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Face Mask And Social Distance Detection With Alarm Using Deep Learning

K Tejaswi[1], E Mounika [2], Mrs.Swathi Sree [3]

Department of Computer Science and Engineering, Stanley College of Engineering and Technology for Women, Telangana, India

Abstract.
The novel coronavirus also called Covid-19 had a huge effect on different sectors in many territories and imposed governments across the world to urge lockdowns to avert novel coronavirus transmission. This little step of wearing a face mask, following social distancing would save plenty of lives as the spread of the novel coronavirus could be mitigated. This theme consists of social distancing noticing and face mask detection for the events of disease like novel coronavirus can be solved by maintaining social distancing as well as wearing/putting on its face mask. This used to develop a Mask Detection using OpenCV, Keras/TensorFlow and also Deep Learning. This System can easily integrated/implemented to various embedded devices with limited computational capacity that uses CNN architecture. System will detect face masks in photos/images and in real-time videos. Social Distancing and wearing masks have become the 2 most popular terms in today's life to keep oneself safe from getting infected from the novel coronavirus. Researchers have concluded that these 2 practises are the warriors against Covid. Governments across the nation are rigorously making efforts to make these 2 practises in action. We as a team came up to a real time solution of detecting distance between humans and detecting persons with no mask covering. This solution was needed as there is a lack of awareness among people about the major precautions which is Mask+Distance. Neither only mask can save, nor only distancing can save you but the aggregation of these two can.

Keywords: OpenCV, Keras/TensorFlow, Deep Learning, COVID – 19 , Social distancing, Face Mask a wareness, Convolutional Neural Network, Computer Vision, Python, Machine Learning

Introduction

About Project

In the proposed system architecture, first our system takes input for evaluating the input can be in form of photo snap, live streaming videos and recorded videos. What our system does is it reads the input frame by frame if it reaches to EOF (End OF Frame) then the system will stop, else continues using algorithm called YOLOv3 (You Only Look Once) it gets the bounding boxes for face and person in the frame. Then using different algorithm for face mask detection and social distance detection can be computed, if the person in frame is wearing mask and maintaining distance then bounding box will be displayed in green colour if the person is not maintaining social distance and not wore face mask then bounding box will be in red colour.

Objectives of the Project

The main objective of our system is that will identify weather the person in frame is wearing the face mask and also maintaining distance between two people. The system provides two bounding boxes one for face and one person. If the person is wearing mask properly them our system will put the green bounding box across the face, else the bounding box will be in red colour. Similarly, the person in frame should maintain minimum of 6 feet distance then our system will put a green bounding box

across the person, else bounding box will be in red colour. Status is shown in the screen, containing number of people in frame and number of people who are not maintaining distance of 6 feet, not in face mask will be displayed in status bar that bottom of the screen. Our proposed model can be integrated with the camera (CCTV camera) also in the web camera to impede the COVID-19 transmission.

Scope of the Project

This method was developed with an efficient way for the people who are not wearing face mask and not maintaining social distance and notified by alarm . As a future enhancement, we can predict/detect time at which it gets crowded and heat map can be plotted in a accuracy way

Literature Survey

Existing System

Government and Public health agencies are recommending face mask as essential measures to keep us safe when venturing into public. 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. Face mask detection refers to detect whether a person is wearing a mask or not. In fact, the problem is reverse engineering of face detection where the face is detected using different machine learning algorithms for the purpose of security, authentication and surveillance. Face detection is a key area in the field of Computer Vision and Pattern Recognition. A significant body of research has contributed sophisticated to algorithms for face detection in past.

Proposed System

This little step of wearing a face mask, following social distancing would save plenty of lives as the spread of the novel coronavirus could be mitigated. This theme consists of social distancing noticing and face mask detection for the events of disease like novel coronavirus can be solved by maintaining social distancing as well as wearing/putting on its face mask. This used to develop a Mask Detection using OpenCV, Keras/TensorFlow and also Deep Learning. This System can easily integrated/implemented to various embedded devices with limited computational capacity that uses MobileNetV2 architecture. System will detect face masks in photos/images and in real-time videos.

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System Architecture

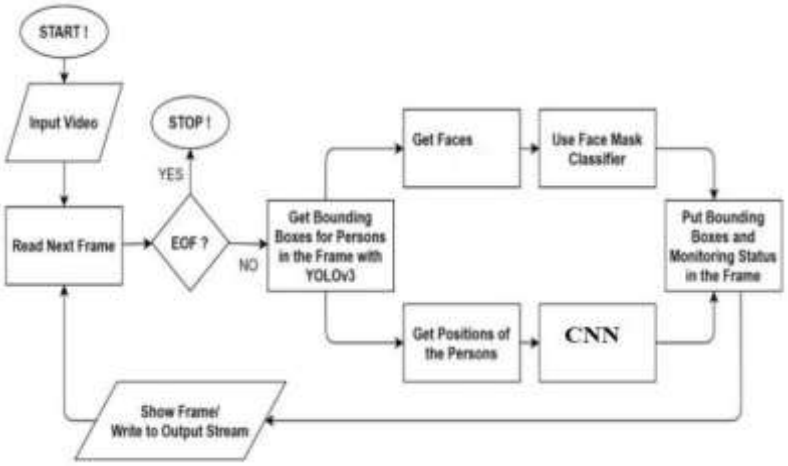

Fig.2. System Architecture

DATA FLOW DIAGRAM

The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system.

The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system.

DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.

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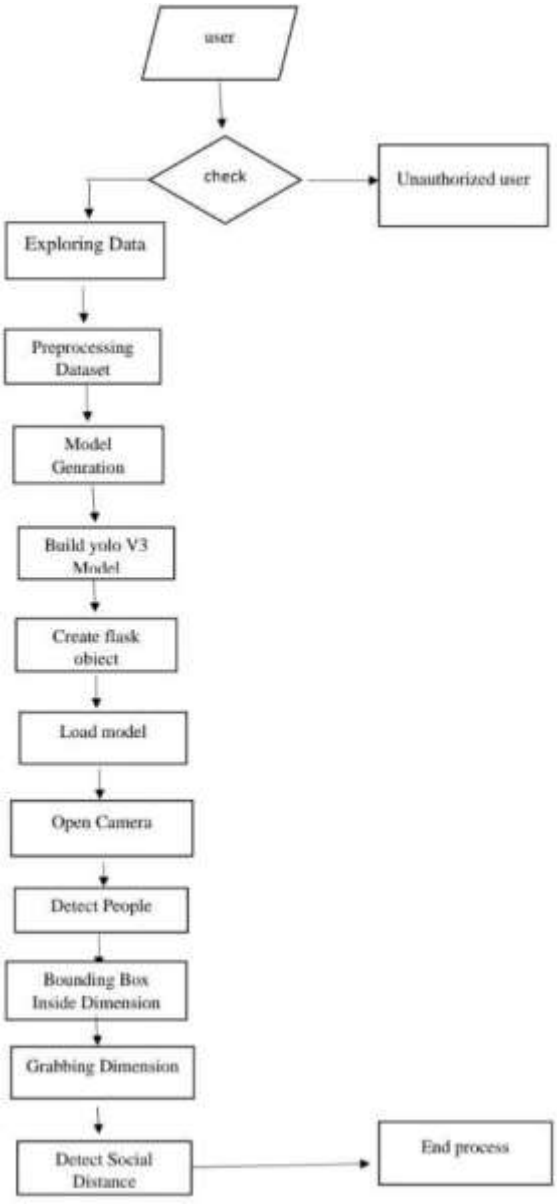
DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.

Fig.3. Data Flow Diagram

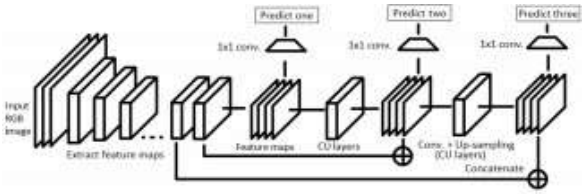


Implementation

Algorithm

MODULES
FACE MASK DETECTION
Face Detection
Collecting Data
Mask Detection
SOCIAL DISTANCE DETECTION
Person Detection
Distance Computing

Algorithms YOLO
Software design sits at the technical kernel of the software engineering process and is applied regardless of the development paradigm and area of application.
Design is the first step in the development phase for any engineered product or system. The designer's goal is toproduce a model or representation of an entity that will later be built.
Beginning, once system requirement have been specified and analyzed, system design is the first of the three technical activities-design,code and test that is required to build and verify software.



Schematic representation of YOLO v3 architecture

Fig 4 Schematic representation of Yolo v3 architecture

Code Implementation

Tensorflow. TensorFlow is an amazing information stream in machine learning library made by the Brain Team of Google and made open source in 2015.It is intended to ease the use and broadly relevant to both numeric and neural system issues just as different spaces. Fundamentally, TensorFlow is a low level tool for doing entangled math and it targets specialists who recognize what they're doing to construct exploratory learning structures, to play around with them and to transform them into running programs.

Python 3.7. Python is broadly utilized universally and is a high-level programming language. It was primarily introduced for prominence on code, and its language structure enables software engineers to express ideas in fewer lines of code. Python is a programming language that gives you a chance to work rapidly and coordinate frameworks more effectively.

Anaconda3 5.3.1. Anaconda is a free and open-source appropriation of the Python and R programming for logical figuring like information science, AI applications, large- scale information preparing, prescient investigation, and so forth. Anaconda accompanies in excess of 1,400 packages just as the Conda package and virtual environment director, called Anaconda Navigator, so it takes out the need to figure out how to introduce every library freely. to Anaconda appropriation that enables clients to dispatch applications and oversee conda packages, conditions and channels without utilizing command line directions.

What is Machine Learning

Before we take a look at the details of various machine learning methods, let's start by looking at what machine learning is, and what it isn't. Machine learning is often categorized as a subfield of artificial intelligence, but I find that categorization can often be misleading at first brush. The study of machine learning certainly arose from research in this context, but in the data science application of machine learning methods, it's more helpful to think of machine learning as a means of building models of data.

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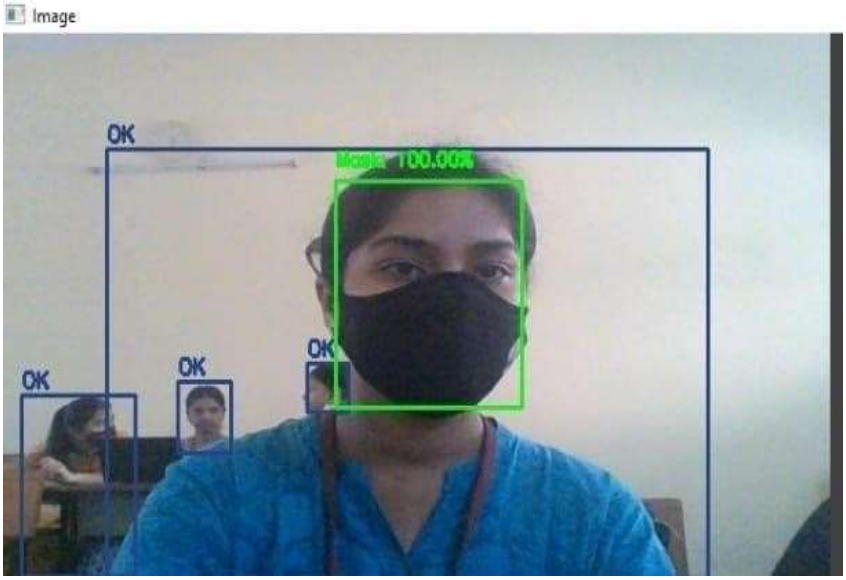
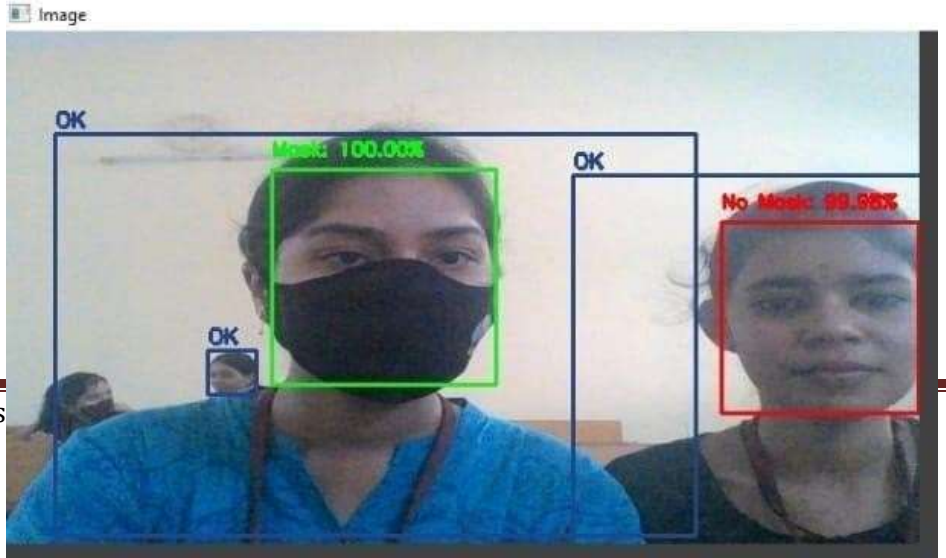
Result





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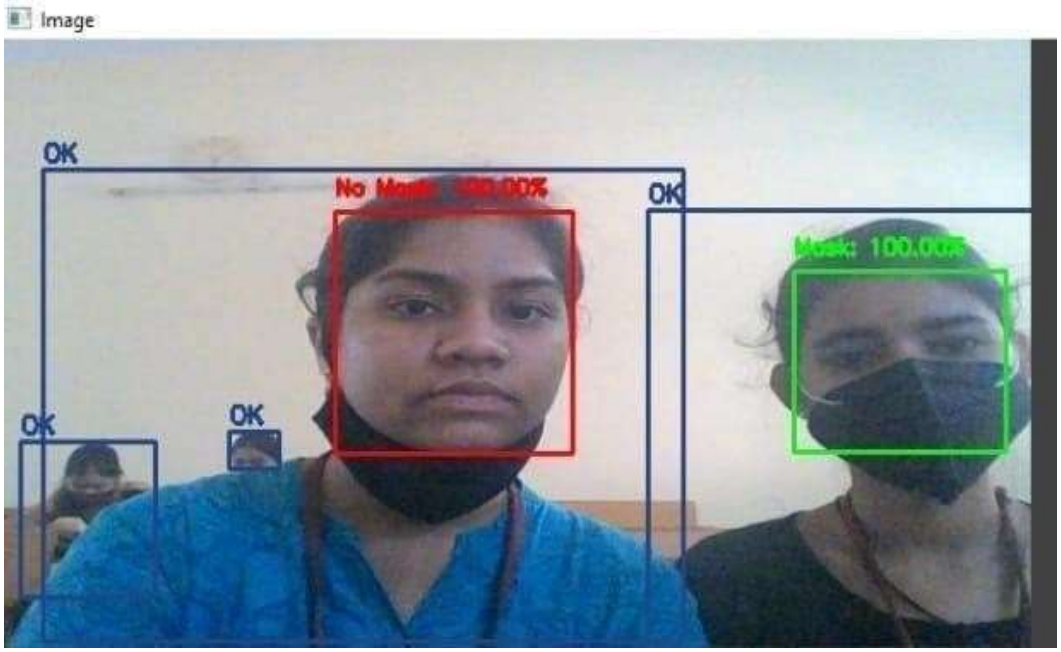

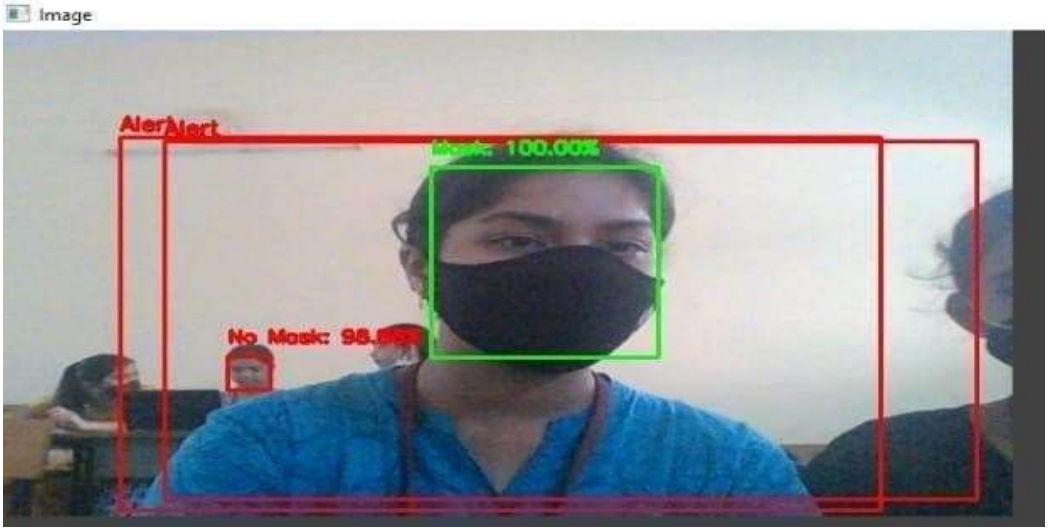

Conclusion

In this project we have used a recent techniques in the field of computer vision and also in the deep learning. A custom dataset can be created using Google/Bing Search API, Kaggle datasets and RMFD dataset.The proposed system will correctly detect the presence of face mask and person is in the safe the distance. The system is accurate, since we have used the CNN architecture for detecting face mask and for distance computing we used Euclidean distance formula. Thus, it makes easier to deploy our model to embedded system like Raspberry Pi, Goole Coral etc. We believe that this approach will enlarge the safety of the individuals during the pandemic. Social distance with Face Mask Detection is performed and Using the two labels which were declared one for color ,title and other social distance. Accuracy percentage is displayed in white color at the top of the image

Future Scope

This method was developed with an efficient way for the people who are not wearing face mask and not maintaining social distance and notified to officials by email. As a future enhancement, we can predict/detect time at which it gets crowded and heat map can be plotted in an accurate way.

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