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Face Mask and Social Distancing Detection Using ML Technique

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Abstract: ***Detecting Mask and Social Distance is our main motive in this project.Face detection plays important roles in detecting face mask. Face detection means detecting or searching for a face in an image or video. For face and mask detection we use viola jones algorithm or Haar cascade algorithm using Open CV. For social distancing we use YOLO algorithm. We have created a system which detect the face and then, it will detect nose and mouth to confirm that the person wear mask or not.***
Keywords: Face detection, Mask detection, Social distancing, Open CV, Viola Jones Algorithm ,YOLO Algorithm.

I. INTRODUCTION

On March 11, 2020 WHO declared COVID-19 as a global pandemic WHO says that people have to maintain social distancing and to wear mask to prevent themselves from the disese. So, now a days Face mask and social distancing is important for every person when they step out from their home. So, this system will detect face and then it will check for mask on the customer's face . For , checking the mask system will detect the person's nose and mouth. If , the system detect their mouth and nose it conclude that the person doesn't wore mask., else it conclude that person wore mask. There are three modules namely face detection , mask check and social distancing.

II. LITERATURE SURVEY

As a unique face detection task, masked face detection is much more difficult because of extreme occlusions which leads to the loss of face details. The break thoughts in many computer vision areas including face detection by using Dataset Pre training dataset, Masked face dataset, training process fine tune model, fine tune mask. The researcher proposes a system that uses three variant steps like eye line detection, face part detection such as mouth detection and at last face detection. During face detection, if eyes are recognized and later if face is recognized, it signifies that there's no mask on the person's face. Haar Cascade and Local Binary Pattern Histogram are used for Face Detection and Recognition. It is robust against monotonic grayscale transformations. Local Binary Pattern creates an image which highlights the characteristics of image in a better way. It has the capability to recognize both front and side faces better compared to eigen faces and Fisher faces. Local Binary Pattern creates an image which highlights the characteristics of image in a better way. This system provides functionalities like taking images of customers and training their images in the database. An individual can be disguised his identity by face alterations or using different altered physical attributes. From training images, CNN can learn valuable features automatically. Recently, due to the success in detection and recognition problems CNNs gained its popularity. It successively apply convolutional filters and they are accompanied by many non-linear activation functions.

III. CATEGORIZATION OF MACHINE LEARNING ALGORITHMS USED FOR FACE MASK AND SOCIALDISTANCE DETECTION

Table I: Analysis of Machine and Deep Learning Algorithms Algorithm used Model

Algorithm used	Model applied	Type
Local binary pattern histogram (lbph)	Classification	Machine learning
Haar cascade	Classification	Machine learning
Yolov3	Classification	Machine learning

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IV. ARCHITECTURE DIAGRAM

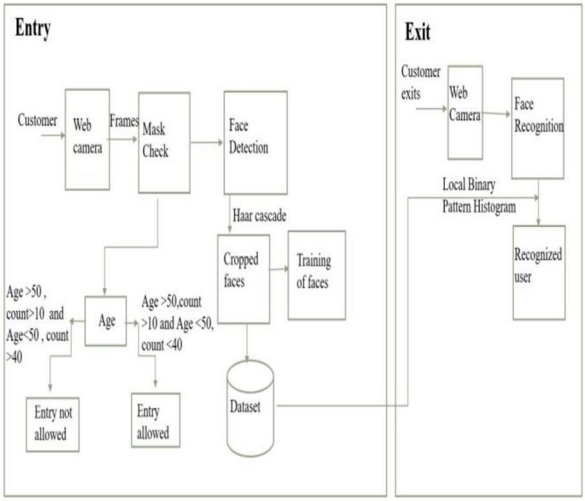


Fig.1 Architecture Diagram

V. PSEUDOCODE

A. Local Binary Pattern Histogram

```
cam.set(3,640)
cam.set(4,480)
face_detector=cv2.CascadeClassifier('haarcascade_frontalface_default.xml')
ret,img=cam.read()
gray=cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
faces= face_detector.detectMultiScale(gray, 1.3,5)
for (x,y,w,h) in faces:
cv2.rectangle(img,(x,y),(x+w,y+h), (255,0,0), 2)
cv2.imwrite("datasetUser." + str(face_id) + '.' + str(count) + ".jpg", gray[y:y+h,x:x+w])
```

B. Haarcascade

```
face_cascade=cv2.CascadeClassifier('haarcascade_frontalface_default.xml')
nose_cascade=cv2.CascadeClassifier('CascadeFiles_haarcascade_mcs_nose.xml')
mouth_cascade=cv2.CascadeClassifier('Mouth.xml')
video_capture=cv2.VideoCapture(0)
current_time=time.time()
timing=current_time-timing
nose_start_time=time.time()
mouth_start_time=time.time()
nose_start_time=time_reset(nose_start_time)

mouth_start_time=time_reset(mouth_start_time)
ret,frame=video_capture.read()
gray=cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
faces= face_cascade.detectMultiScale(gray, 1.1,4)
noses= nose_cascade.detectMultiScale(gray, 1.3,5)
mouths=mouth_cascade.detectMultiScale(gray,1.7,5)
nose=True
mouth=True
```

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C. YOLOV3

```
labelsPath="D:\social-distance-detector-master\social-distance-detector-master\yolov3\coco.names"
LABELS=open(labelsPath).read().strip().split("\n")
np.random.seed(42)
COLORS=np.random.randint(0,255, size=(len(LABELS),3),dtype="uint8")
weightsPath = "D:\social-distance-detector-master\social-distance-detector-master\yolov3\yolov3.weights"
configPath = "D:\social-distance-detector-
master\social-distance-detector-
master\yolov3\yolov3.cfg."
net=cv2.dnn.readNetFromDarknet(configPath,weightsPath)
ret,image=cap.read()
image = imutils.resize(image, width=800)

(H,W)=image.shape[:2]
ln=net.getLayerNames()
ln=[ln[i[0]-1]

forIinnet.getUnconnectedOutLayers()]
blob=cv2.dnn.blobFromImage(image, 1/255.0,(416,416),swapRB=True, crop=False)
net.setInput(blob)start=time.time()
layerOutputs=net.forward(ln)
end=time.time()
box = detection[0:4] * np.array([W, H,
W,H])(centerX, centerY, width, height) =
box.astype("int")
x=int(centerX-(width/2))
y=int(centerY-(height/2))
boxes.append([x,y,int(width),int(height)])
confidences.append(float(confidence))
classIDs.append(classID)

idxs=cv2.dnn.NMSBoxes(boxes,confidences,0.5,0.3)
(x,y)=(boxes[i][0],boxes[i][1])
(w,h)=(boxes[i][2],boxes[i][3])
x_dist=(a[k]-a[i])
y_dist=(b[k]-b[i])
d=math.sqrt(x_dist*x_dist+y_dist * y_dist)

nsd=list(dict.fromkeys(nsd))
color=(0,0,255)
(x,y)=(boxes[i][0],boxes[i][1])
(w,h)=(boxes[i][2],boxes[i][3])
cv2.rectangle(img, (x, y), (x + w, y + h), color, 2)text="RedAlert"

cv2.putText(image,text,(x,y-5), cv2.FONT_SIMPLEX,0.5,color,2)
color=(0,255,0)
(x,y)=(boxes[i][0],boxes[i][1])
(w,h)=(boxes[i][2],boxes[i][3])
cv2.rectangle(img, (x, y), (x + w, y + h), color,2)text='Normal'
cv2.putText(image,text,(x,y-5), cv2.FONT_SIMPLEX,0.5, color, 2)
```

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VI. LIMITATION OF EXISTING APPROACHES

In the Cascade framework for masked face detection by Wei Bu∗†, Jiangjian Xiao†, Chuanhong Zhou∗, Minmin Yang‡, Chengbin Peng† in the year 2017 a unique face detection task was done, the limitation is masked face detection is much more difficult because of extreme occlusions which leads to the loss of face details besides because of the shortage of masked face training samples and overfitting problem, we propose a new dataset called "MASKED FACE" dataset to fine tune our CNN models.
In the Masked face detection using the Viola Jones Algorithm by Aishwarya Radhakrishnan Nair, Dr. Amol D. Potgantwar Savitabai Phule in the year 2017 eyes are recognized and later if face is recognized, it signifies that there's no mask on the person's face using three variant steps like eye line detection,face part detection such as mouth detection and at last face detection.. The limitations are it is sensitive to light and produce wrong result ,if the face have more lightening effect.
In the Masked face recognition using CNN by Md.Sabbir Ejaz and Md. Rabiul Islam in the year 2019 .An individual can be change his identity by face alterations or using different altered physical attributes by CNN model. The limitation are there exist many number of face occlusion problems.
In the Face Recognition based Attendance System using Haar Cascade and LBPH by Bharath tej Chinimilli in the year 2020 Haar Cascade and LBPH are used for Face Detection and Recognition. The limitations are dataset is small and unknown person face if new that can't be recognised.there is no alert system too for intruder.

VII. SCREENSHOTS



Fig.2 Face Mask Detection

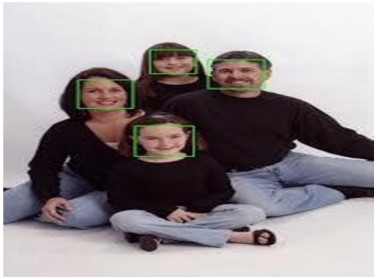


Fig.3 Face Detection and Recogntion

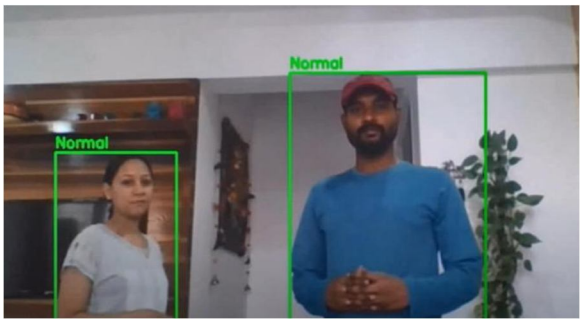


Fig.4 Social Distance Detection

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VIII. CONCLUSION

We proposed facial mask and social distancing detection using machine learning technique. We demonstrated that our models are able to generate image objects and videos for those detections. We showed that the how that the face has been detected using various algorithms and for distancing we are using real time videos to implement them. The project we made is to ensure that the project could be valid in today's challenging real world. It has a vast scope in future. More functionality can be added in accordance with the flexibility of the user requirement and specification. In future using IoT we have planned to implement that people who

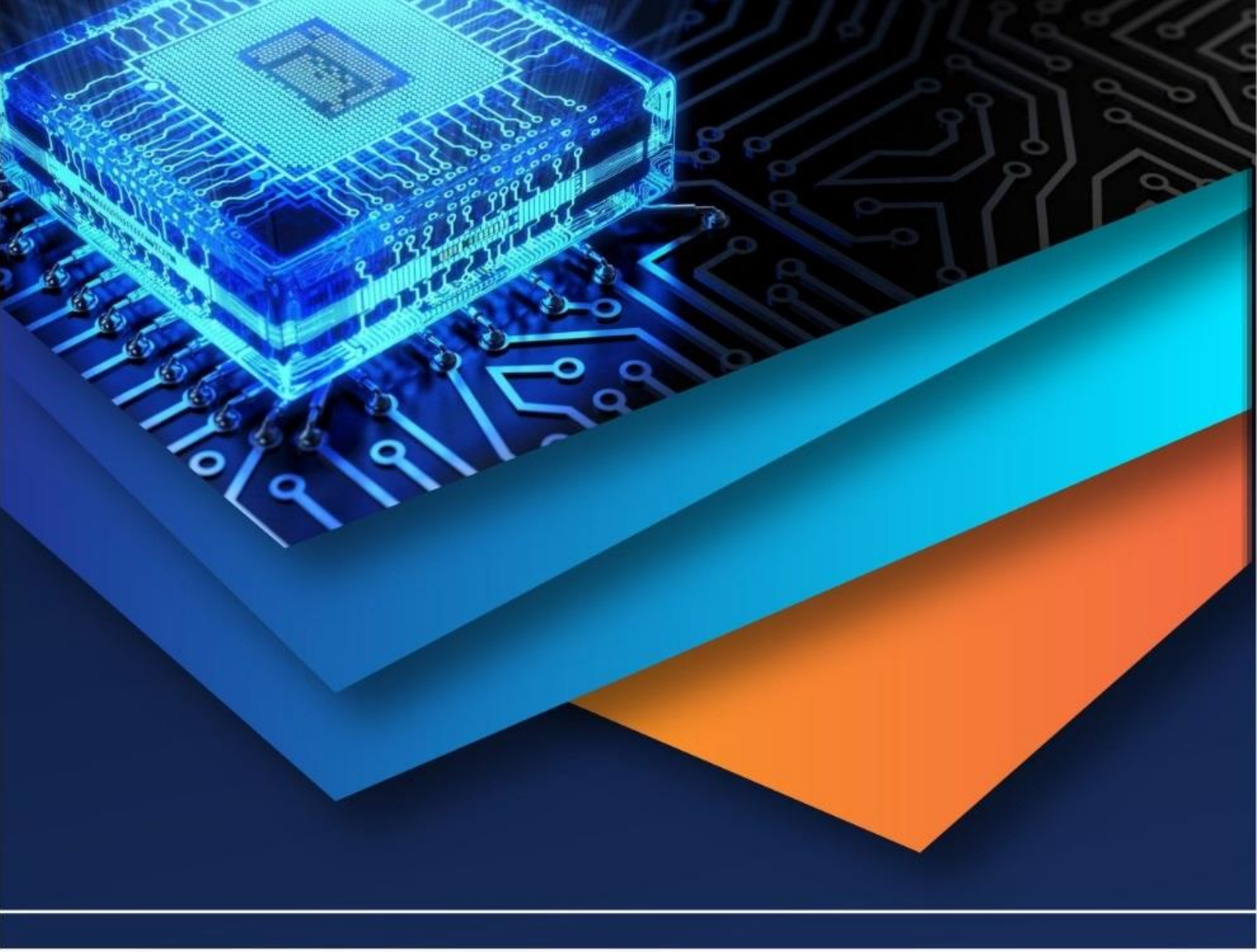
IX. ACKNOWLEDGMENT

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