Touchless – Face Mask Detector

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9.0

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Meet Touchless:

Public places perform entry checks manually, where personnel are stationed outside to check each individual that walks in. This requires an employee to always be stationed at the entry, and also poses a risk for them.

Touchless automates a mask check to make sure that every individual that enters is wearing a face mask in real-time using the power of neural networks.

Methodology:

Phase #1 : Train Face Mask Detector

Load face mask dataset → Train face mask classifier with Keras/TensorFlow → Serialize face mask classifier to disk

OpenCV

Phase #2: Apply Face Mask Detector

Load face mask classifier from disk → Detect faces in image/video stream → Extract each face ROI → Apply face mask classifier to each face ROI to determine "mask" or "no mask" → Show results
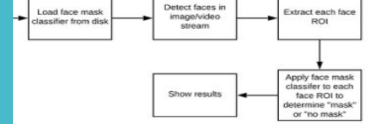
Making the Model:

1. First, the face ROI (region of interest) was extracted from the data, which was run through a neural network.

2. The model will later output a probability of the face being masks or not, which we will use in the deployment phase.

3. The Model gives an accuracy of nearly 99%.

## Deploying the Model:

1. The deployment phase feeds real-time video to the program frame by frame using OpenCV, where the video data is recorded by the 5MP Raspi Camera Module and the program keeps a track of all detected faces in the video stream.

2. The model is run on each frame which contains a face, and the model returns the probability a masked face or otherwise, all in real time at a good framerate.
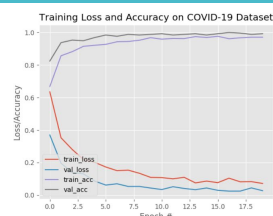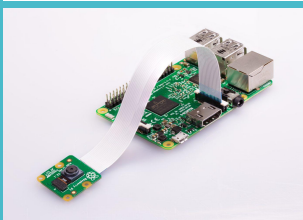
In Action: Maskless
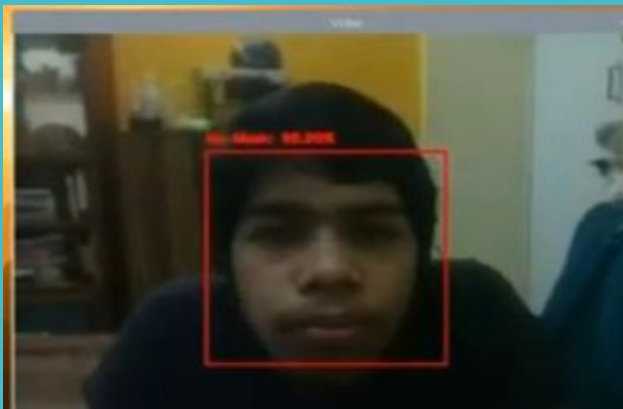
In Action: Masked
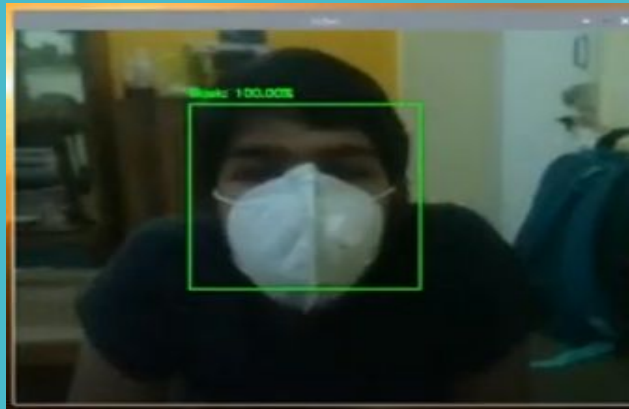
Technologies and Packages Used:

- Raspberry Pi 4
- Raspberry Pi Camera Module (5 MP)
- Python and Tensorflow
- Keras and OpenCV libraries
- A Dataset containing 690 masked faces and 686 unmasked faces was used.

Insights and References:

The model predicts with an accuracy of almost 99% in real-time video with a good framerate.

Further Possible Developments:

1. Addition of IR sensor for in-built contact-free temperature readings

2. Could be connected to a smart door and sanitizer dispenser for complete touch-free smart system.

References:
Data Set: https://github.com/prajnasb/observations