Indian Institute of Information Technology Allahabad
Department of Information Technology

Image and Video Processing Course 2021

Progress Report on

Real-Time Face Mask Detection Model

as part of C1 assessment

by

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1. Abstract

The rapid outbreak of COVID-19 has caused serious harm and infected tens of millions of people worldwide. Since there is no specific treatment, wearing masks has become an effective method to prevent the transmission of COVID-19 and is required in most public areas, which has also led to a growing demand for automatic real-time mask detection services to replace manual reminding.

To contribute towards communal health, this paper aims to devise a highly accurate and real-time technique that can efficiently detect non-mask faces in public and thus, enforce the wearing of masks. We have used deep learning and open CV to develop our face detector model.

2. Introduction

Coronavirus Disease unexpectedly broke out in 2019 and has seriously affected the whole world. As of now, COVID-19 has infected more than 125 million people worldwide and caused over 2.7 million deaths. One of the transmission routes of COVID-19 is through droplets of saliva or nasal secretions when an infected person coughs or sneezes, which is highly infectious and could be worse in crowded places. Recently, a study on understanding measures to tackle the COVID-19 pandemic reveals that wearing a face mask or other covering over the nose and mouth cuts the risk of Coronavirus spread by avoiding forward distance traveled by a person's exhaled breath by more than 90%. To mandate the use of facemask, it becomes essential to devise some technique that enforce individuals to apply a mask before exposure to public places.

Through this paper, we aim to build a computer vision system that can detect if a person is wearing a mask or not.

3. Methodology Being Used

We have used the following steps for our project:

- The main task of our project is to recognize faces correctly and to do that we need to build a dataset of faces wearing face masks.

- In the dataset, we apply face detection to compute the bounding box location of the face in the image.
- Once we know *where* in the image the face is, we can extract the face Region of Interest (ROI):
- And from there, we apply facial landmarks, allowing us to localize the eyes, nose, mouth, etc.
- Then we will again use facial landmarks to find if the person is wearing a mask or not.
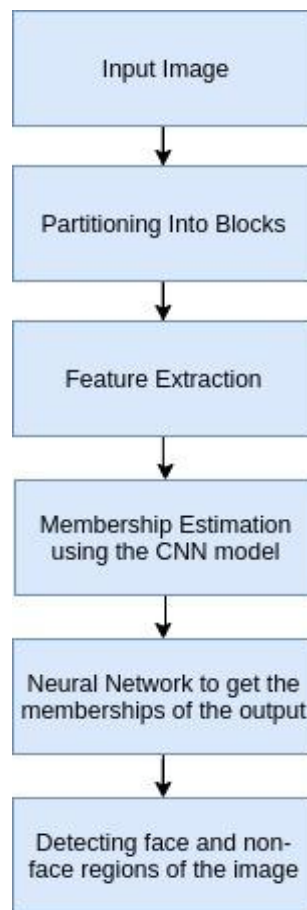
Language Used: Python

Libraries Used:
- Tensorflow
- Keras
- Imutils
- Numpy
- OpenCV
- Matplotlib
- Scipy
- Scikit

| Test Dataset | → | Frame Extraction | → | Face Detection | → | Pre-trained classification model | → | Mask/ No mask detection |

Phases for building a mask detector with computer vision and deep learning using Python, OpenCV, and TensorFlow/Keras.

Input Image
↓
Partitioning Into Blocks
↓
Feature Extraction
↓
Membership Estimation using the CNN model
↓
Neural Network to get the memberships of the output
↓
Detecting face and non-face regions of the image

CNN face mask detection

4. Datasets Being Used

For the experiment, we use the dataset, which consists of 600 masked faces with a minimum size of 32×32. The faces in this dataset have different orientation and occlusion degrees. We select 400 images that contain frontal faces from the dataset. The dataset is divided into 3 parts for training and validation and a test set with 400, 120, and 80 images, respectively.

Github Link: https://github.com/prajnasb/observations/tree/master/experiements/data

5. Conclusion

In this project, we have developed a deep learning model for face mask detection using Python, Keras, and OpenCV. We developed the face mask detector model for detecting whether a person is wearing a mask or not. We have trained the model using Keras with network architecture. Training the model is the first part of this project and testing using a webcam using OpenCV is the second part.

6. Individual Contribution

Code	Aamej, Aryan, Aviral, Varun
Documents	Bhupesh, Ritik, Tejas

7. References

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