmartLicense-(SL), a PC, and Road Side Units (RSUs).

[10] The recommended structure centers explicitly around the fields of vulnerable side ID, sleepiness, and fire and liquor recognition. Through the help of a regulator, these issues can be redressed utilizing various sensors. The signs are utilized to caution the driver and the travelers and guarantee their wellbeing. The sign got from the sensors is taken care of by the regulator and the regulator makes the important move. This security framework is applied to the vehicles by making them aware of deflecting impacts. [11] This paper illustrates an inquiry into methodologies that take care of mechanisms to detect, quantify, and mastermind plant contaminations from electronic photographs in the undeniable range using a propelled picture. Despite the way that signs of affliction can occur in any part of the plant, only programs that analyze unquestionable symptoms in leaves and stems have been taken into account. The suggested plan or separated as acknowledgment, severity assessment, and structure in three groups according to the objectives.

[12] A persuading weighting approach is proposed to depend on their arranged thickness to influence SRNs. Additionally, the model is designed for joining numerous gatherings. This plays an intensive preliminary investigation of the proposed arrangement against current positioning expectation and item suggestion gauges, utilizing created and two certifiable information assortments (Epinions and Flixter). Our preliminary outcomes show that our assessment of the Social Union is consistently enticing in estimating evaluations and appraisals. [13] This paper exhibits a rating framework for pre-arranged Convolution Neural Network (CNN) models that have maintained facial acknowledgment. It is significant for the Intelligent Person and Computer Interface (HCI) that the PC comprehends human outside appearances. With HCI, the distance will diminish among PCs and people. Bypassing judgment on their looks, the PCs will connect with people in an extra appropriate manner. Various conventions happen for outward appearance following human explanation and after notice results.

III. PROPOSED MODEL

The counter is fixed at the entrance of the bus. It counts the number of passengers who entered the bus. If fixed counts exceed it gives notification as buzzer sound. So the conductor will not allow passengers. Using the camera and image processing techniques, it is possible to detect whether passengers are wearing the face mask or not. For safety

precaution, passengers were sanitized while entering the bus. Using a thermal scanner checks the passengers' body temperature [14 -15].

The object which is detected with a temperature above absolute zero (-273.15 ° C) will emit IR (thermal radiation). IR is of 0.7um-1000um wavelength, which is invisible to the human eye and emits different wavelengths according to external temperature. After absorption of IR, the temperature of the heat-sensitive material will increase, and then the thermal imaging camera will then produce the corresponding temperature. For example the human body, (oral- 35.8 ° C to 38 ° C, forehead- 35.8 ° C to 37.8 ° C, face - 32 ° C to 36 ° C). On detecting human body temperature measurement big data, it is mapped to this algorithm [16-17].

If the body temperature exceeds the normal means the conductor will not allow him/her to travel on this bus. The people who are using public transport regularly can be benefited from this proposed model. Through this mode; schools and college students will travel without any fear and risk. This service is very crucial in this COVID situation and this will be accepted by all the peoples. It can be planned to collaborate with the government transport corporation, schools, and college institutions in-order to implement this service.
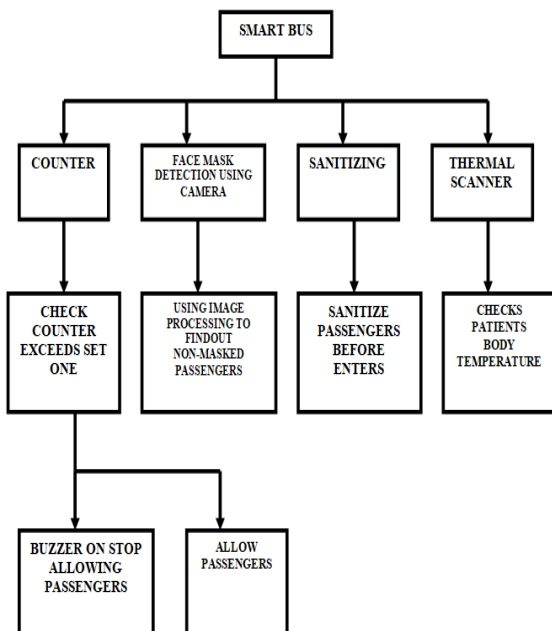

Figure 1: A Safety and Riskless Travel Block Diagram

Implementation of this technique involves different stages like a train the model to face mask detection and apply the face mask detection.
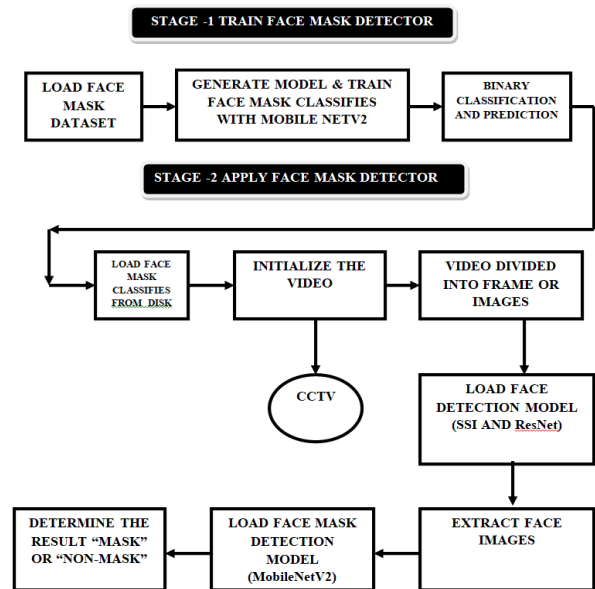

Figure 2: Flowchart for Identifying Face Masks

Mask detection has can be validated in the open and closed environments which validate the mask detection and social distancing. If the model is validated in the closed environment then algorithms will be trained to detect the mask and face recognition. This can be stored in the cloud database.
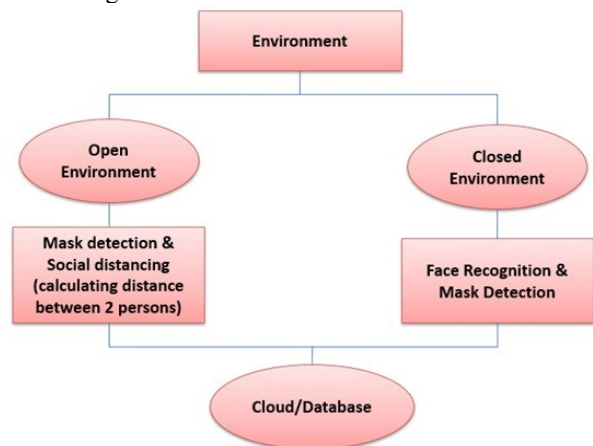

Figure 3: Types for Face Mask Detection

In the hardware system, the artificial neural network has been implemented in the form of software with some process data for training the model. It has the capability to map the nonlinear variables with a set of simple neurons and the complex behavior of the model also can be described. In face mask detection there are two stages, one is training for deep learning classifier and another one is applying the deep learning classifier on test data or images extracted from the CCTV.
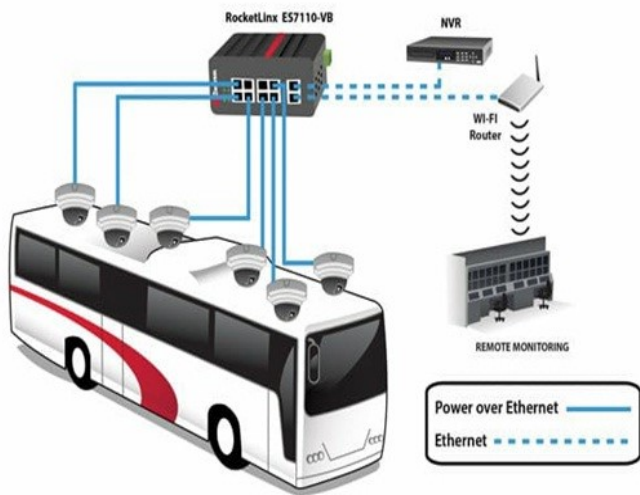
Figure 4: Model of Implementation

IV. DEEP LEARNING CLASSIFIER TRAINING DATASETS

For data preprocessing it needs huge data or images of a person with and without a mask so the images of a person with and without a mask are taken from mask face net data Kaggle. The data set consists of two categories one is the person with a mask and another one is the same person without a mask. Categories with mask consist of 958 images and without mask consist of 1048 images.
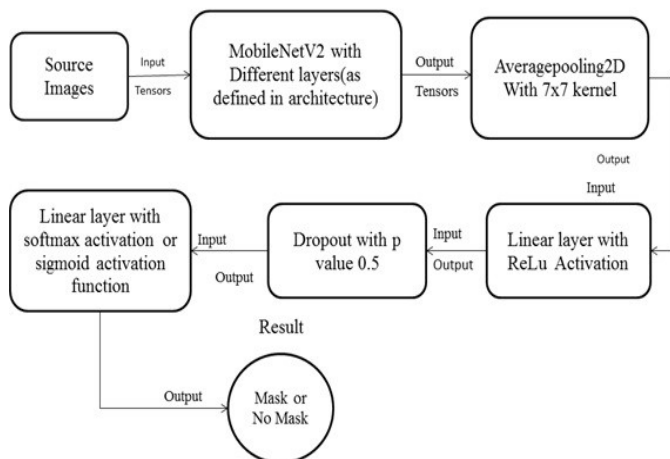

Figure 5: Face Mask Recognition based on Neural Network

In data preprocessing with help of datasets of a person with and without mask needs to generate a model after generating a model to train it with help of deep neural network MobileNetV2 which is actually a classifier for classifying the input tensor image of a person's face neither masked nor not masked. In the deep learning algorithm, transfer learning is used, for example, there is the model used for classifying either the given image is cat or dog so in this case, the

problem is the same but classification categories are different. In the neural network fully connected layer changed with Rectified Linear unit (ReLu) activation and also made changes in the last fully connected layer with softmax activation. Probability for the binary classification uses a fully connected layer with sigmoid probability. After the training model, it predicts by input images of a person with and without a mask. In this below figure can infer the accuracy of predicting the epoch set for face mask detection is 20 and INIR_LR (the initial learning rate for face mask detection is 1e-4).

V. APPLYING TEST DATA ON DEEP LEARNING MODEL

Mobilenetv2

The ideas are collected from mobile Net V1 and construct mobile netV2, which is efficient building blocks and uses depth-wise separable convolution and also the new features are introduced by V2
1) *In between the layer has linear bottlenecks*
2) *In between the bottlenecks has Shortcut connections.*

Many layers are listed below for mobile net V2. Instead of constructing their own model, the models can be extracted from the torch vision library in Pytorch and can create the mobilenetV2. Based on the image net data set, the model weights are predefined. The selecting algorithm must be capable to develop a model that extended to the mobile device. Generally, the model weights pinned the I/O channels, kernel size, strides, and padding. The developed model has various layers, but the last layer of Softmax activation has the result of binary values. It means for this application, the probability between the two classifications that is Mask or No Mask
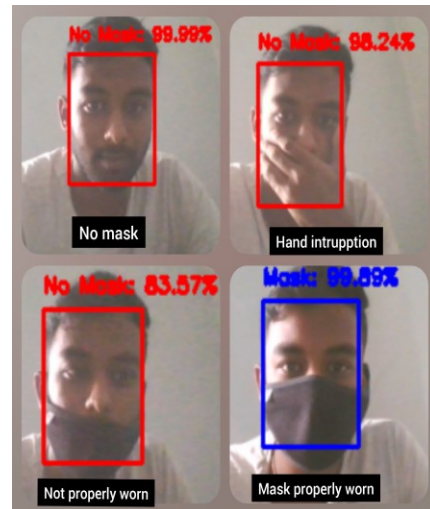

Figure 6: Experiment Results

In this first stage, it has to initialize the video stream or CCTV, that image is fitted in the bus and video will be captured. Actually, video is a sequence of images or frames, from this sequence, the images are extracted for frames. In the

extracted from it has to take Region of Interest (RoI) which means the people face from the extracted frames .To extract face from the image, extracted images are loaded for the face re-organization model (Rest Net) which will detect face from the extracted images and make boundary boxes in the extracted frames of the person faces so that extracted face image of boundary boxes are trained with deep learning classifier. The MobileNetV2 will classifies the given extracted face images and identified whether the person worn the mask is proper or improper.

Figure 7: Degree of Accuracy

VI. CONCLUSION

In this pandemic situation, the mobility of passengers and transportation are critical. The developed model ensured the safety and riskless transport for the sustainable environment with GPS and image pattern analysis using deep learning techniques. Besides, the passenger's healthiness is also considered by the use of sanitizer and body temperature scanning. This model provides better safety precaution and also avoid crowd based on the passenger's count.

VII. FUTURE SCOPE

In the future development, the website and then the mobile application is been created for the benefit of the passengers. Through this app, passengers can know the actual location of the bus and also they can view the count of passengers inside the bus by deploying a GPS module. By updating the count of passengers inside the bus every second on the website or application the crowd can be controlled and therefore social distancing is been maintained so that passengers can be travelled without any fear.

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