Capstone Project

Face Emotion Recognition-Deep Learning Approach

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Contents:

Face Emotion Detection:

AI

1) Humans are used to taking in non verbal cues from facial emotions. Now computers are also getting better to reading emotions. So how do we detect emotions in an image?

2) We used the given dataset of Face Emotion Recognition and built a CNN to detect emotions. The emotions can be classified into 7 classes — happy, sad, fear, disgust, angry, neutral and surprise.

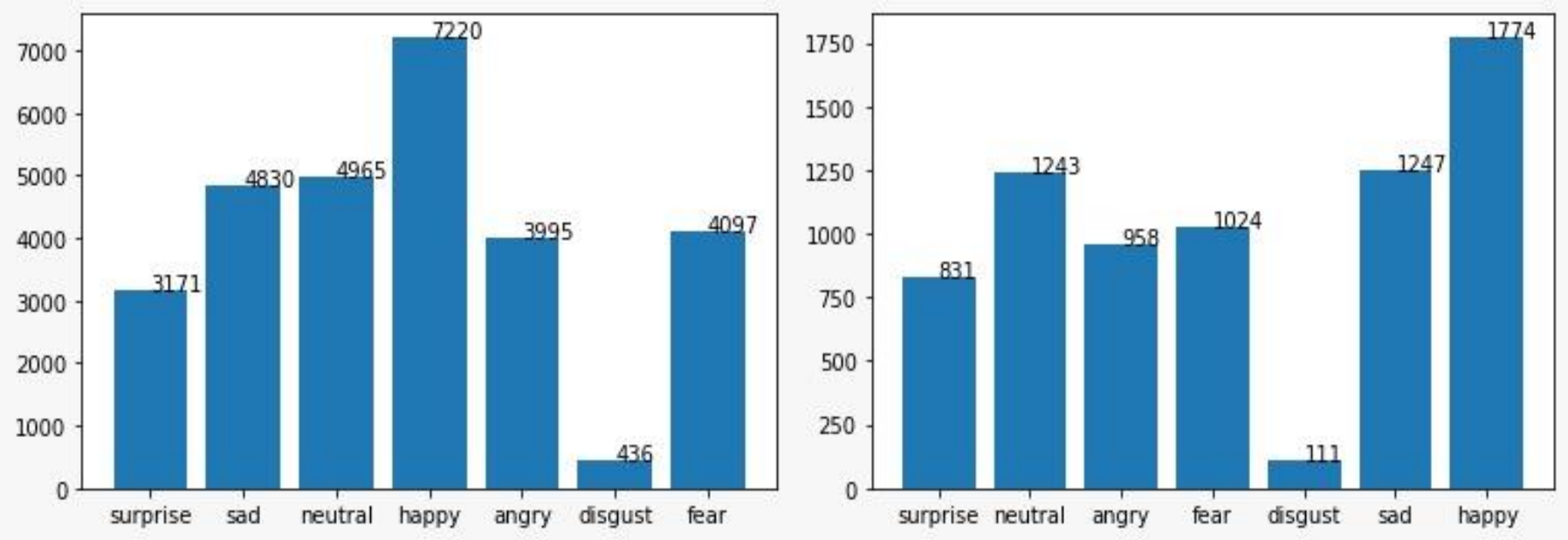
3) Model — We built a 6 layered Convolutional Neural Network (CNN) in Keras and use image augmentations to improve model performance. We tried many different models and did the implementation.

Problem Statement:

We tackled the problem of recognizing the emotion of a person from an image of their facial expression. First, we built models capable of recognizing seven emotions (happy, sad, angry, afraid, surprise, disgust, and neutral). Given static, cropped headshots, our model would output a probability distribution over emotions of the pictured individual. Next, we transferred the skills learned on static datasets to implement a real-time emotion classifier. Using a webcam video feed, we built a system to continuously detect faces, extract, crop, and grayscale the face region, and classify the emotion of the person.

Dataset Elaboration

The FER-2013 dataset consists of 28,000 labeled images in the training set, 3,500 labeled images in the development set, and 3,500 images in the test set. Each image in FER-2013 is labeled as one of seven emotions: happy, sad, angry, afraid, surprise, disgust, and neutral, with happy being the most prevalent emotion, providing a baseline for random guessing of 24.4%. The images in FER-2013 consist of both posed and unposed headshots, which are in grayscale and 48x48 pixels. The FER-2013 dataset was created by gathering the results of a Google image search of each emotion and synonyms of the emotions.



Our Dataset is divided into 80% training data and 20% testing data. First graph is for training dataset in which 7220 people are happy, this is the highest count and the least count is 436 belongs to disgust emotion. Second graph is for testing dataset in which 1774 people are happy, this is the highest count and the least count is 111 belongs to disgust emotion.

Libraries Used:

AI

- **Flask:** Flask is a lightweight Python web framework that provides useful tools and features for creating web applications in the Python Language. It gives developers flexibility and is an accessible framework for new developers because you can build a web application quickly using only a single Python file.

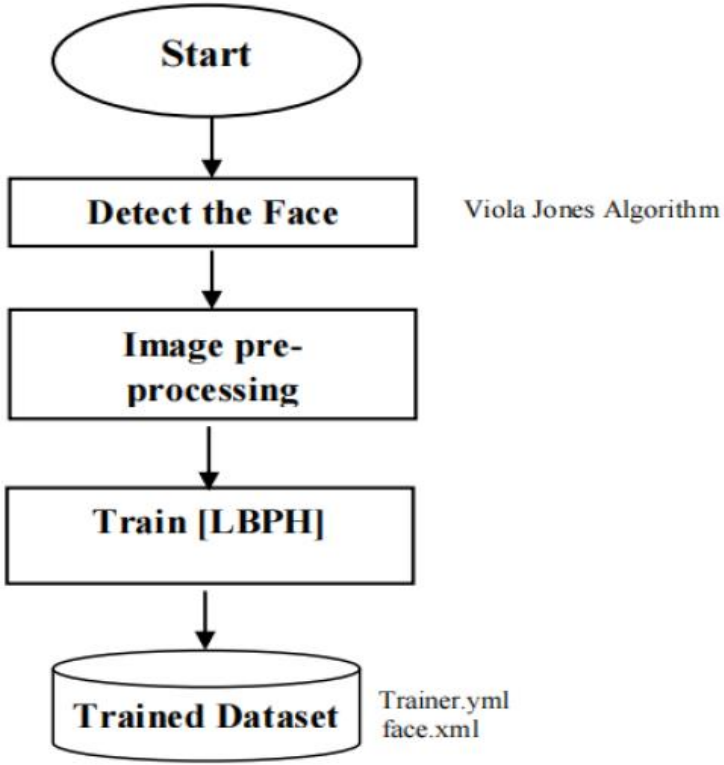
- **Tensorflow:** TensorFlow is a Python library for fast numerical computing created and released by Google. It is a foundation library that can be used to create Deep Learning models directly or by using wrapper libraries that simplify the process built on top of TensorFlow.

- **Keras:** Keras is a high-level, deep learning API developed by Google for implementing neural networks. It is written in Python and is used to make the implementation of neural networks easy. It also supports multiple backend neural network computation.

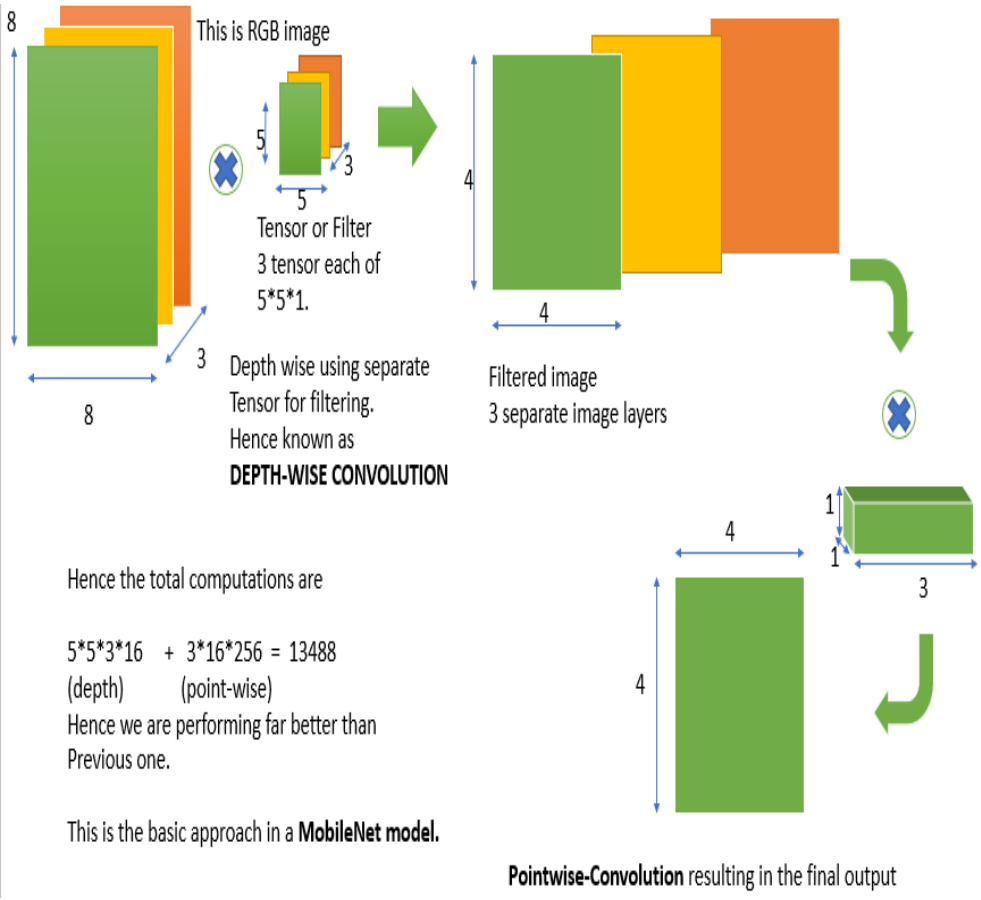
- **json:** JavaScript Object Notation (JSON) is a standardized format commonly used to transfer data as text that can be sent over a network. It's used by lots of APIs and Databases, and it's easy for both humans and machines to read. JSON represents objects as name/value pairs, just like a Python dictionary.

- **openCV:** OpenCV is a Python library that allows you to perform image processing and computer vision tasks. It provides a wide range of features, including object detection, face recognition, and tracking. In this OpenCV Tutorial in Python, we'll be learning more about the library.

Testing Flowchart



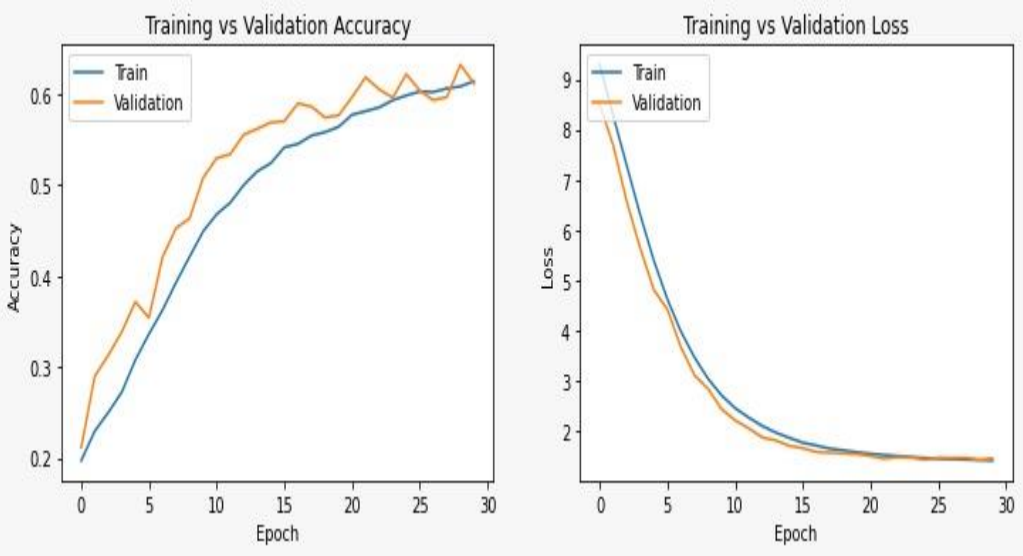
MobileNet:



Mobilenet is a model which does the same convolution as done by CNN to filter images but in a different way than those done by the previous CNN. It uses the idea of Depth convolution and point convolution which is different from the normal convolution as done by normal CNNs. This increases the efficiency of CNN to predict images and hence they can be able to compete in the mobile systems as well. Since these ways of convolution reduce the comparison and recognition time a lot, so it provides a better response in a very short time and hence we are using them as our image recognition model.

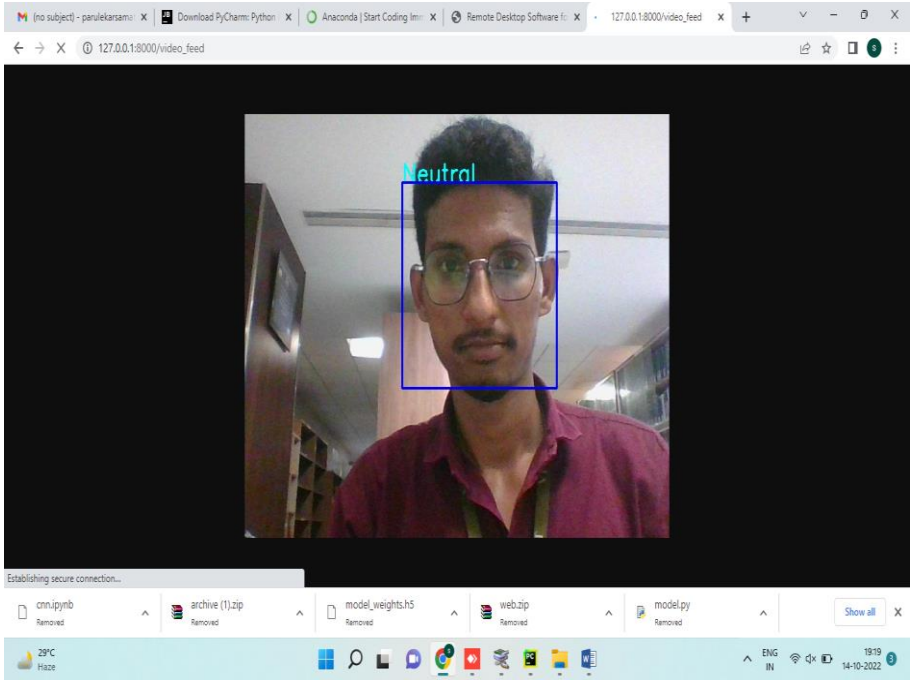
CNN model

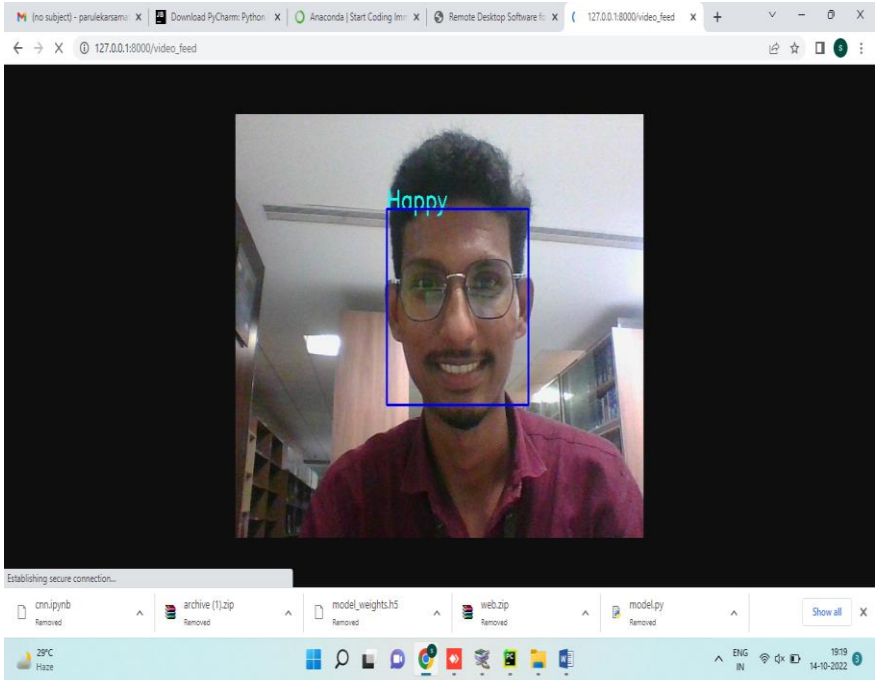
The Convolutional Neural Network (CNN or ConvNet) is a subtype of Neural Networks that is mainly used for applications in image and speech recognition. Its built-in convolutional layer reduces the high dimensionality of images without losing its information. That is why CNNs are especially suited for this use case.



- From the graph its clearly visible that the number of epoch increases then accuracy increases and loss function decreases
- For Epoch 30 the accuracy is around 60%. We trained the neural network and we achieved the highest training accuracy around 84%. After using test data to check how well our model generalize, we score an astounding 60% on the test set.

Emotion prediction Images from the WebApp





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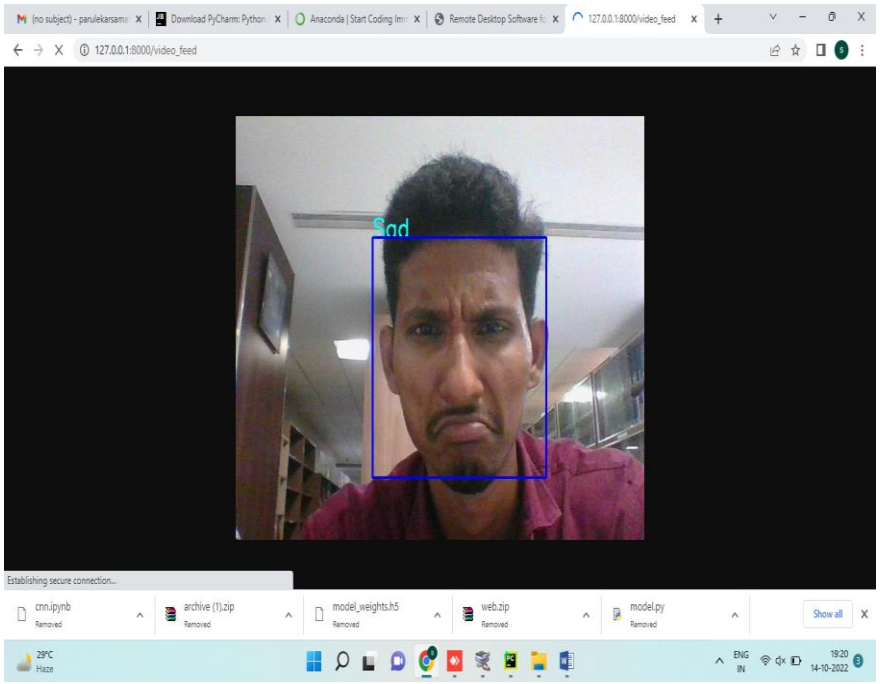
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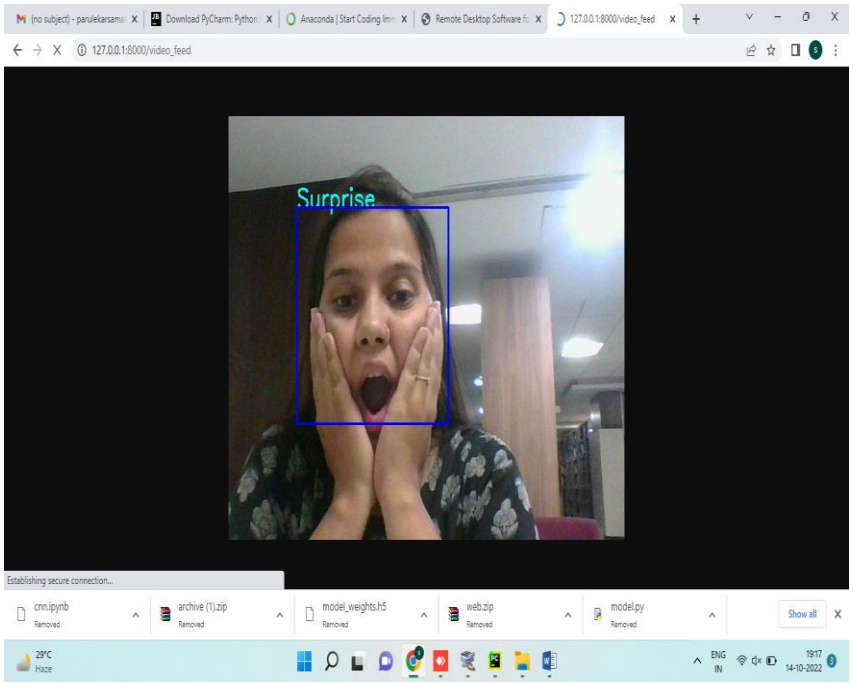
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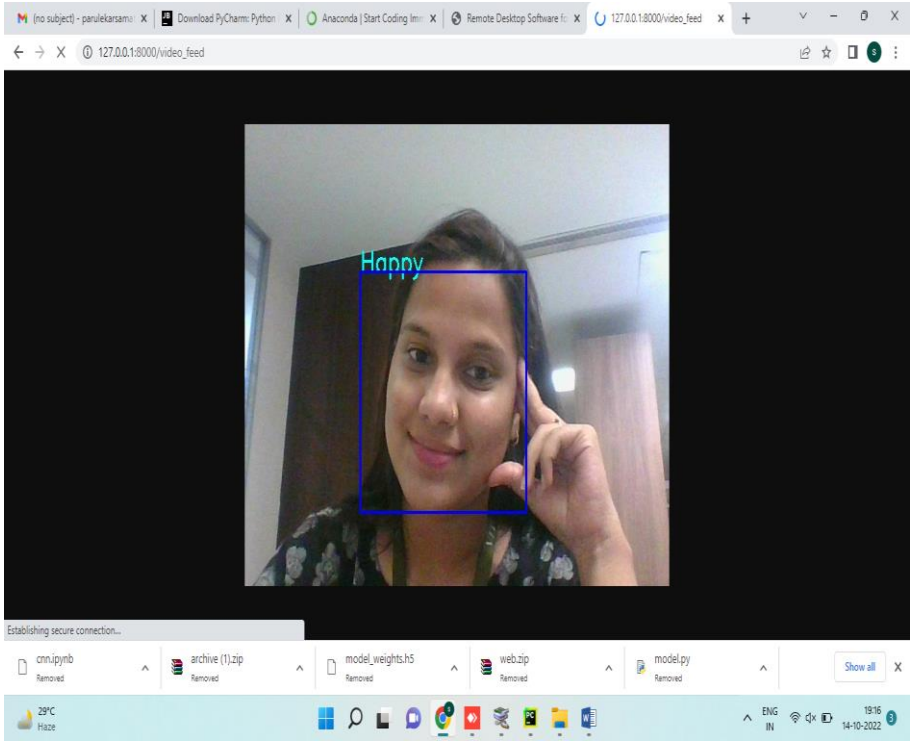
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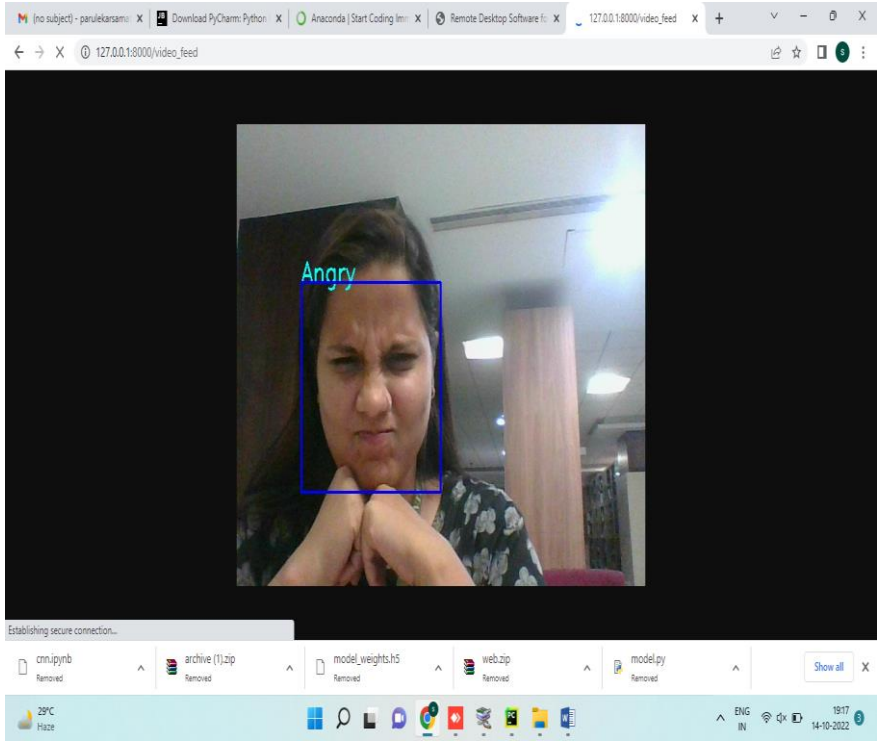
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Conclusion:

- We are able to achieve the accuracy of about 84% for the 50 epochs whereas it is shown from the above graph that accuracy is 60% for 30 epochs. Hence, we can conclude that as we increase the epoch, we can have the improvement in accuracy.
- Also, as far as validation losses are considered, as we increases the epoch, validation losses gradually decreases
- Face recognition and emotion recognition are the goals of this project, which will use computer vision to accomplish facial recognition and emotion identification while also improving advanced feature extraction and classification in face expression recognition.
- This project investigates the topic of face emotion analysis, namely the recognition and detection of emotions. A convolution neural network is described for the purpose of classifying face pictures into the seven regular emotions of happiness, fear, sorrow, anger, surprise, disgust, and neutral.

Thank You.....