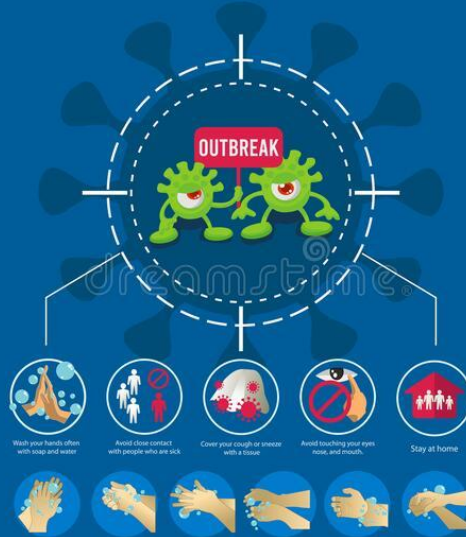


SAMHAR-COVID19 Hackathon

HOW TO PROTECT YOURSELF FROM **CORONAVIRUS** ?



Title: Other/Open House Challenge

The objective is to make use of Artificial Intelligence (AI) & Computer vision in predicting, minimizing, and stalling its spread of the viruses.

Washing our hands with soap and water or using an alcohol-based hand rub kills viruses that may be on your hands, but yet most of us does it wrong.

The problem statement is to come up with a solution to ensure the hands were being washed properly.

About the solution

Hand washing is the basic step you need to follow to avoid the spread of not only COVID19 but also many other viruses.

But most of us don't know whether we had properly washed or not.

Our idea is to build a deep learning model that can keep track of how well a user had washed his/her hands by comparing with the WHO prescribed handwash procedure.

The model then can be deployed in form of a cross platform web application.

This could be very useful tool that can be implemented from shopping malls to individual households.

HOW TO HANDRUB?

RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

⌚ Duration of the entire procedure: 20-30 seconds



Apply a palmful of the product in a cupped hand, covering all surfaces;



Rub hands palm to palm;



Right palm over left dorsum with interlaced fingers and vice versa;



Palm to palm with fingers interlaced;



Backs of fingers to opposing palms with fingers interlocked;



Rotational rubbing of left thumb clasped in right palm and vice versa;



Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



Once dry, your hands are safe.

The task of our DL model is to identify whether the user had covered all these steps or not.

There after making sure the user had properly washed his/her hands.

By the WHO

TECH STACK

Latest technologies

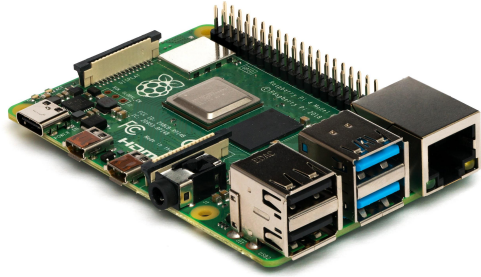
- ❑ We use Flutter to develop the application that allows us to build the app across all the platforms at a time.
- ❑ We use Tensorflow Lite to optimize & deploy the deep learning model effectively.

Frameworks

- TensorFlow
- OpenCV
- CUDA (for GPU programming)

Hardware requirements

1. A camera to capture the video.
2. A digital screen to show the results.



Our solution
can be
integrated with

Android • iOS • WEB • Raspberry Pi



Step 1



Step 2 Left



Step 4 Left



Step 4 Right



Step 6 Left



Step 6 Right

DATASET

12 steps • 292 individual videos

The *Hand Wash Dataset* consists of videos of hand washes in different environments to provide as much variance as possible. The variance was important to ensure that the model is robust and can work in more than a few environments. The varied parameters are:

- Illumination
- Background
- Source Camera Position
- Field of view
- Individuals performing the hand wash

Model architecture

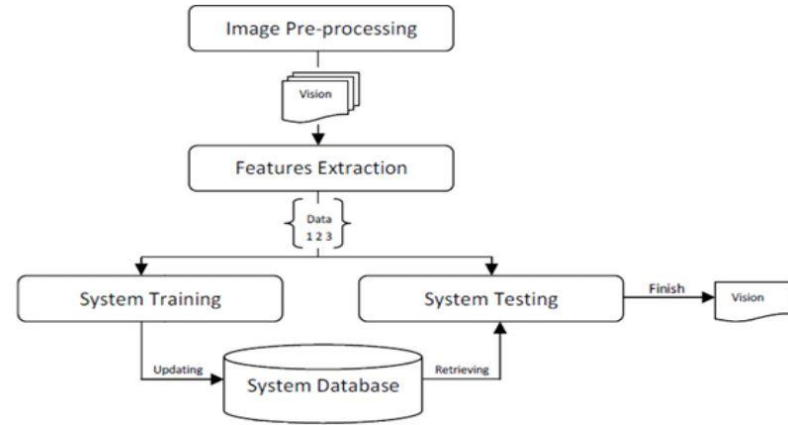
Types of layers Pipeline

- CNN2D
- CNN1D
- Fully connected
- Max pooling
- Dropout for regularization
- RNN for sequential data

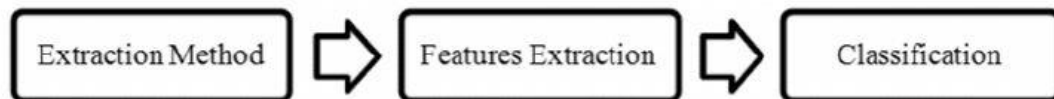
The video/images were first preprocessed then they were fed into our pre-trained model.

The model then outputs a one hot encoded vector of our labels, here that are the 12 steps of washing.

Under the hood our model would perform a multi class classification task.



How it actually works

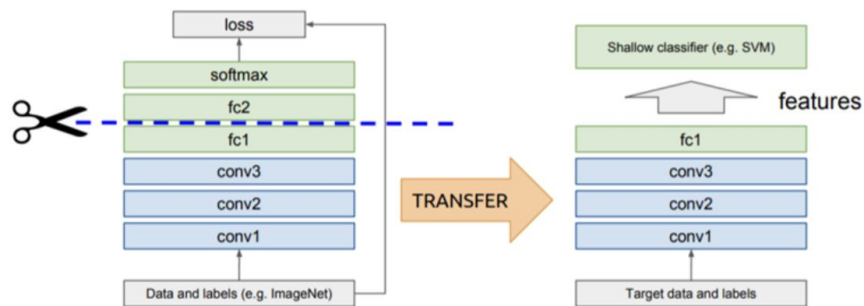


We gonna make use of transfer learning to achieve state of the art results.

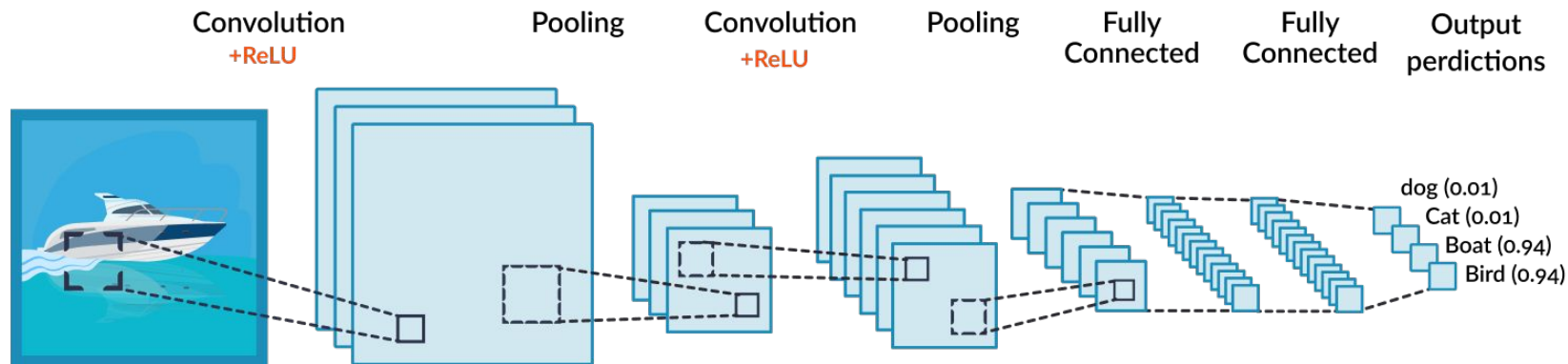
Here we take Google's MediaPipe model & cut off the last few layers of that model and we add few fully connected layers & at last a fully connected layer of 12 nodes. Then start training our model on our training dataset.

Here the advantage is that, our model need not to learn everything from scratch like detecting fingers & other parts of the hand.

If require we shall fine tune it.



An insight of how a CNN works



The colour image or a frame from the video is first converted into 3 huge matrices of each containing the pixel values of Red, Blue & Green.

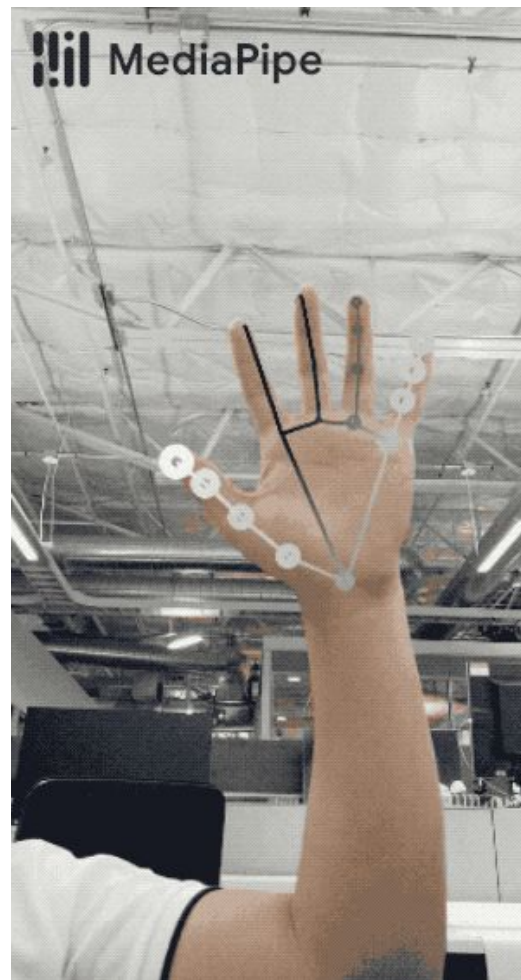
Then on those convolution operation is performed thereby reducing the dimensions of our data.

Now the resultant can be used to classify whether a certain step is covered or not.

This involves a lot of matrix multiplications which can be executed in parallel & that's the reason for us to use GPU for training the model.

REFERENCE

- Model used for transfer learning
- <https://github.com/SBoulanger/blazepalm/blob/master/model.png>
- [mediapipe/hand_tracking_mobile_gpu.md at master · google/mediapipe](#)
- [\(PDF\) Hand Gesture Recognition: A Literature Review](#)



Thank you

We are excited to implement our solution..!



STAY HOME. SAVE LIVES.

