

PROFESSIONAL TRAINING REPORT
at
Sathyabama Institute of Science and Technology
(Deemed to be University)

Submitted in partial fulfillment of the requirements for the award
of Bachelor of Technology Degree in Information Technology

By
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the Bonafide work of who carried out the project entitled "FACE MASK DETECTION" under our supervision.

Internal Guide

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Submitted for Viva voce Examination held on _____

Internal Examiner

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DECLARATION

I hereby declare that the Project Report entitled “**FACE MASK DETECTION**“ done by me under the guidance of Dr.P.Ajitha M.E.,Ph.D., at Sathyabama Institute of Science and Technology (Deemed to be University), Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600119 is submitted in partial fulfillment of the requirements for the award of Bachelor of Technology degree in Information Technology.

DATE:

Place: Chennai

SIGNATURE OF THE CANDIDATE

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I convey our thanks to **Dr. T. SASIKALA M.E., Ph.D., Dean, School of Computing** and **Dr. R. SUBHASHINI M.E., Ph.D., Head of the Department, Department of Information Technology** for providing us the necessary support and details at the right time during the progressive reviews.

I would like to express our sincere and deep sense of gratitude to our Project **Dr.P.AJITHA M.E.,Ph.D.**, for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work.

I wish to express our thanks to all Teaching and Non-teaching staff members of the Department of **INFORMATION TECHNOLOGY** who were helpful in many ways for the completion of the project.

ABSTRACT

FACE MASK DETECTION

Currently, we are facing the 2019–2020 coronavirus pandemic. Coronavirus disease 2019 (COVID-19) is an infectious disease with first symptoms similar to the flu. The symptom of COVID-19 was reported first in China and very quickly spreads to the rest of the world. The COVID-19 contagiousness is known to be high by comparison with the flu. In this paper, we propose a design of a mobile application for permitting everyone having a smartphone and being able to take a picture to verify that his/her protection mask is correctly positioned on his/her face. Such application can be particularly useful for people using face protection mask for the first time and notably for children and old people. The designed method exploits Haar-like feature descriptors to detect key features of the face and a decision-making algorithm is applied. Experimental results show the potential of this method in the validation of the correct mask wearing. To the best of our knowledge, our work is the only one that currently proposes a mobile application design “CheckYourMask” for validating the correct wearing of protection mask.

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CHAPTER 1

1.INTRODUCTION

1.1 FACE MASK DETECTION

In the context of transmitted virus between humans by sputtering (spraying), wearing the mask on the face appears necessary to protect people and to limit the propagation of the disease. Coronavirus disease 2019 (covid-19) is an infectious disease with first symptoms similar to the flu. The symptom of covid-19 was reported first in China and very quickly spreads to the rest of the world. The covid contagiousness is known to be high by comparison with the flu. In this paper, we propose a design of a mobile application allowing people able to take a picture with a smartphone to verify that his/her protection mask is correctly positioned on his/her face. To the best of our knowledge, our work is the only one that currently propose a mobile application design “ CheckYourMask ” for validating correct the wearing of Protection mask. Before implementing face mask detection problem, first we need to understand that how to handle images. Images are simply a collection of colors in red, green format. As a human we see an image with some object or shape in it, but for computer it is just an array with color values range from 0 to 255. The way computer sees anything is different from the way human see an image. if we got an array of the image than it becomes simple for us to implement a m on that array.

1.2 PROJECR DESCRIPTION

Today everyone is aware of taking precaution and safety measures regarding covid-19, so face mask detection will play a huge role to avoid corona virus.

This project helps us to spread the awareness among people using face mask properly. It detects the face mask on your face whether the person is hiding his/her face by mask or not. It also check the face mask is properly cover your face both nose and mouth.

CHAPTER 2

SYSTEM CONFIGURATION

2.1 HARDWARE REQUIREMENT

This section gives the details and specification of the hardware on which the system is expected to work.

Processor	: Intel Pentium IV Processor
Speed	: 2.00 GHZ
RAM	: 4GB
Hard Disk Capacity	: 320 GB
Monitor	: 14" Colour Monitor
Keyboard	: Microsoft Natural PS/2 IBM Keyboard
Mouse	: IBM PS/2 Compatible Mouse

2.2 SOFTWARE REQUIREMENT

This section gives the details of the software that are used for the development.

Front End	: PYTHON
IDE	: PyCharm
Back End	: SQLite3
Operating system	: Windows 7
Documentation	: Microsoft Word

CHAPTER 3

SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

The most popularly studied computer vision problems include localization and object detection in images. Due to presence of intra-class variation, inter-class diversity, and noisy annotations in wild images, it becomes challenging task. To achieve better performance, data is vital to train detectors. Before the coronavirus pandemic, facial recognition algorithms failed to identify 20-50% of image of people wearing face masks, according to a report from the national institute of standards and technology. But by the end of 2020, it reported a vast improvement in accuracy.

3.1.1 DRAWBACKS OF EXISTING SYSTEM

The existing system has following disadvantage

- Facial Recognition and Racial Bias.
- Low Reliability
- Lack of regulation

3.2 PROPOSED SYSTEM

Proposed architecture easily deals with image retrieval problem without any complications. Deep neural network can solve the problems occurring in both the issues, by generating suitable, expressive and fluent captions. Efficient computation of automatic metrics is possible using deep learning. It speeds up the development process of image captioning. The solution is flexible and easy for people to deploy. In some situation, face mask are mandatory or even recommended. Access control with mask detection is a simple solution to help reduce the risk of getting infected, and also a good reminder to wear masks before entering the controlling areas.

3.2.1 ADVANTAGES OF PROPOSED SYSTEM

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The propose system has following advantage

- To detect travelers without masks in airport.
- To send a notification with a reminder to wear a mask
- To monitor the employees without mask in offices.

FEASIBILITY STUDY

This feasibility study deals with all the analysis that takens up in developing the project. Each structure has to be thought of in the developing of the project. As it has to serve the end user in a user-friendly manner. One must

know the type of information to be gathered and the system analysis consists of collecting, organizing and evaluating facts about a system and its environment.

Three considerations involved in feasibility analysis are

- ECONOMIC FEASIBILITY
- OPERATIONAL FEASIBILITY
- TECHNICAL FEASIBILITY

ECONOMIC FEASIBILITY

The organization has to buy a personal computer with a keyboard and a mouse, this is a indirect cost. There are many direct benefits of covering the manual system to computerized system. The user can be given responses on asking questions, justification of any capital outlay is that it will reduce expenditure or improve the quality of service to the user. The user who have basic knowledge about Microsoft technologies can use this service by accessing the service provided in the web site.

OPERATIONAL FEASIBILITY

The proposed system accessing process to solve problems what occurred in existing system. The current day-to-day operations of the organization can be fit into this system. Mainly operational feasibility should include on analysis of how the proposed system will affects the organizational structures and procedures.

The proposed system requires less human interaction and anybody who has the basic computer devices can access these services and operate on their needed part of the services to get the services that are needed by the user.

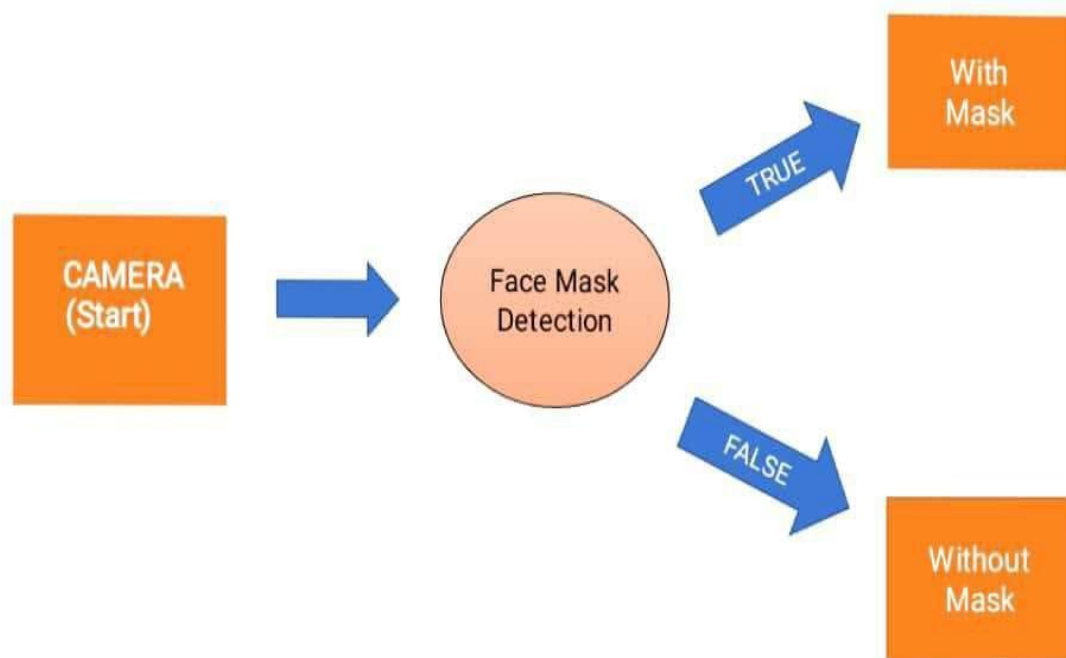
TECHNICAL FEASIBILITY

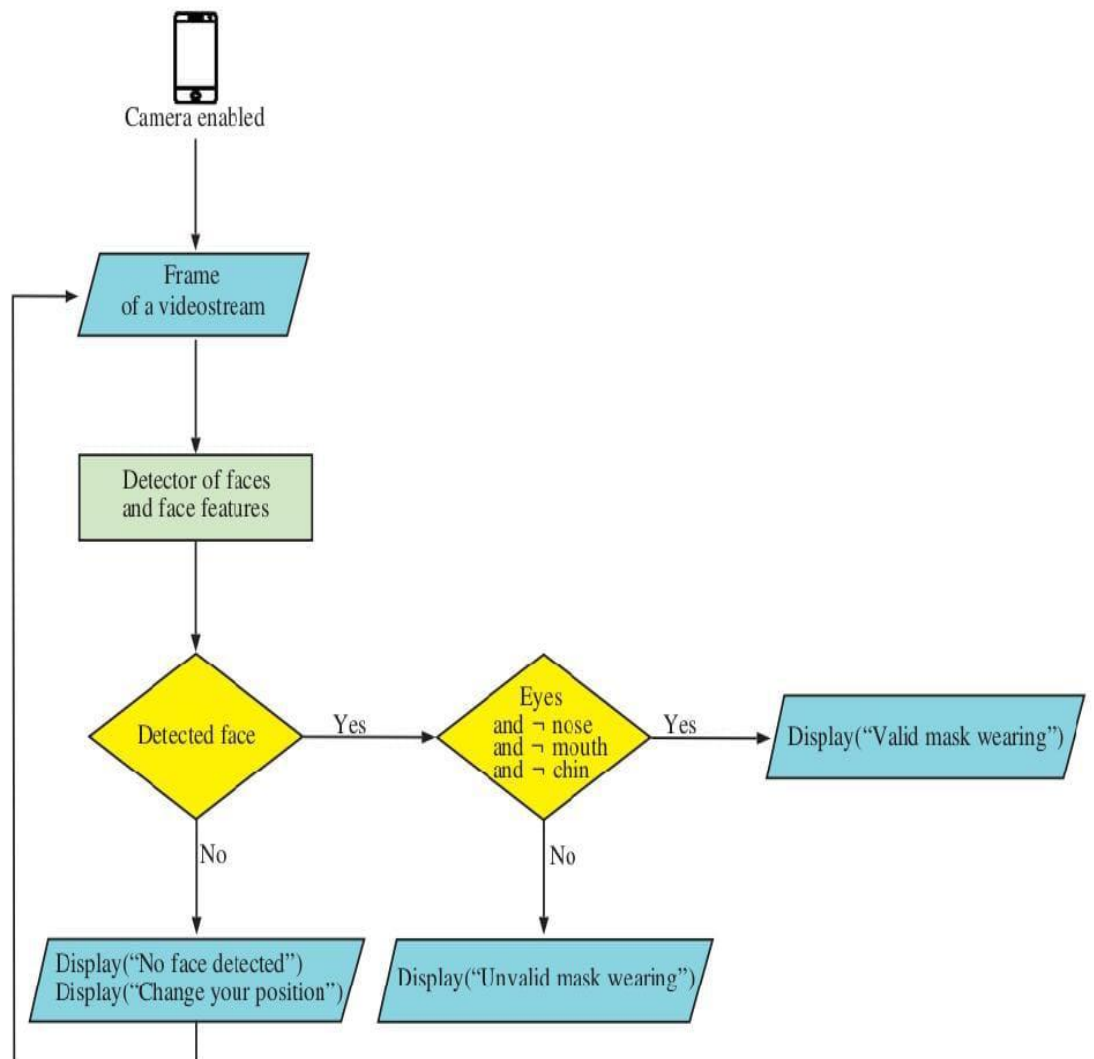
The cost and benefit analysis may be concluded that computerized system is favorable in today's fast moving world. The announcement of technical feasibility must be based on an outline design of the system requirements in terms of input , output, files, programs and procedure.

The project aims to provide the faster information sharing using the web applications and to reduce the difficulties involved in request handling that are given by the users of website. The current system is to reduce the technical skill requirements so that more number of users can access the application.

CHAPTER 4

4.1 SYSTEM FLOW DIAGRAM





4.2 DATABASE DESIGN

The most important consideration in designing the database is how Information will be used .The main objectives of designing a database are:

Data Integration

In a database , information from several files are coordinated,accessed and operated upon as through it is in a single file .Logically ,the information for centralized, physically, the data may be located on different devices, connected through data communication facilities.

Data Integrity

Data integrity means storing all data in one page only and how each application to access it.This approach results in more consistent information , one update being sufficient to achieve a new record status for all application , which use it .This leads to less data redundancy ; items need not be duplicated ; a reduction in the Direct Access storage requirement.

Data Independence

Data independence is the insulation of application program from changing aspects of physical data organization. This objective seeks to allow changes in the content and organization of physical data without reprogramming of applications and to allow modifications to application programs without reorganizing the physical data.

The tables needed for each module were designed and the specification of each and every column was given based on records and details collected during record specification of the system study.

4.3 INPUT DESIGN

The user interface design is very important for any application. The interface design describes how the software communicates within itself, to the system that interprets it and with humans who use it. The interface is a packaging for computer software if the interface is easy to learn, simple to use. If the interface design is very good, the user will fall into an interactive software application. The input design is the process of converting the user-oriented inputs into the computer-based format. Errors entered by data entry operations can be controlled by input design. The data is fed into the system using simple interactive forms. The forms have been supplied with messages so that the user can enter data without facing any difficulty. The data is validated wherever it requires in the project. This ensures that only the correct data have been incorporated into the system. The goal for designing input data is to make data entry as easy, logical and free from errors.

The objectives of input design are:

- To produce a cost effective method of input
- To make the input forms understandable to the user
- To ensure the validation of data input
- To achieve the highest possible level of accuracy.

The various activities to be performed for the overall input processors are:

- Data recording at its source.
- Data transfer to input form.
- Data conversion to computer acceptable mode.

- Data validation.
- Data flow control.

Data correction if necessary. In the proposed system, the user is provided with respective forms to input the required data. The input screens in this project are:

- Input image form
- Data set form
- Audio form

4.4 OUTPUT DESIGN

A major form of output is a hard copy obtained from the printer. These printouts are designed to include the exact requirements of the user. The outputs required by the end-user are defined during the logical design stages.

Output specification Output definition takes into account the type of output contents, its frequency and its volume. The appropriate output media is determined for outputs. Once the output media is chosen, the detail specification of output documents are carried out. The nature of output required from the proposed system is determined during the logical design stage itself. Physical design stage takes the outline of the output from the logical design and produces the output as specified during the logical design phase. The necessary reports are generated which provide the complete information required by the user: The objectives of output design are:

- Design output to serve the indented purpose.
- Provide output on time.
- Assume that output is where it is needed.

As you know videos are basically made up of frames, which are still images. We perform the face detection for each frame in a video. So when it comes to detecting a face in still image and detecting a face in a real-time video stream, there is not much difference between them. We will be using Haar Cascade algorithm, also known as Viola-Jones algorithm to detect faces. It is basically a

machine learning object detection algorithm which is used to identify objects in an image or video. In OpenCV, we have several trained Haar Cascade models which are saved as XML files.

4.5 CODING

```
import os
import keras
import random
import shutil
import tensorflow as tf
from tensorflow.keras.optimizers import RMS
from tensorflow.keras.preprocessing.image import
ImageDataGenerator
from shutil import copyfile
from os import getcwd
from os import listdir
import cv2
from tensorflow.keras.layers import Conv2D, Input,
ZeroPadding2D, BatchNormalization,
Activation, MaxPooling2D, Flatten, Dense
from tensorflow.keras.models import Model,
load_model
from tensorflow.keras.callbacks import TensorBoard,
ModelCheckpoint
from sklearn.model_selection import train_test_split
from sklearn.metrics import f1_score
from sklearn.utils import shuffle
import imutils
import numpy as np
import matplotlib.pyplot as plt
import matplotlib.image as mpimg
```

Data Augmentation is a technique to artificially create training data from existing training data. In this step we will split the dataset into training set and test set which will contain the images on which the CNN model will be trained and tested.

```

def split_data(SOURCE, TRAINING, TESTING, SPLIT_SIZE):
    dataset = []
    for unitData in os.listdir(SOURCE):

        data = SOURCE + unitData
        if(os.path.getsize(data) > 0)
            dataset. Append(unitData)
    else:
        print('Skipped ' + unitData)
        print('Invalid file i.e zero size')
    train_set_length = int(len(dataset) * SPLIT_SIZE)
    test_set_length = int(len(dataset) - train_set_length)
    shuffled_set = random.sample(dataset, len(dataset))
    train_set = dataset[0:train_set_length]
    test_set = dataset[-test_set_length:]
    for unitData in train_set:
        temp_train_set = SOURCE + unitData
        final_train_set = TRAINING + unitData
        copyfile(temp_train_set, final_train_set)
    for unitData in test_set:
        temp_test_set = SOURCE + unitData
        final_test_set = TESTING + unitData
        copyfile(temp_test_set, final_test_set)
    WITHMASK_SOURCE_DIR = "experiment's/dest_folder/val/with_mask/"
    TRAINING_WITHMASK_DIR = "experiment's/dest_folder/train/with_mask/"
    TESTING_WITHMASK_DIR = experiments/dest_folder/test/without_mask/"
    WITHOUTMASK_SOURCE_DIR = "experiments/dest_folder/val/without_mask/"
    TRAINING_WITHOUTMASK_DIR =
    "experiments/dest_folder/train/without_mask/"
    TESTING_WITHOUTMASK_DIR= "experiments/dest_folder/test/without_mask/"
    split_size = .8
    split_data(WITHMASK_SOURCE_DIR,
    TRAINING_WITHMASK_DIR,
    TESTING_WITHMASK_DIR, split_size)
    split_data(WITHOUTMASK_SOURCE_DIR,
    TRAINING_WITHOUTMASK_DIR,
    TESTING_WITHOUTMASK_DIR, split_size)
    print("number of images with facemask in the training set' with_mask':",

```

```
len(os.listdir('experiments//dest_folder//train//with_mask'))
print("number of images with facemask in the test set 'with_mask':"
,len(os.listdir('experiments//dest_folder//test//with_mask'))
print("number of images without facemask in the training set 'without_mask':"
,len(os.listdir('experiments//dest_folder//train//without_mask'))
print("number of images without facemask in the test set 'without_mask':"
,len(os.listdir('experiments//dest_folder//test//without_mask'))
```

CHAPTER 5

5.1 SYSTEM TESTING

After the source code has been completed, documented as related data structures, Completed the project has to undergo testing and validation where there is substitute and definite attempt to get errors.

The project developer treads lightly, designing and execution test that will demonstrates that the program works rather than uncovering errors, unfortunately errors will be present and if the project developer doesn't find them ,the user will find out.

The project developer is always responsible for testing the individual units i.e., modules of the program. In many cases developer also conducts integration testing i.e., the testing step that leads to the construction of the complete program structure.

This project has undergone the following testing procedures to ensure its correctness.

- Unit Testing
- User Acceptance Testing
- Integration Testing
- Validation Testing

UNIT TESTING

In unit testing ,we have to test the program making up the system. For

this reason, Unit testing sometimes called as Program testing. The software units in a system are the modules and routines that are assembled and integrated to perform a specific function. Unit testing first on the modules independently of one another, to locate errors.

USER ACCEPTANCE TESTING

In these testing procedures the project is given to the customer to test whether all requirements have been fulfilled and after the user is fully satisfied. The project is perfectly ready. If the user makes for any change and if they found any errors those all errors has to be taken into consideration and to be correct it to make a project a perfect project.

INTEGRATION TESTING

In this integration testing is done to test if the individual module work together as one single unit. In integration testing, the individual modules that are to be integrated are available for testing. Thus the manual test data that used to test the interfaces replaced by that which is generated automatically from the various modules. It can be used for testing how the modules would actually interact with the proposed system. The modules are integrated and tested to reveal the problem interfaces.

VALIDATION TESTING

It is said that validation is successful when the software function is a systematic manner that can be reasonably accepted by the customer.

5.2 SYSTEM IMPLEMENTATION

When the initial design was done for the system, the client was consulted for the acceptance of the design so that further proceedings of the system development can be carried on. After the development of the system a demonstration was given to them about the working of the system. Bottom of the system installation was to identify any malfunction of the system.

After the management of the system has approved the system implemented in the concern, initially the system was run parallel with existing manual system. The system has been tested with live data and has proved to be error free and user friendly.

Implementation is the process of converting a new or revised system listening to one operational one when the initial design was done by the system; a demonstration was given to the end user about the working system.

This process uses to verify and identify any logical mess working of the system by feeding various combinations of test data. After the approval of the system by both end user and management the system was implemented. System implementation is made up of many activities. The six major activities areas follows.

CODING

Coding is the process of whereby the physical design specifications created by the analysis team turned into working computer code by the

programming team.

TESTING

Once the coding is being and proceed in parallel , as program module can be tested.

INSTALLATION

Installation is the process doing which the current system is replaced by the new system. This includes conversion of existing data, software, and documentation and work procedures to those consistent with the new system.

DOCUMENTATION

It is result from the installation process, user guides provides the information of how the use the system and it's flow.

TRAINING AND SUPPORT

Training plan is a strategy for training user so they quickly learn to the new system. The development of the training plan probably began earlier in the project.

CHAPTER 6

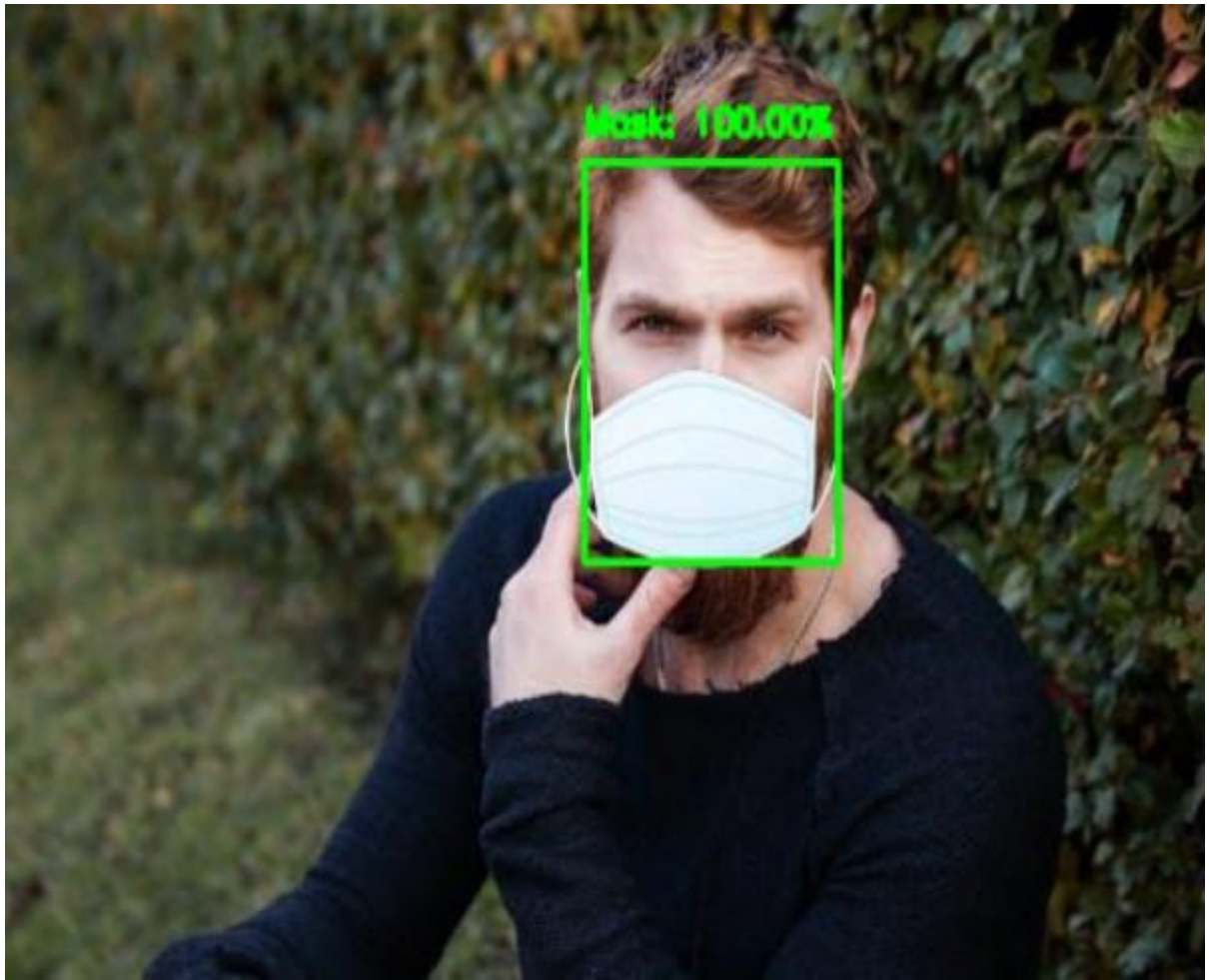
SCOPE OF FUTURE ENHANCEMENT

- A method is designed for checking the correct wearing of face protection mask from a video selfie.
- Different analysis scenarios have been experimented using diverse types of conventional mask and varied acquisition conditions.
- The performance of the designed method relies on the efficiency of the exploited face and face-feature detectors.
- In the present study, wearing glasses had no negative effect. The use of rigid masks seems preferable because they reduce possibilities of wrong positioning on the face. For this latter, the designed prototype can particularly be efficient.

7.CONCLUSION

Hence, a promising application “CheckYourMask” has been proposed. A proof of concept as well as a development base are provided towards reducing the spread of COVID-19 by allowing people to validate the wearing of their masks via their smartphones (m-health). Moreover, this self-checking of the correct mask wearing could be exploited by monitoring-related applications as a conformity attribute.

Future works may investigate the development of highly robust detectors by training a deep learning model with respect to specific face features or more globally to correctly/incorrectly worn mask classes.



1.1 LIVE CAMERA

Python Project - Real-Time Face Mask Detection



1.2 LIVE CAMERA



1.3 LIVE CAMERA



1.4 LIVE CAMERA