Mask Detection System

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Description

The COVID-19 pandemic has had a significant impact not only on health, but also on various industries, including the medical, educational, and tourism sectors. Multiple infection control methods have been introduced to curtail the spread of the virus. One such method is the use of masks to prevent viral spread and ensuring that it is being followed is paramount to fighting the virus. To enforce this preventative measure, many computer vision and machine learning approaches have been proposed. One such solution is the Mask Detection systems powered by the Haar Cascade Algorithm.

Currently available Mask Detection systems can monitor people to identify masks irrespective of their position, distance, and angle. These systems have been implemented in various public places or institutions such as airports, shopping malls, and schools to ensure compliance with mask-wearing regulations. Moreover, they can work with images and/or videos and are easy to setup along with most available monitoring systems.

Our proposal is to modify the existing Haar Cascade Algorithm used for such systems to improve detection systems' accuracy. All of the available mask detection systems use the off-the-shelf algorithm to detect whether a person is wearing a mask or not but this introduces a lot of false positives, which is a known issue of the algorithm. We will modify the algorithm to work specifically to detect masks which would involve modifications to the pre-processing and feature detection aspects of the code.For pre-processing of the images we are looking at techniques such as illumination, lighting corrections, pixel brightness transformation, geometric corrections, color corrections, edge enhancements, segmentation, filtering, zooming, and cropping. We are also looking at fourier image transformation technique for removing noise from the image. Finally, we will test our design and compare it with OpenCV's implementation using a dataset consisting of faces at various distances and angles, with or without a mask.

Input

Images of various sizes in jpg format. Images will contain people wearing or not wearing a mask with faces in different angles and at varying distances. The masks are also quite different in color, pattern, and size. Similarly, there aren't any similarities in the background of the images.

Output

For each image, categorize and store it in separate folders for faces with masks and faces without masks. Also, print the category to the console with the image file name.

Evaluation Methods

In order to accurately assess the performance, we will test our approach on the dataset in batches of 100 pictures at a time. We will use multiple criterias like accuracy, precision, recall, and F1 score to compare our design with the standard algorithm. These metrics will be calculated on a separate set of validation images that wouldn't have been used to design the modified code. All of these metrics will provide us with an accurate assessment of our solution and will assist us in identifying any potential improvements.

Schedule

Date	**Checkpoint Tasks**
1st May, 2023	Finalize the project proposal
8th May, 2023	Data Collection and cleaning to be completed. Image pre processing should be completed. Documentation should be in progress.
15th May, 2023	Model building should be in progress. Design document creation should be completed. Any pre processing work should be completed.
22nd May, 2023	Model building should be completed. Finish any work left from previous week.

	Unit testing should be in progress. Documentation should be in progress.
29th May, 2023	The working algorithm should be tested on more number of images and also varied types of images. Evaluation on additional test images. Summarizing the results and look into future work.
5th June, 2023	Project completion and final report documentation. Preparation of the presentation/video and submission.

Publicly available code/data

Dataset

Face Mask Detection Dataset which contains 7553 images with 3 color channels (RGB). Images of faces with mask are 3725 and images of faces without mask are 3828.

Code

Haar Cascades: https://github.com/opencv/opencv/tree/master/data/haarcascades

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