PREDICTING HUMANS FROM SPREAD OF DELTA VARIANT TYPE COVID-19 VIRUS BY EMBEDDED WITH FACE MASK DETECTION AND RECOGNITION USING MACHINE LEARNING TECHNIQUES

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ABSTRACT:

In the world, viruses like Covid-19 emerge causing health emergencies, pandemics, discomfort and poor financial conditions. Due to changing structure of the virus, pharmaceutical companies are working hard to develop effective treatments. It has taught the importance of safety precautions. Present paper proposes an innovative method to automate face mask detection with biometric attendance. Proposed method works in four phases. In the first phase, images of all individuals are collected and stored in a centralized database. During second phase collected image samples are loaded in to a model for training and a separate suite is maintained for every individual. In the third phase employee' images are collected and checked with centralized database to prepare a list of employees not wearing face masks. In the fourth phase prepared list is displayed using visualization techniques and implementation is done using machine learning classification algorithms. This method helps to trace the employees not wearing masks during working.

Keywords*: Machine learning, Image processing, Covid-19,Delta variant, Mask Detection, Health Emergency, Classification Algorithms.*

I.Introduction

In the month of February 2020 in China Wuhan megacity blazoned strict cinch down it will give sign of nimbus contagion to world that will constitute a big health exigency epidemic situation. First the contagion is named as 2019nCov and latterly it's began as SARS- Cov2 [17]. After February 2020 contagion spread too numerous countries in the world and contagion also affect more on frugality. Corona contagion belonging to SARS category of contagion, it may prompt on RNA systems of mortal body and length of contagion is 30 kilo base. Corona contagion is began in catcalls and as well as in creatures [17]. Before 2012 seven types of nimbus contagion are linked (SARS- COv1). The contagion goods on mortal RNA system and those who are having lower vulnerable power are affected more on this kind of contagion. In December 2019 Wuhan virology lab SRAS- Cov2 contagion linked [17].

In demitasse Wuhan numerous members are admitted to sanitarium in the month of December 2019 with new symptoms and all these members has direct contact or indirect contact linked to meet market in Wuhan. Thereafter each and every day cases are increased tremendously and lockdown declared by government of Wuhan. China declared that all these cases are belongs to nimbus contagion named SARS- Cov2 in January 2020 [4]. At the same time World Health Organization (WHO) scarified the World in future there must be a big health emergency. Trials are conducted on SARS- Cov2 in numerous laboratories and they linked the size of the contagion periphery is from 49 to 110 nm.

Corona contagion (lately named as 2019- nCoV), a new Covid infection and rate mortality is very high which in turn arises epidemic situation. As of March 9, 2020, COVID- 19 has fast spread to almost 102 nations and almost 4271 passed away with covid-19 virus. As on the day there was no appropriate treatment unequivocal for COVID-
19. Current drugs are generally reflective. Enhancement of feasible evasion and treatment is a humorless need, particularly for cases with high infections [5].

Corona contagion is bringing about by severe violent respiratory complaint Covid-19 (SARS- CoV-2). Multitudinous COVID- 19 cases promote violent respiratory misery complaint   (ARDS),
which prompt blood clot which supply from legs to lungs and which in turn damage kidney functioning, liver system, and heart conditions [6]. Jyothi et al. [7], researchers conducted survey on covid-19 cases and to reduce number of cases better to increase more number of tests to lift pandemic situation and suggested deep learning technique to analyze patient's images to confirm covid-19 [19]. Experimenters worked on patient casket images using deep learning techniques, they conducted experiments over thousand patient's images, samples of images are collected from both healthy and unhealthy suspected people, and metrics are used to calculate both specificity and sensitivity. In their proposed research model they have used more than hundred layers to study cases to confirm whether patient effected with covid-19 or not affected.

As of now all studies on covid-19 shows that virus infection from person to person when they are contacting in the form of vomits or drops and also virus spread to others through noses, mouth, and eyes [10]. Infection from covid-19 patient to others when they are within one meter diameter range, those who are affected must be in isolation mode at least fifteen day, and try to avoid contact with others. WHO also suggested to everybody that everyone must follow some precautions like wash hands every fifteen minutes, try to use sanitizer, mandatory to wear masks, follow social distance, try to avoid long journey, and so on [18]. WHO also made some suggestions to covid-19 patients like fifteen days isolation, stay away from others, and try to take non vegetarian food, use medicines continuously, and all these measures useful to prevent transmission of virus to other individuals [15]. When covid-19 virus identified from that day onwards WHO is giving time to time guidelines to protect individuals from virus, WHO suggested using N95 or equal quality mask by doctors and public to stop spread of virus.

WHO also suggested to vaccinate all peoples which will in turn enhance immunity that will fight with virus, but there is no guarantee vaccine may not cure covid-19, only way to protect from delta variant is to follow WHO

timely guidelines such as frequent hand wash, wear hand glove, wear N95 mask, follow two meter distance, and so on. Covid-19 raises a big world emergency and still the position is out of control [20]. In this research paper we are using IOT and application to trace out covid-19 patients in an organization at early stage and which will in turn useful to predict the risk of affecting covid-19 virus from other persons. In this research paper we proposed new model of face recognition system embedded with face mask detection to know exactly who are not wearing face mask on a particular time period, also take action on those employees, and these method will help any organization to control spread of any dangerous virus.

II. Related Work

Covid (CoV) are positive-abandoned RNA infections with a put the finishing touch to look under an electron magnifying lens because of the occurrence of spine glycoprotein on the cover. ☐CoV family is additionally partitioned into five categories [10]. Genomic portrayal has exposed that bat are the plausible quality wellsprings of ☐CoV and ☐CoV. Going against the norm, avian varieties appear to address the quality wellsprings of ☐CoV and ☐CoV. CoV have turned into the significant microbes of arising respiratory illness flare-ups [7]. Individuals from this enormous group of infections can cause respiratory, intestinal, hepatic, and neurological sicknesses in various creature species, including dairy cattle, camels, bats, and felines [4]. Because of reasons yet to be made sense of, these infections can cross family affect on persons, sickness going from the normal cold to grim illnesses like CoV, αCoV, βCoV, δCoV, and γCoV. So far seven types of Covid virus has been discovered which effected to human body [9].

SARS type of virus where identified from 1961 and remaining are all identified in the recent decade only [14]. In 2019 identified SARS family of virus is named as SARS_Cov2 and which is more intelligent than βCoV which has similar gens but more dangerous than SARS_Cov2 and which change RNA structure [8]. Shape of virus is round and width is approximately 65 to 134 mm, when infected it replicate them self with heavy temperature, research work is also carried out by many researches to deactivate temperature of
SARS_Cov2 when they are replication process, and when it is on steel structure to deactivate temperature nearly half an hour time is required [1]. To deactivate virus infection chemical are used and some of them are ethanol, sanitizer with chlorine, and etc.

From the beginning to till date of SARS_Cov2 it is identified as genetic transmission from each person to others and SARS_Cov2 some of the researchers stated that it is mostly developed from damage cells and can be treated as bats [9]. Researchers conducted experiments on SARS_Cov2 group of virus which is affected on humans and β CoV are almost bats of type ratg13. SARS_Cov2 is more dangerous bats affected to scaly anteater, badger, and then humans [3]. WHO released a report on starting point of SARS_Cov2 is from 2019 December with uncertainty situation. This WHO report given a chance of investigation of starting point of SARS_Cov2 infection, how virus is spread to others, how it is transmitted from one to other, and what are all the sources of this virus [13]. Before SARS_Cov2 tending many viruses are identified with different types of gens. SARS_Cov2 viral infection forced world to pandemic and it is new variant of SARS type of virus.

In general people will not take care of heredity, people with case many affect more from

SARS_Cov2, and this virus continuously do mutations until patient enter into serious illness [1, 2]. At the same time different type of variant is identified in humans which endorsed to transmit from dirty and slum areas and this type of virus is not like mutation themselves. From this point onwards different types of viruses are form with different types of mutations and some of them are delta variant, omicron variant, etc [3]. As per WHO reorganization report these types of different viruses may address dangerous impact on human lives. From twenty two years history virus SARS_Cov1 is identified from 2002 to 2003, swine flu is in the year 2009, in 2012 MERS, SARS_Cov2 in 2019 December, SARS_Cov2 has spread to all the countries of world and millions of cases where reported and millions of peoples are expired due to SARS_Cov2 [4].

As per WHO news updates SARS_ Cov2 spread to almost all 220 countries in the world which implies world to epidemic, with in no time period various changes its position to omicron first identified in multiple countries on 24th November 2021, delta variant, αCoV identified in UK on 18th December 2020, βCoV identified in South Africa on 18th December
2020, δCoV identified in India on 11th May 2021, and γCoV identified in Brazil on 11th January 2021, and these variants are spread to all countries in the world. Large number of cases reported due to these variants in USA, second placed Brazil, and next place is India [12]. The USA reported almost 400000 people are passed away due to Covid-19 variants. WHO reported more patients are in causality due to many health conditions like hidden health situations, serious health sickness, and symptoms may change country to country and enable to find structure of virus [5].

The over aged persons are effected more due to these virus and that to those we are already suffering with other diseases like heart disease, kidney problems, diabetic type 1 and type 2 patients, patients

with lung infection, drinkers, smokers, and patients suffering with genetic problems [6]. The rate of patients hospitalized due to covid- 19 is increased rapidly day by day, the countries which are having limited medical or limited beds or limited testing labs are suffered more with these virus [7]. The WHO released a report on covid-19 that states that contamination of these disease to other persons is almost in multiples and also the rate of effect on males or more when compared with females. As per USA report the death rate of male patients around 15% and death rate of females is approximately 10%. The total structure and design of this virus are useful to strong itself and transmitted from human to human [11].

III. Face Mask Detection Technique

Covid-19 virus is spread fast from one person to others due to non maintenance of covid-19 protocols, physical contact, and non maintenance of incubation period that is approximately one week, non maintenance of social distance, crowd on vegetable and meat markets, droplets, sharing of materials physically, get together parties, shake hands, marriage events, touching equipments physically, money circulation in public, covid-19 patient travelling to different areas, and so on. Due to all these factors virus is transmitted from one to others easily with in no time gap. Covid-19 virus infected to a person from infected person through eyes or nose or mouth or droplets.

In general with help of mask persons are cover only mouth and nose but eyes are also play vital role to transmit virus from one person to others.

In this research, we propose an innovative face mask detection method, and this method consists of four phases. In phase 1, Assign unique id to each and every employee, all employee images are collected three or four times, stored all these images in to a centralized server, complete description of phase 1 is depicted in figure 1.
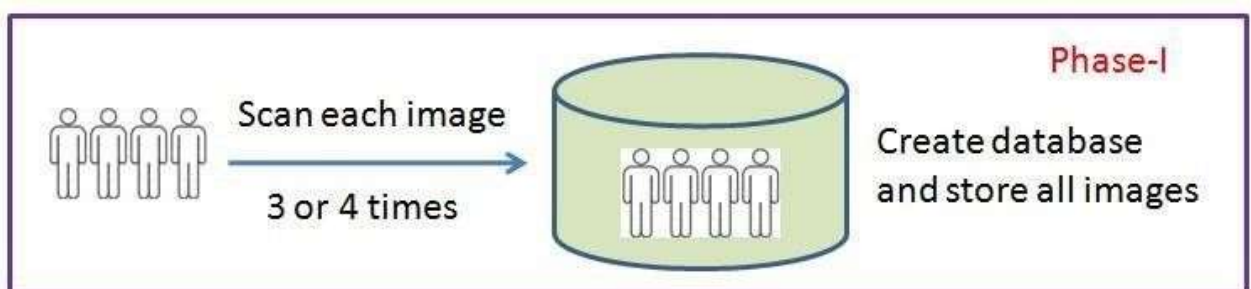
Figure 1: Phase I: Data Collection.

In phase 2, collected image samples are loaded from centralized server to proposed face mask detection module, where separate folder is used for every individual person, after loading images to proposed model it can be applied to training phase, in training phase all images are learned by the system and which is ready to classify, and the complete procedure is shown in figure 2.
Algorithm of load and training model is discussed below.

Algorithm of Load module:

Step 1: load
numpy as np
Step 2: load cv2
Step 3: load os

Step 4: Load
face_Recog as FR
Step 5: Display FR
Step 6: timg = cv2.imread(path\1.jpg')

Step 7: FD, gray_img =
fr.faceDetection(timg) Step 8: display
FD
Step 9:
FR=cv2.face.LBPHFaceRecognizer_create
() Step 10:FR.read (r'Give Path
Here\trainingData.yml')
Step 11:name={0:"Husna",1:"Shivani"}

name={0:"name"

} thats all. Step 12:for face in FD
Step 13: (x,y,w,h)=face,
roi_gray=gray_img[y:y+h,x:x+h] Step 14:
confidence=FR.predict (roi_gray)
Step 15: Display Confidence

Step 16:
FR.draw_rect(test_img,face)
Step 17: predicted_name =
name [label]

Step 18:
FR.put_text(test_img,predicted_name,x,y)
Step 19: RI =
cv2.resize(test_img,(1200,800))
Step 20: cv2.imshow("face
detection ", RI) Step 21:
cv2.waitKey(0)
Step 22: cv2.destroyAllWindows

Pseudo code of Training Model:

Step 1: load
numpy as np
Step 2: load
cv2
Step 3: load os

Step 4: Load
face_Recog as FR
Step 5: Display FR
Step 6: timg=cv2.imread(r'F:\path\main.jpeg')

Step 7: FD,gray_img =
FR.faceDetection(test_img) Step 8:
Display FD
Step 9:
faces,faceID=fr.labels_for_tdata(r'F:\path\image
s') Step 10: FR =
fr.train_classifier(faces,faceID)
Step 11: FR.save(r'F:\path\trainingData.yml')

Step 12: name={0:"sivani",2:"husna",1:"rahman"}

Step 13: name={0:"name"} thats all. Dont write for id
number 1. Step 14: for face in FD: (x,y,w,h)=face
Step 15: roi_gray=gray_img[y:y+h,x:x+h]

Step 16:
confidence=FR.predict(roi_gra
y) Step 17: Display Confidence

Step 18 FR.draw_rect(timg,
face) Step 19:
predicted_name=name[labe
l]
Step 20:
FR.put_text(timg,predicted_name,x,y)
Step 21: RI =
cv2.resize(timg,(1200,800))
Step 22: cv2.imshow("face
detection ", RI) Step 23:
cv2.waitKey(0)
Step 24: cv2.destroyAllWindows
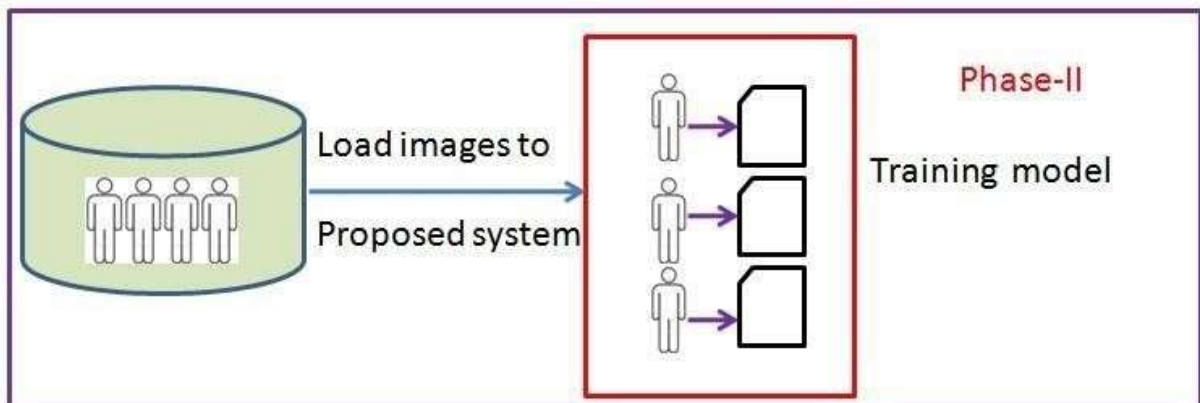
Figure 2: Phase II of proposed model.

 In the proposed model third phase, all persons who are coming or roaming inside of organization images are captured using webcams or face recognition systems or drones, captured images are applied to training phase, which in turn separate persons who are wearing masks and who are not wearing face masks, complete process of third phase is depicted in figure 3, and algorithm used for these process is listed below.

Algorithm Prediction model:

Step 1: load
numpy as np
Step 2: load
cv2
Step 3: load os

Step 4: FD = faceDetection (timg)

Step 5:
GI=cv2.cvtColor(test_img,cv2.COLOR_BGR2GRA
Y) Step 6: FH=cv2.CascadeClassifier(r'F:\
path\HF_alt.xml')
Step 7: faces= FH.detectMultiScale(GI,scaleFactor=1.2,
minNeighbors=3) Step 8: Display faces, GI
Step 9: FD labels_for_training_data(directory):

Step 10: for path, subdirnames, filenames in
os.walk(directory): Step 11: for FN in filenames:
Step 12: if FN.startswith(".") then display missing system file or
otherwise Step 13: id=os.path.basename(path)
Step 14:
IP=os.path.join(path,
FN) Step 15: Display IP

and ID
Step 16: timg=cv2.imread(IP)

Step 17: if timg is None: display "Not Loaded Properly"
otherwise Step 18: faces_rect, GI = faceDetection(timg)
Step 19: if len(faces_rect)!=1:
(x,y,w,h)=faces_rect[0] Step 20: RG=
GI[y:y+w,x:x+h]
Step 21: faces.append(RG)

Step 22: FID.append(int(id)) Step 23: return
faces, FID Step 24: FD
train_classifier(faces,faceID):
Step 25: FR =
cv2.face.LBPHFR_create()
Step 26:
FR.train(faces,np.array(FID))
Step 27: Display FR
Step 28: FD draw_rect (timg,face):

Step 29: (x,y,w,h)=face

Step 30:
cv2.rectangle(timg,(x,y),(x+w,y+h),(0,255,0),thickness=3)
Step 31: FD put_text(timg, text,x,y):
Step 32: cv2.putText(timg,text,(x,y),cv2.FONT_HERSHEY_DUPLEX,3,(255,0,0),6) Capture
webcam images and drone images used in phase III and check with database images data for face
mask, if mask is found in faces of people simply discard or otherwise identify their personal ID, and
which is helpful to know who all wearing masks in an organization are.
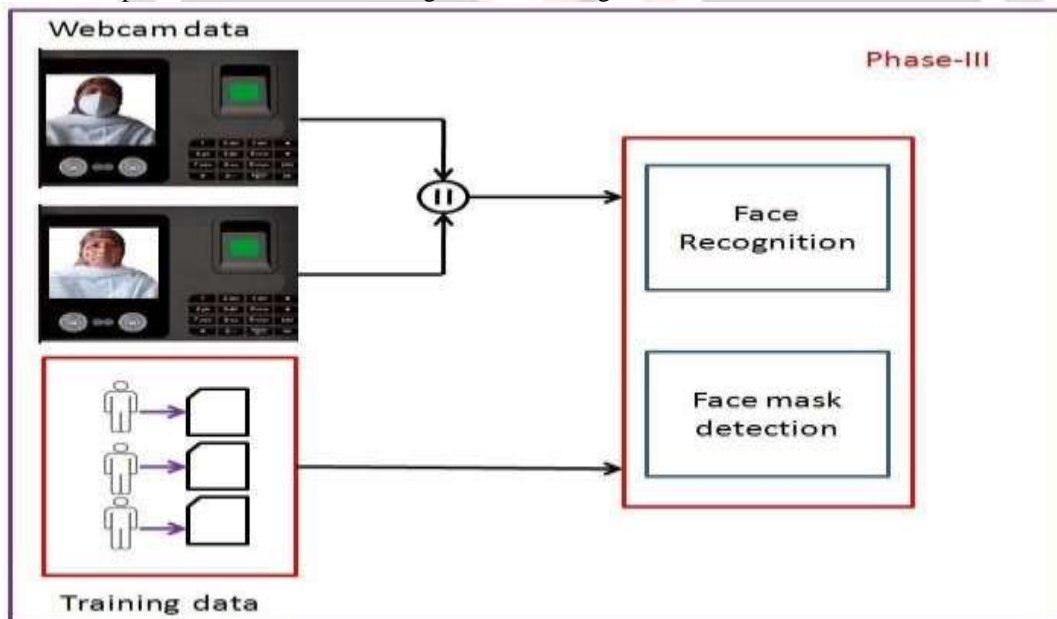
Figure 3: Phase III of proposed model.

Proposed research method fourth phase, list of persons IDs wear collected, using visualization methods
results are displayed to end user, same copy is also stored in a database, and complete process is
shown in figure 4. To eradicate covid-19 virus only solution is to maintain some safety measures,
proposed method is used to known employees who are not wearing face mask, same list is submitted
to higher officials, and also informed to individuals.
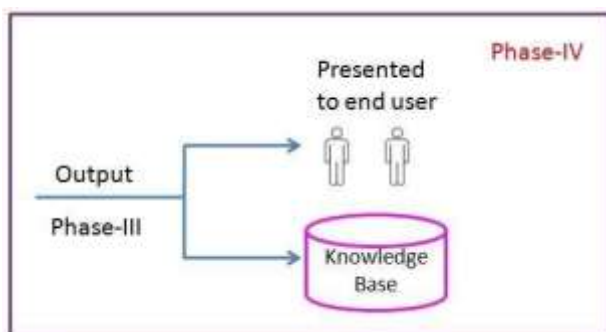
Figure 4: Phase IV of proposed model.

Conclusion :

Covid-19 is a more powerful and dangerous virus, the impact of these virus created big health emergency, virus mutated many times itself to produce delta variant virus, death rate is creased rapidly, and to eradicate these problem we have to educate all individuals must wear face masks. In this research, we proposed a innovative method to automate mask detection and face recognition to know list of members not following basic principles, and it is working in four phases. In first phase, images of all employees or persons are collected and stored in a centralized database, in second phase collected image samples are loaded in to proposed model for training where separate suite is maintained for each and every individual, in third phase employees images are collected with help webcams and drones and checked with centralized database and list of employees ID is prepared who are all not wearing face masks, in fourth phase prepared list is displayed as a result using visualization techniques, and complete implementation is done by using machine learning classification algorithms. The proposed method will be useful to trace out list of employees who are not wearing masks, and same list forwarded to higher officials to take necessary actions.

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