FACE MASK DETECTION

PROBLEM STATEMENT

The effects of COVID-19 on the global economy can be seen with the naked eye, as the confinement of people in their homes brings with it less production and slows down commercial dynamism. However, it should be noted that in situations of a health crisis such as the one that continues to be experienced, it is relevant to put people's health before any productive activity. That is why biosecurity measures and social distancing protocols have been implemented to limit the spread of this dangerous virus. As well as the capacity in public institutions, industries, and other establishments have been limited, highlighting the so-called telework (in certain cases). Thus, companies have implemented various methodologies, strategies, and techniques to protect integrity and health, both when entering and staying in face-to-face work sessions.

As previously mentioned, CNN has been an important technological tool during this pandemic. Although most approaches have been taken toward the diagnosis of the disease, monitoring, and prevention have also been covered.

Today, the use of a personal face mask is a mandatory preventive measure. Keeping the mouth, nose, and cheeks covered has now made people only recognizable by their eyes, eyebrows, and hair, which is a problem for the human eye, which tends to find similarities in several faces that have similar features. This problem also affects computer systems, as facial recognition systems are now very common. They are used to unlock the smartphone, access sensitive applications, and enter certain places. Current systems usually process information from the entire face of the person, which

is why technology must adapt to these new conditions. All this is done with the purpose of maintaining the biosecurity of the user, but giving them the opportunity to continue with the activities as naturally as possible.

The literature has shown that there are systems that seek to identify whether people use it properly. These works have had very good results. However, facial recognition using biosecurity material has not yet been explored. All of this motivated the present investigation, in which a detection system with two approaches is presented. The first is to develop a face classifier, starting from a database of people with and without a mask. The second describes a facial recognition algorithm in controlled environments, which allows for personnel to be identified automatically, without removing the face mask. This can be implemented as an access system to an institution or a home, but at a low cost. This is ensured by using open-source programming software and simple features that reduce computational expense. For this reason, the possibility of improving the adaptability of current facial recognition systems, in the face of new circumstances, has been established as a starting hypothesis.

SOLUTION

This face mask detection model can be used at a variety of places at checkpoints to ensure mandatory steps are followed as regulated by the government.

To counter covid from spreading to a large majority of people in a region, rules are to be followed which include the role of an individual to wear a face mask this software can help to tackle this problem after implementing it on various checkpoints it can uniquely

identify whether a person is wearing a face mask or not. It is simple and does not require much human regulation.

The Face Mask Detection module is designed to detect people not wearing medical face masks in the frame. When such persons are detected, the module highlights them in the frame with a square in real-time and enters the event in the event log.

The module is capable of detecting up to ten people not wearing face masks in the frame at the same time (if allowed by the computing capacity). The module does not recognize (identify) faces, it cannot tell one person from the other or compare a person's face with the faces from a database; it only finds people without face masks in the frame.

When an infringement event (no mask) is detected, the module briefly highlights the person's face with a red square in the client application and creates a corresponding event in the event log.

FUNCTIONAL REQUIREMENTS:

1. Face Detection

The system would detect faces in images or video streams. The system would extract each face's Region of Interest (ROI).

Input: The camera will capture the images of individuals.

Output: It will Check whether it is a human 'face or any object or animal.

2. Mask Identification

After face detection through instant screen capture, it would identify whether a face mask is present or not by comparing it with database images of people with masks.

Input: captured camera images.

Output: Image analyzed and processed.

3. Result Generation

The result of a particular event would be displayed on the screen with percentage precision along with the output of ‘Mask’ or ‘No Mask’.

Input: Input camera images and images data sets that we have.

Output: Check person with mask and without a mask.

4. Event Creation

An event would be generated when the system encounters that a person is not wearing a face mask, it would briefly highlight the person’s face with a red square in the client application and create a corresponding event in the event log.

Input: Image obtained after processing.

Output: Creates photo logs in the dashboard if a non-mask person is detected.

5. Report Generation

Graphical Analysis of density of people and percentage of people wearing masks on Dashboard of software.

Input: Violators and non-violators list

Output: Generate a Report on the number of violators to non-violators on basis of the event log.

NON-FUNCTIONAL REQUIREMENTS:

1. Availability Requirement

The system should be available 100% for all the occasions.

The system shall be operational 24 hours a day and 7 days a week.

2. Efficiency Requirement

Even if the system fails, the system should be recovered back up within an hour or less.

3. Performance Requirement

The system should generally take less than 2 second per person to detect their faces once they are facing camera and produce results.
The system must be able to correctly detect more than one face if present, and hence the presence of mask in the frame.

4. Accuracy

The system should produce a result with over 80% of accuracy and should show the percentage chance a person is wearing a mask on the screen.

5. Camera Agnostic

It should be compatible with all modern CCTV, USB, and IP camera systems, connected to the Internet. Run the software on the equipment you already have.

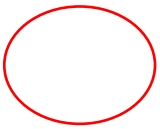
6. Usability

The system must be portable and can be applied to embedded devices with limited computational capacity
(ex., Raspberry Pi, Google Coral, NVIDIA Jetson Nano, etc.).

Akhil Dubey – 2020UCO1673
Aman Kumar Jha -2020UCO1673
Amanjot Singh – 2020UCO1702

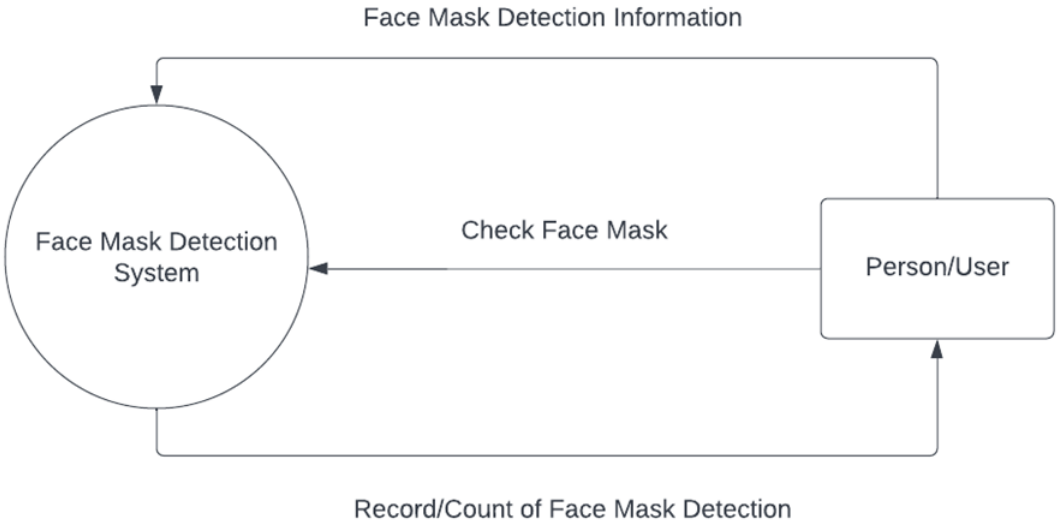
ER Model

1. Data Flow 

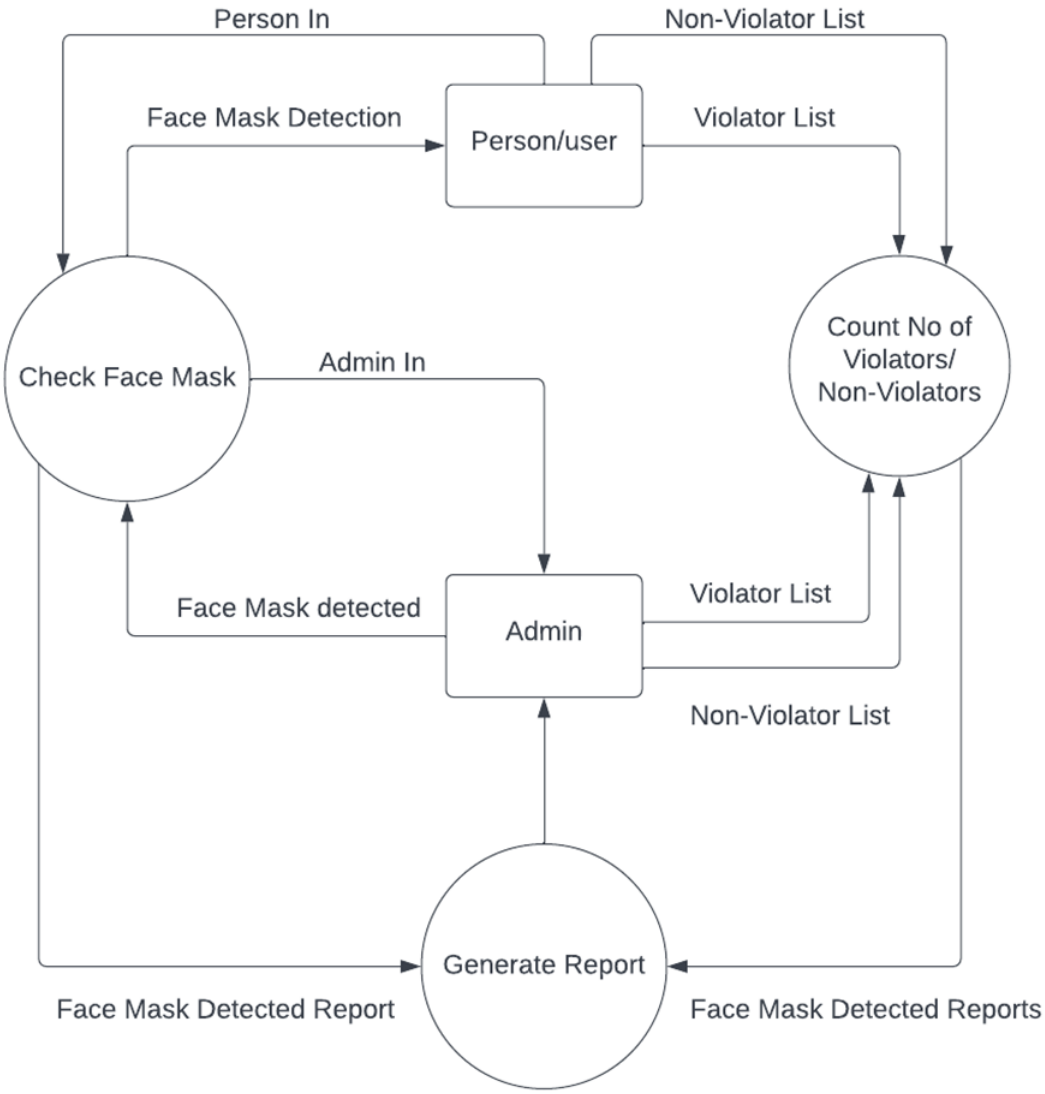
2. Process 

3. Source 

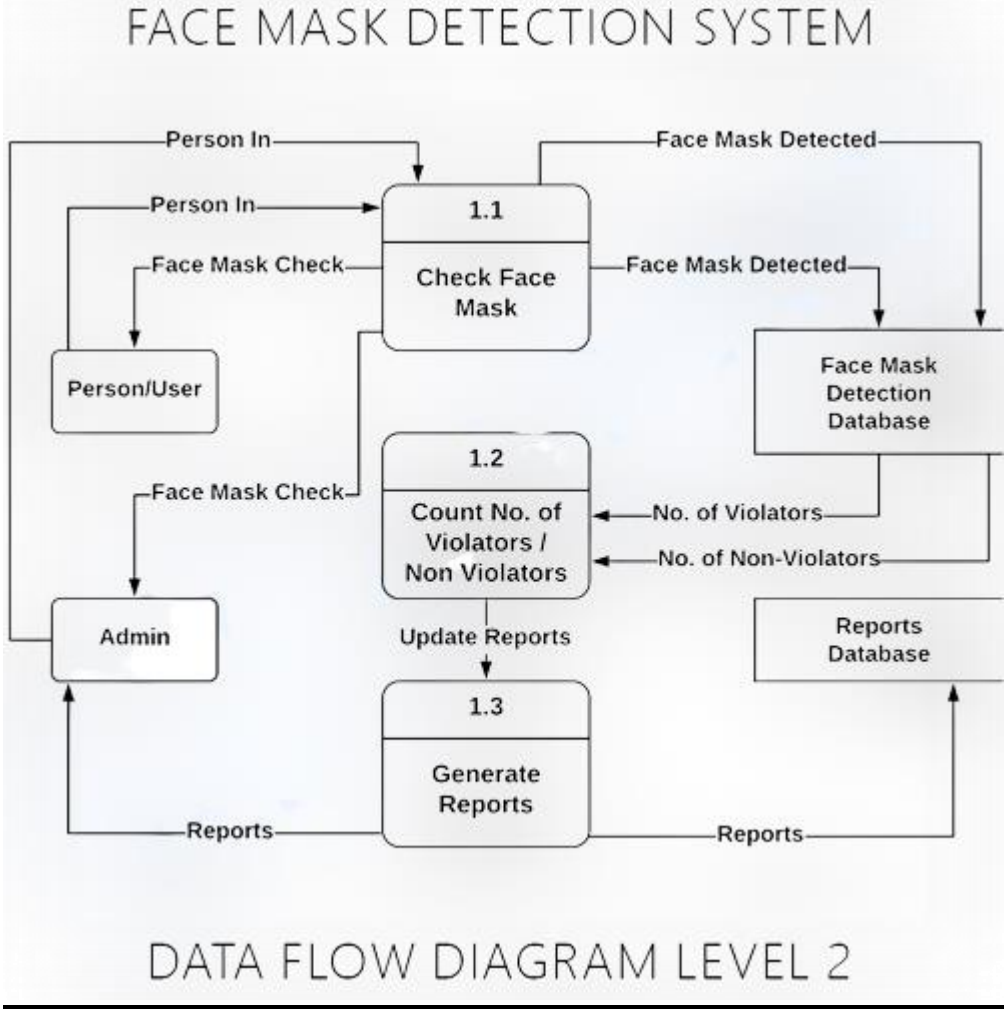
Level-0 DFD



Level-1 DFD


Person In
Non-Violator List
Face Mask Detection
Person/user
Violator List
Check Face Mask
Admin In
Count No of Violators/ Non-Violators
Face Mask detected
Admin
Violator List
Non-Violator List
Generate Report
Face Mask Detected Report
Face Mask Detected Reports

Level 2 DFD


FACE MASK DETECTION SYSTEM
Person In
Face Mask Detected
Person In
1.1
Face Mask Check
Check Face Mask
Face Mask Detected
Person/User
Face Mask Detection Database
1.2
Face Mask Check
Count No. of Violators / Non Violators
No. of Violators
No. of Non-Violators
Admin
Update Reports
Reports Database
1.3
Generate Reports
Reports
Reports
DATA FLOW DIAGRAM LEVEL 2