isrjournals

International Journal of Advanced Research in Computer Science Engineering and Information Technology

Volume: 6, Issue: 3,Special Issue: 2 ,Apr,2021 ,ISSN_NO: 2321-3337

Face Mask Detection And Recognition Using OpenCV, Tensor Flow and Machine Learning

Mr. B. Arunmozhi M.E., Assistant Professor of Computer Science Department,

Mr. V. T. Mohit, Student of Computer Science Department,

Mr. R. Vijaya Kumar, Student of Computer Science Department,

St. Joseph College of Engineering, Sriperumbudur, Chennai

Abstract

The corona virus COVID-19 pandemic is causing a global health crisis so the effective protection methods is wearing a face mask in public areas according to the World Health Organization (WHO). The COVID-19 pandemic forced governments across the world to impose lockdowns to prevent virus transmissions. Reports indicate that wearing facemasks while at work clearly reduces the risk of transmission. An efficient and economic approach of using AI to create a safe environment in a manufacturing setup. A hybrid model using deep and classical machine learning for face mask detection will be presented. We will use the dataset to build a COVID-19 face mask detector with computer vision using Python, OpenCV, and Tensor Flow and Keras. Our goal is to identify whether the person on image/video stream is wearing a face mask or not with the help of computer vision and deep learning.

1. Introduction

Face detection is a computer technology being used in a variety of applications that identifies human faces in digital images.

Face detection also refers to the psychological process by which humans locate and attend to faces in a visual scene.

Face detection can be regarded as a specific case of object-class detection.

Examples include upper torsos, pedestrians, and cars. Smile detection can

distinguish which people are smiling and when a certain minimum 'smile threshold' is triggered.

Since lots of methods are introduced fordetection and recognition which considered as a milestone.

Android Studio is the real time software for the development for Android Applications.

It enables the development and testing of the application by using dynamic simulations of images.

- In our proposed system, the organization can predict its future using the concept drift methodology through which it gets the idea for implementation of the required input.
- The possibility of the organization or company's loss could be less and probability of profit will also increase as the future is predicted previously.
- The efficiency, planning, decisions activity of the organization can be improved and analyzed drastically.
- It can be used in multiple domains for the best output of the system.
- The reason of failure also provided for rectification.

Face detection involves separating image windows into two classes; one containing faces (tarning the background (clutter).

It is difficult because although commonalities exist between faces, they can vary considerably in terms of age, skin colour and facial expression.

The problem is further complicated by differing lighting conditions, image qualities and geometries, as well as the possibility of partial occlusion and disguise.

An ideal face detector would therefore be able to detect the presence of any face under any set of lighting conditions, upon any background.

2. Literature Survey

Mingjie Jiang ,Hong Yan, Xinqi Fan*

Coronavirus disease 2019 has affected the world seriously. One major protection method for people is to wear masks in public areas.Face detection is a computer technology that determines the location

Volume: 6, Issue: 3,Special Issue: 2 ,Apr,2021 ,ISSN_NO: 2321-3337

and size of human face in arbitrary (digital) image. The facial features are detected and any other objects like trees, buildings and bodies etc are ignored from the digital image.

It can be regarded as a _specific‘ case of object-class detection, where the task is finding the location and sizes of all objects in an image that belong to a given class. Face detection, can be regarded as a more _general‘ case of face localization. In face localization, the task is to find the locations and sizes of a known number of faces (usually one).

Basically there are two types of approaches to detect facial part in the given image i.e. feature base and image base approach.Feature base approach tries to extract features of the image and match it against the knowledge of the face features. While image base approach tries to get best match between training and testing images.

Images containing faces are essential to intelligent vision-based human computer interaction, and research efforts in faceprocessing include face recognition, face tracking, pose estimation, and expression recognition.

To build fully automated systems that analyze the information cNumerous techniques have been developed to detect faces in a single image, and the purpose of this paper is to categorize and evaluate these algorithms. We also discuss relevant issues such as data collection, evaluation metrics, and benchmarking. After analyzing these algorithms and identifying their limitations, we conclude with several promising directions for future research.

3. System Design

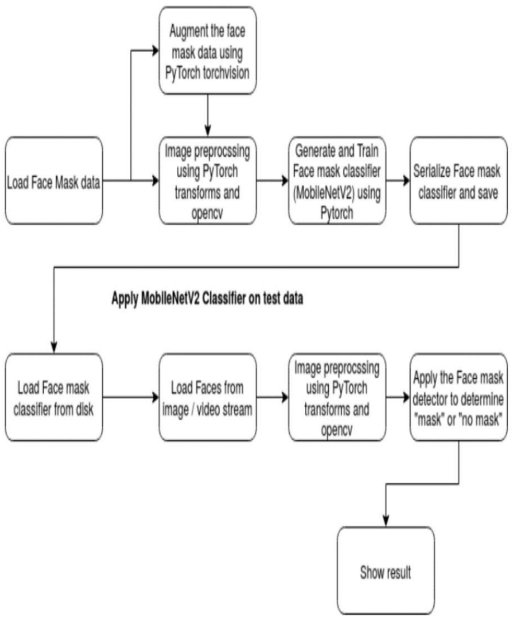
Face Mask Detection System by using existing cameras combined with Trident Computer Vision platform to detect people without masks.

Face Mask Detection Platform uses Artificial Network to recognize if a user is wearing or not wearing a mask on a metrices of a percentage.

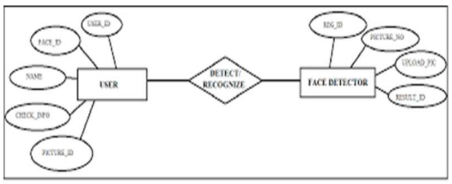
isrjournals

International Journal of Advanced Research in Computer Science Engineering and Information Technology

Volume: 6, Issue: 3,Special Issue: 2 ,Apr,2021 ,ISSN_NO: 2321-3337



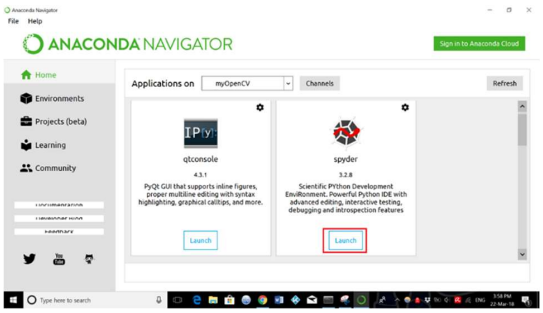
The proposed system focuses on how to identify the person on image/video stream wearing face mask with the help of computer vision and deep learning algorithm by using the OpenCV, Tensor flow, Keras and PyCharm library.



Machine learning is the practice of teaching a computer to learn. The concept uses pattern recognition, as well as other forms of predictive algorithms, to make judgments on incoming data. This field is closely related to artificial intelligence and computational statistics

4. Implementation

The two-stage detector can provide high detection performance but with low speed The seminal work R-CNN is proposed by R Girshick et al R-CNN uses selective search to propose some candidate regions which may contain objects After that, the proposals are fed into a CNN model to extract features, and a support vector machine (SVM) is used to recognize classes of objects However, the second-stage of R-CNN is computationally expensive, since the network has to detect proposals on a one-by-one manner and uses a separate SVM for final classification.



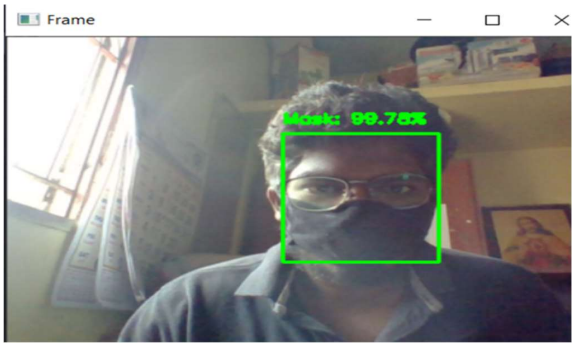
Fast R-CNN solves this problem by introducing a region of interest (ROI) pooling layer to input all proposal regions

Volume: 6, Issue: 3,Special Issue: 2 ,Apr,2021 ,ISSN_NO: 2321-3337

at once Finally, a region proposal network (RPN) is proposed in faster R-CNN to take the place of selective search, which limits the speed of such detectors Faster R-CNN integrates each individual detection components, such as region proposal, feature extractor, detector into an end-to-end neural network architecture.

```
# Detect faces in the photo using OpenCV library
faces = haar_face_cascade.detectMultiScale(
    grayscale,
    scaleFactor = 1.1,
    minNeighbors = 5,
    minSize = (30, 30)
    )
```

One-stage detector utilizes only a single neural network to detect objects In order to achieve this, some anchor boxes which specifies the ratio of width and heights of objects should be predefined Rather than the two-stage detector, one-stage detectors scarify the performance slightly to improve the detection speed significantly In order to achieve the goal, YOLO divided the image into several cells and then tried to match the anchor boxes to objects for each cell, but this approach is not good for small objects The researchers found that one-stage detector does not perform well by using the last feature output only, because the last feature map has fixed receptive fields, which can only observe certain areas on original images.



Therefore, multi-scale detection has been introduced in SSD, which conducts detection on several feature maps to allow to detect faces in different sizes Later on, in order to improve detection accuracy, Lin et al proposes Retina Network (RetinaNet) by combining an SSD and FPN architecture, which also include a novel focal loss function to mitigate class imbalance problem.

5. Conclusion and Future Enhancement

As the technology are blooming with emerging trends the availability so we have novel face mask detector which can possibly contribute to public healthcare. The architecture consists of MobileNet as the backbone it can be used for high and low computation scenarios. In order to extract more robust features, we utilize transfer learning to adopt weights from a similar task face detection, which is trained on a very large dataset. We used OpenCV, tensor flow, keras, Pytorch and CNN to detect whether people were wearing face masks or not. The models were tested with images and real-time video streams.

6. References

[1] P. A. Rota, M. S. Oberste, S. S. Monroe, W. A. Nix, R. Campagnoli, J. P. Icenogle, S. Penaranda, B. Bankamp,K. Maher, M.-h. Chenet al., "Characterization of a novel coronavirus associated with severe acute respiratorysyndrome,"science, vol. 300, no. 5624, pp. 1394–1399, 2003.

[2] Z. A. Memish, A. I. Zumla, R. F. Al-Hakeem, A. A. AlRabeeah, and G. M. Stephens, "Family cluster of middleeast respiratory syndrome coronavirus infections,"New England Journal of Medicine, vol. 368, no. 26, pp.2487–2494, 2013.

[3] Y. Liu, A. A. Gayle, A. Wilder-Smith, and J. Rocklöv, "The reproductive number of covid-19 is higher comparedto sars coronavirus,"Journal of travel medicine, 2020.

[4] Y. Fang, Y. Nie, and M. Penny, "Transmission dynamics of the covid-19 outbreak and effectiveness of governmentinterventions: A datadriven analysis,"Journal of medical virology, vol. 92, no. 6, pp. 645–659, 2020.

[5] N. H. Leung, D. K. Chu, E. Y. Shiu, K.-H. Chan, J. J. McDevitt, B. J. Hau, H.-L. Yen, Y. Li, D. KM, J. Ipet al.,"Respiratory virus shedding in exhaled breath and efficacy of face masks."