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FACE MASK DETECTION AND SAFE SOCIAL DISTANCING IN PUBLIC AREAS FOR COVID-19

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ABSTRACT

The global pandemic of COVID-19 has severely impacted the world and has now infected more than eight million people worldwide. Wearing face masks and following safe social distancing are two of the enhanced safety protocols need to be followed in public places in order to prevent the spread of the virus. To create safe environment that contributes to public safety. The proposed work has an efficient computer vision based approach focused on the real-time automated monitoring of people to detect both safe social distancing and face masks in public places by implementing the model on raspberry pi4 to monitor activity and detect violations through camera. After detection of breach, the raspberry pi4 sends alert signal to control center at state police headquarters and also give alarm to public. In this proposed system modern deep learning algorithm have been mixed with geometric techniques for building a robust modal which covers three aspects of detection, tracking, and validation. Thus, the proposed system favors the society by saving time and helps in lowering the spread of corona virus.

INTRODUCTION

Since the end of 2019, infectious coronavirus disease (COVID-19) has been reported for the first time in Wuhan, and it has become a public damage fitness issue in China and even worldwide. This pandemic has devastating effects on societies and economies around the world causing a global health crisis. All over the world, especially in the third wave, COVID-19 has been a significant healthcare challenge. Rising numbers of cases and stretched health facilities, as well as the lack of a vaccine throughout 2020 and difficulties associated with achieving herd immunity for COVID-19.Therefore , to prevent rapid COVID-19 infection, many solutions, such as confinement and lockdowns, are suggested by the majority of the world's governments .Suggested using social programs such as emergency relief funds and unemployment insurance to lower the costs of compliance, particularly for lower-paid workers . As vaccines became available at the end of 2020.

LITERATURE REVIEW

Presented accumulative article that contains the different categories of COVID datasets available. These datasets are publicly available open source data. The listed sequence of data hold the X-rays images, CT scan images, in few cases with health background is narrowed then MRI images are also used. Another set of data set used for COVID analysis is textual data based on discussions, medical suggestions made on social media etc. Clinical test results and reports are also considered in many data set windows that are utilized for analysis of diagnostic procedures. Evaluated a virtual social distancing model that helps out the peoples being alerted in the public places. They graphically represented four types of spacing calling intimate space , personal space, social space and public spacing .Based on distance measurement rule ,the spaces are measured. The procedure belongs to scene understanding and geometrical measurement, homograph estimation, metric references and density estimation etc. these analysis consists of two dimensional people detection and multiple angle people processing applications. The system determines the image enhancement procedures , image segmentation, applying filters and evaluating the task that helpful for analyzing various parameters of the images. The presented system deals with radiation based medical images and handling procedures. Reconstruction of images with reduced resolution also determined. For various image related unique steps the journal provides the hints and suggestions. Although the computation time and process lots of effort, the result of the proposed study offers valuable suggestions on choosing the right machine learning algorithm for research. The supervised models and unsupervised models are clearly depicted with comparative results.

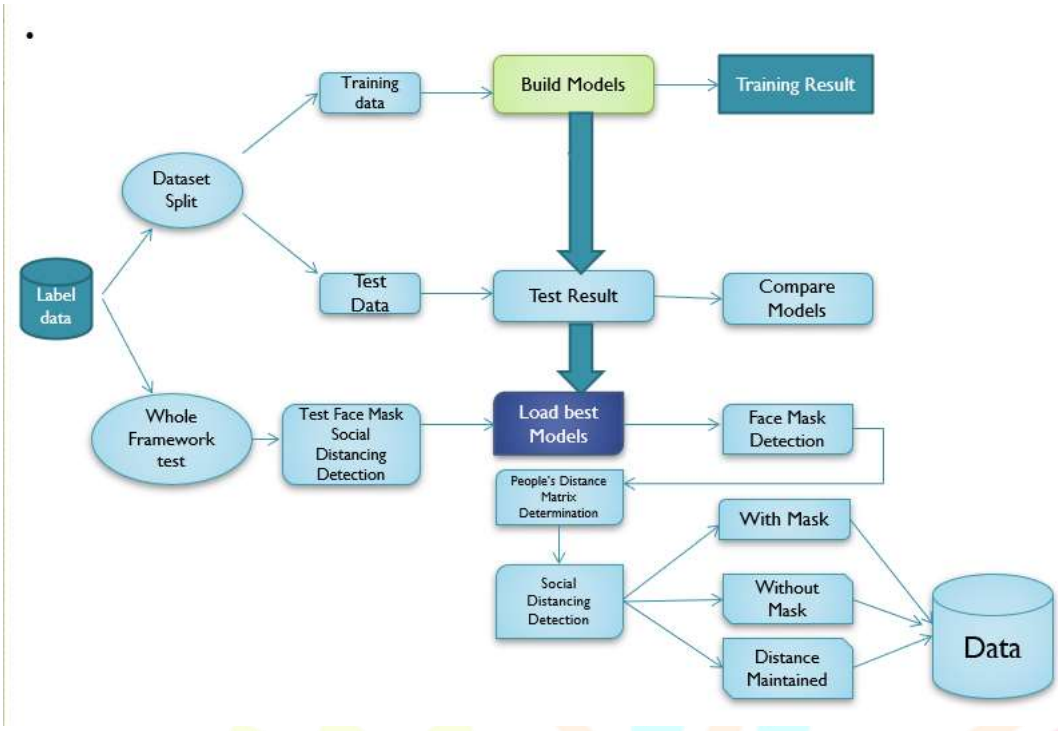
PROBLEM IDENTIFICATION

Many shutdowns in different industries have been caused by this pandemic. In addition, many sectors such as maintenance projects and infrastructure construction have not been suspended owing to their significant effect on people's routine life. It is an emerging respiratory infectious disease caused by Severe Acute Respiratory Syndrome Coronavirus2(SARS-CoV-2) All over the world, especially in the third wave, COVID-19 has been a significant healthcare challenge. According to the centers for Disease Control and Prevention (CDC), coronavirus infection is transmitted predominantly by respiratory droplets produced when people breathe, talk, cough, or sneeze with common dropletsize5–10'mbutaerosolemissionincreases. Prevent rapid COVID-19 infection, many solutions, such as confinement and lockdowns, are suggested by the majority of the world's governments.

PROPOSED METHODOLOGY

Thermal screening is done using handheld contactless IR thermometers where health worker need to come in close proximity with the person need to be screened which makes the health workers vulnerable to get infected and also its practically impossible to capture temperature for each and every person in public places, the proposed use-case can be equipped with thermal cameras based screening to analyze body temperature of the peoples in public places that can add another helping hand to enforcement agencies to tackle the pandemic effectively We will know the age and gender of those who are not wearing masks so that we can educate them. it will be easier for them to run a campaign. Signature is done on the register for attendance and either through bio metric, due to which there are more chances of getting corona Instead there should be attendance with face detection and body temperature. A large amount research has been conducted on detecting facemasks and tracking social distancing violations, but none of it has succeeded in an integrated system for both. Here , the authors have proposed an integrated approach for detecting face masks on humans and monitoring social distancing violations.

OVERALL ARICHTECTURE



MODULE DESCRIPTION

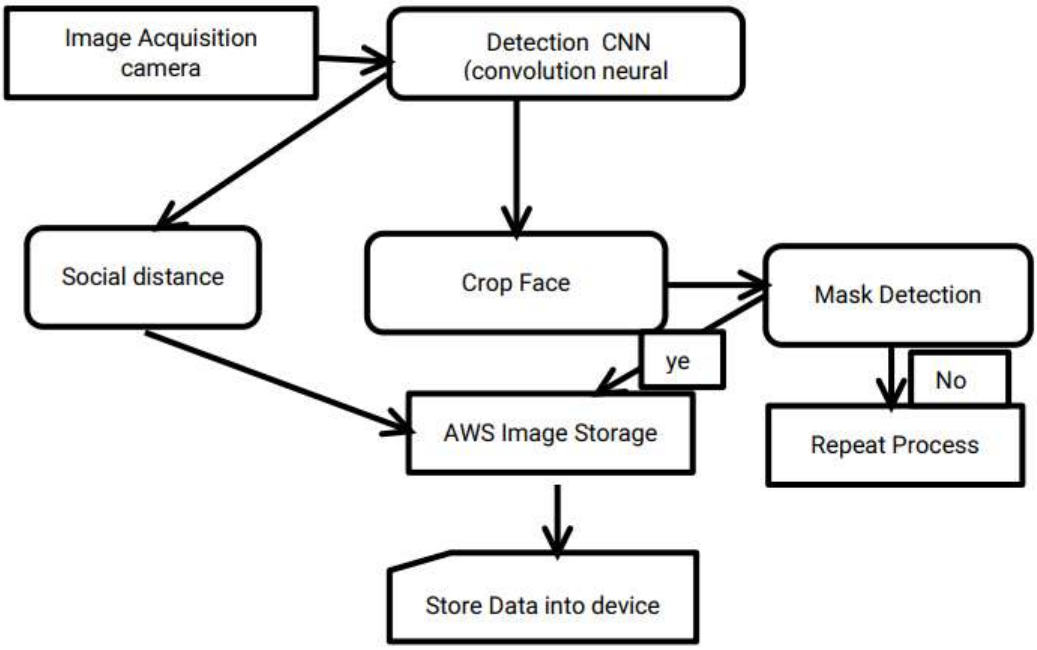
The CNN which is the key construction block of any convolutional networks. The main goal of CNN is to take out features from the image's data . The classification layer is habitually the last layer in a CNN. Soft max function is utilized generally in CNNs, in order to match normalized values of the previous layer to allow distribution of above-predicted class scores. Equation designs the soft max function. Illustrates an example of faces wearing and not wearing masks. The experiments of this research are conducted on one original dataset. It comprises two categories. This dataset is used not only for training and validation, but also for testing, and if an individual is wearing a mask or not, then the social distance between two individuals will be estimated. Accuracy is the overall number of the correct predictions fractionated by the whole number of predictions created for a dataset.

Accuracy = TP+TN/(TP+FP)+(TN+FN)

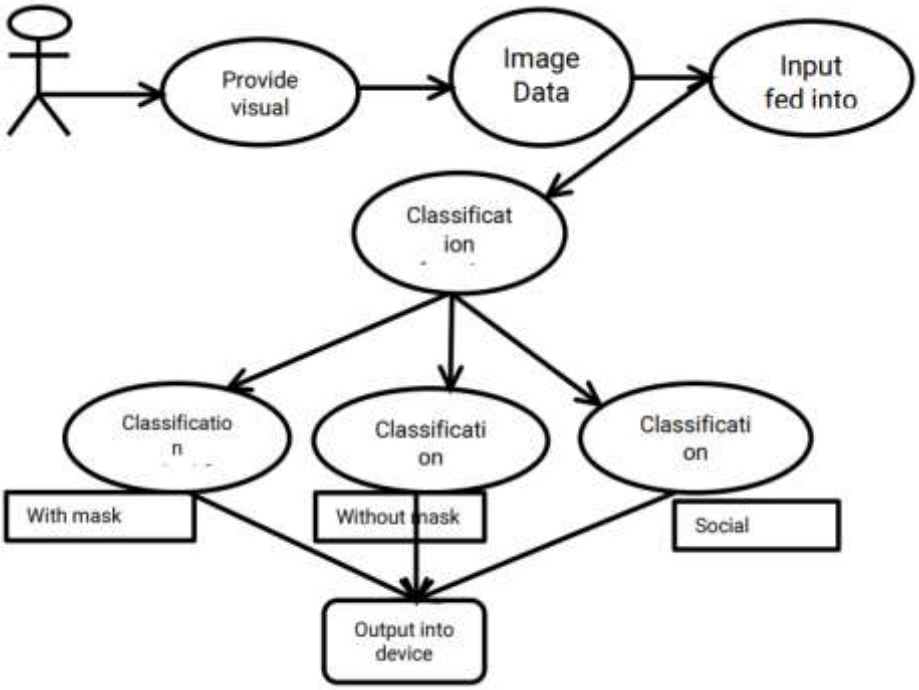
PRECISION = TP/(TP+FP)

RECELL = TP/(TP+FP)

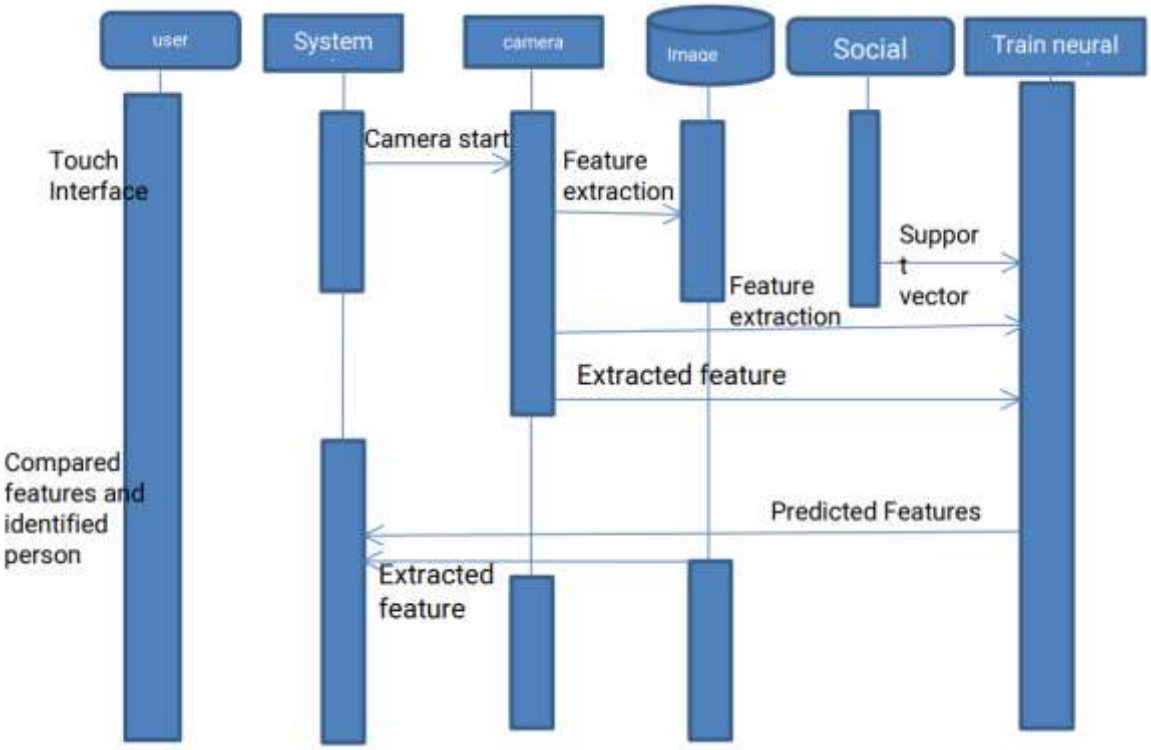
FLOWCHART



USE CASE DIAGRAM



CLASS SEQUENCE DIAGRAM



Convolutional Neural Networks

A convolutional neural network is a series of convolutional and pooling layers which allow extracting the main features from the images responding the best to the final objective. In the following section, we will detail each brick along with its mathematical equations. Computer vision is a sub field of deep learning which deals with images on all scales. It allows the computer to process and understand the content of a large number of pictures through an automatic process. The main architecture behind Computer vision is the convolutional neural network which is a derivative of feed forward neural networks. Its applications are very various such as image classification, object detection, neural style transfer, face identification. If you have no background on deep learning in general. Neural network is a sequence of regressions followed by an activation function. They both define what we call the forward propagation. W^{[i]}W[i]and b^{[i]}b[i]are the learned parameters a teach layer ii. The back propagation is also a sequence of algebraic operations carried out from the output towards the input.

It's computed using the all the neuron soft he previous layer as follows z1[2]=∑l=13w1,l[2]ai[1]+b[2] a^{[2]}_1=Ψ(z^{[2]}_1) →a1[2]=ψ[2](z1[2]) In general, considering the j^{th}jth node of thei^{th}it layer we have the following equations zj[i]=∑l=1ni−1wj,l[i]al[i−1]+bj[i] a^{[i]}_j=ψ{[i]}(z^{[i]}_j)→aj[i]=ψ[i](zj[i]) Deep learning is as field of the Machine Learning Science which is based onartificialneuralnetworks.IthasseveralderivativessuchasMulti-Layer Perceptron-MLP-,Convolutional Neural Networks -CNN-and Recurrent Neural Networks-RNN-which can be applied to many fields including Computer Vision, Natural Language Processing, Machine Translation. Deep learning is taking off for three main reasons In active features engineering: while most of machine learning algorithms require human expertise for the feature engineering and extraction, deep learning handles automatically the choice of variables and their weights Huge Datasets: the continuous collection of data has led to large databases which allow deeper neural networks Hardware evolution: the new GPUs, for Graphical Process Units, allow faster algebraic calculation which is the core base of DL It is able of mathematical operations linking between entities When including more description about the house by adding more Σ Neuron Input X Output y Mathematical Operation variables, the graph be comes as follow.

Convolutional layer

As we have seen before, at the convolution all layer, we apply convolutional put followed by an activation function \psiψ. More preciously, at the^{th}layer}lth layer, wed note.

Input:a^{[l-1]}a[l−1]with size(n_H^{[l-1]},

n_W^{[l-1]},n_C^{[l-1]})(nH[l−1],nW[l−1],nC[l−1]),a^{[0]}a[0]

being the image in the input.

Padding:p^{[l]}p[l],stride:s^{[l]}s[l]

Number of filters:n_C^{[l]}nC[l]where each K^{(n)}K(n)has the Filter F=3,f=3,nc=3 Nh=6,nw=6,nc=3,p=0,s=1

dimension:(f^{[l]},f^{[l]},n_C^{[l-1]})(f[l],f[l],nC[l−1]) Bias of the n^{th}nth

convolution:b^{[l]}_nbn[l]

Activation function:ψ[l]Output:a^{[l]}a[l]withsize(n_H^{[l]},n_W^{[l]},

n_C^{[l]})(nH[l],nW[l],nC[l])

- **And we have**

∀n∈[1,2,...,nC[l]]
conv(a[l−1],K(n))x,y=ψ[l](∑i=1nH[l−1]∑j=1nW[l−1]∑k=1nC[l−1]Ki,j,k(n)ax+i−1, y+j−1,k[l−1]+bn[l])dim(conv(a[l−1],K(n)))=(nH[l],nW[l])

Thus:

a[l]=[ψ[l](conv(a[l−1],K(1))),ψ[l](conv(a[l−1],K(2))),ψ[l](conv(a[l−1],K(nC[l])))]d im(a[l])=(nH[l],nW[l],nC[l])

with nH/W[l]=⌊s[l]nH/W[l−1]+2p[l]−f[l]+1⌋;s>0=nH/W[l−1]+2p[l]−f[l];s=0nC[l]=num be off ilters Filters with

(f[l]×f[l]×nC[l−1])×nC[l]parameters.

Bias with(1×1×1)×nC[l]parameters(broadcasting)

RESULT AND DISCUSSION

This method is developed with an efficient way for the people who are not wearing face mask and not maintaining social distance and Notified to officials by email. As a future enhancement, we can predict/detect time at which it gets crowded and heat map can be plotted in an accurate way. The proposed new idea of face mask detection scheme is discussed in Detail at the previous sec . even through many case studies enrolled to show off the real time scenario of COVID-19 situation, it is quite Challenging in terms of implementation of the systems in real time Developing the systems that is flexible for all the environments, adaptable changes are become challenge. the proposed model could be installed in major public places to keenly monitor the human beings. Violation is expected at any cost, we suggesting the cloud based approach that host the current level off followers and number of peoples failed to follow, regardless of age, location etc. Will be reflection globally. IOT implementation creates awareness To global users and increasing the system accuracy and monitoring span will improve the situation.

The analysis results should be publicly available to access so that the System is tunable to future expectations.

CONCULSION

Depth the tracking of social distancing and the identification of face masks that help to ensure human health. The implementation of this solution was successfully tested in real-time by deploying model in raspberry pi4.The solution has the potential to significantly reduce violations by real-time interventions, so the proposed system would improve public safety through saving time and helping to reduce the spread of coronavirus. This solution can be used in places like temples, shopping complex, metro stations, airports etc. It can be used in smart city innovation, and it would boost up the development process in many developing countries.

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