REAL-TIME FACE MASK DETECTION IN LIVE VIDEO STREAMS

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PROBLEM STATEMENT AND MOTIVATION:

The recent pandemic pushed face coverings as mandatory in many public areas, but we sometimes see people without them. Studies have found that spread loads peak due to the spillage of droplets that come out due to coughing, sneezing, or just talking. So, until a vaccine is discovered, face masks become essentially vital as it may help slowdown the spread and help avoid the virus transmission from infected people to others.

The latest forecast from the Institute of health metrics and evaluation suggests that 33,000 deaths in the US could be avoided by October 1, 2020, if 95 percent of people wore a mask in public places[1]. However, the most significant challenge with COVID is now we cannot look in the crowd and say, oh! You should wear a mask. So, this can be made easy with the help of an automated system. This stands as a motivation behind this project to take help of artificial intelligence and convert it to a machine learning problem to detect people who are not wearing masks in public places to increase safety and reduce the spread. An individual can ensure his/her safety, another person's safety, and help to cut the spread of the disease to an extent through this work.

APPROACH:

We plan to approach this problem with three main steps: 1)Identifying an object detection technique that will suit our use case accurately to detect human faces in video frames. People might not look into the camera, or the object size(people faces) might be less in size or blurred in video streams. 2)To classify the pre-processed data and train the model. 3)To identify humans in the video stream, detect mask or no mask from the live feed, and present results.

For object detection strategy, we are proposing to try with object detection techniques like SSD to detect faces, or expand our detection using pose detection and then extract head from that to follow the humans through the frames accurately. For the classifier to classify detected objects as with mask and without the mask, we plan to use Keras. The model will be trained based on this data. The last step is to apply the object detection on video steam and analyze the results using the trained model. We are planning to use OpenCV, Keras, and TensorFlow to achieve our results.

RELATED WORK AND NOVELTY:

The related work[2][7][8] focuses on detecting face masks on a single person image or on a very high-resolution live feed. They are using straight object detection techniques for face detection, training the model with sample data set, and detecting face masks.

However, it faces two issues, that though it can detect people with no-mask in high-resolution images, it fails to detect people with a mask due to problems in object detection that could not detect a face when the face itself is covered in a mask. Second, it does not seem to handle live feeds of various resolutions.

And then, another paper[3] fails to give real-time inference with the increase in the input size and comparatively massive processing overheads, which results in high false positives.

In the paper[4], the authors presented a system for minimizing the false positive face detections as possible without missing mask detections to trigger alarms only for medical staff who do not wear a surgical mask.

The novelty in our approach comes from the fact that it aims to address human face mask detection problems in standard resolution video streams, as it might get impacted due to the sheer amount of varying environment variables. These

environment variables include different cameras, sizes, varying resolutions, and, as well as challenges, including the resolution of the video feed, the clarity and changing angles of people's faces.

This project's overall novelty is in detecting the masks through a standard resolution live feed instead of still images and overcoming the challenges mentioned above.

EVALUATION APPROACH:

The project's solution to the problem could be evaluated using the accuracy with which it detects masks and no-masks in the data that we are testing.

In our approach, we are planning to train the model with two different datasets, face with mask and face without mask. Object detection will also be applied against the dataset, and from the detected object, it will be classified into two types, with a mask and without a mask.

80% of the dataset will be used to train the model in various features with correspondence to our novelty idea, and the remaining 20% will be used to test our solution. Once the process of testing with of dataset against our trained model completes, it will help us calculate and achieve the desired output accuracy, which is approximately 96%.

MILESTONES:

Data acquisition- complete [5][6][9][10]
Pre-processing – 11/12/2020
Training the model – 11/20/2020
Testing results – 11/27/2020
Paper Preparation - 12/02/2020
Final Presentation - 12/04/2020

DIVISION OF WORK:

The four of us will be collaborating in all stages. We believe that a clear division of work cannot be planned at this stage. As we start the implementation, we will divide the tasks at hand proportionately.

DELIVERABLE:

A solution that when you input a video with people results with a masked or unmasked person detection.

HOPEFUL EXTENTION:

Provided enough time, we aim to implement several other classification methods to come up with the results, so that we can have a holistic view of which classification method is best suited for this problem.

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