

Capstone Project - 5

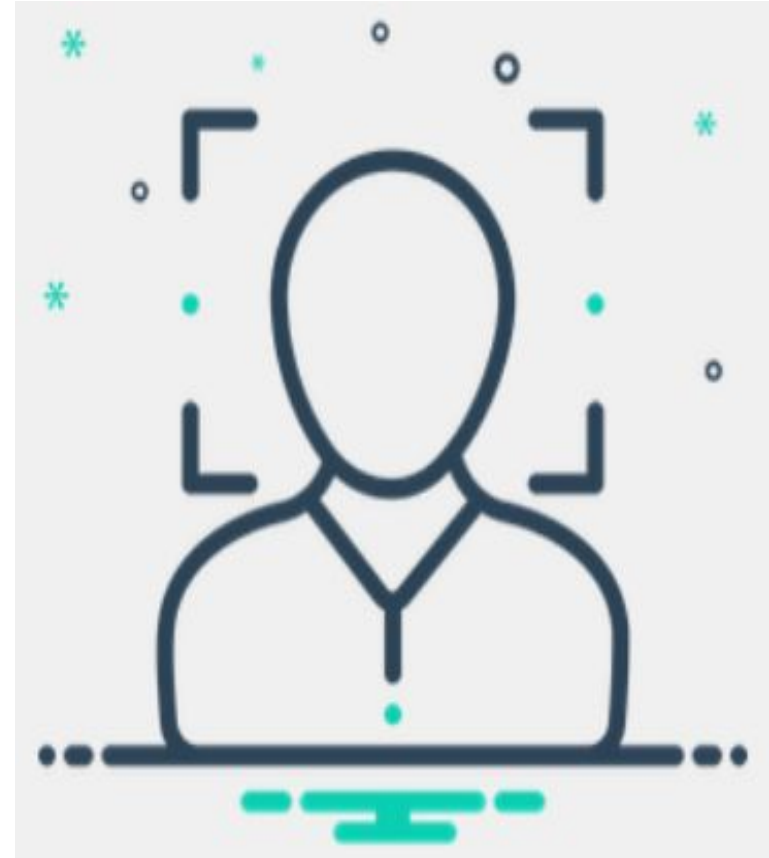
Face Emotion Detection

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Problem Statement

- One of the biggest problems of E-learning systems is to maintain the motivation of the students in the virtual classrooms. This situation is easier in formal classrooms because the educator is in face-to-face contact with the students in the same environment. In this aspect, it is much easier to observe their emotional states and motivations.
- The purpose of the project is to develop a Facial Emotion Recognition System (FERS), which recognize the emotional states of students in video-conference type E-learning systems. In order to create a more interactive educational environment, this system transfers the emotional states of the students to the educator instantaneously. Our study is supportive of the studies that make possible to observe the motivation level of both the individual and the virtual classroom in the e-learning systems.

Data Summary

The data comes from the past Kaggle competition “Challenges in Representation Learning: Facial Expression Recognition Challenge”:

We have defined the image size to 48 so each image will be reduced to a size of 48x48. The faces have been automatically registered so that the face is more or less centered and occupies about the same amount of space in each image. Each image corresponds to a facial expression in one of seven categories (0=Angry, 1=Disgust, 2=Fear, 3=Happy, 4=Sad, 5=Surprise, 6=Neutral). The dataset contains approximately 36K images.

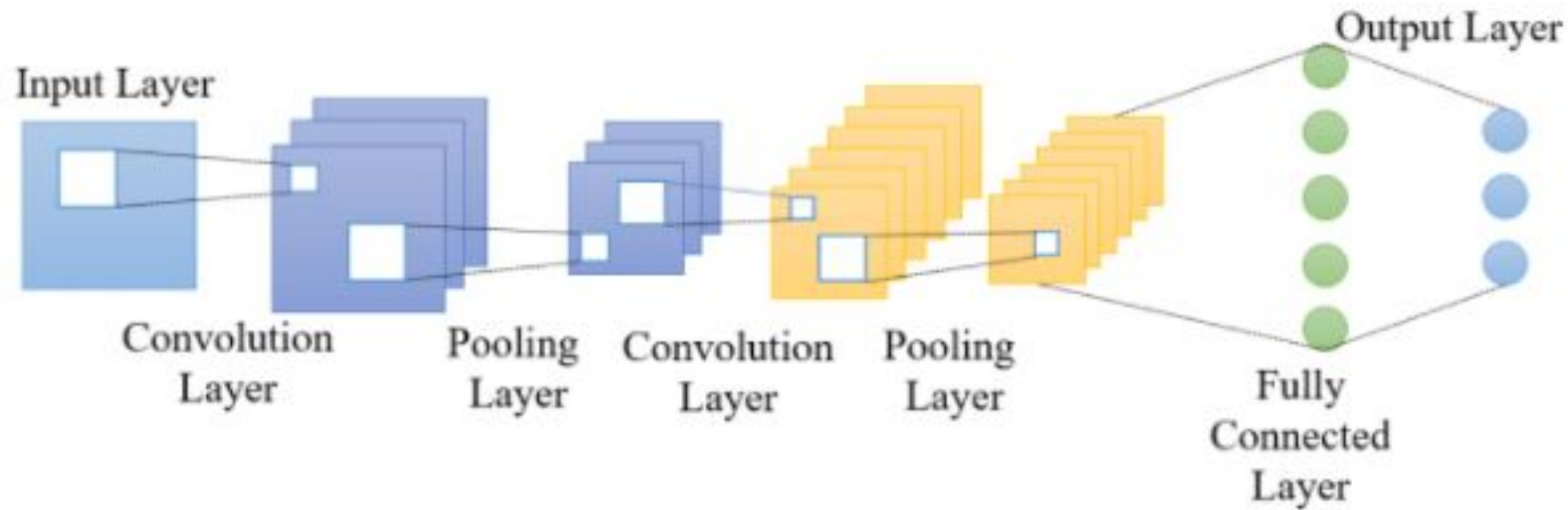
Data is converted into raw images and splitted them in multiple folders.

	Train Images	Test Images
0=Angry	4103	960
1=Disgust	436	111
2=Fear	3993	1018
3=Happy	7164	1825
4=Sad	4938	1139
5=Surprise	3205	797
6=Neutral	4982	1216

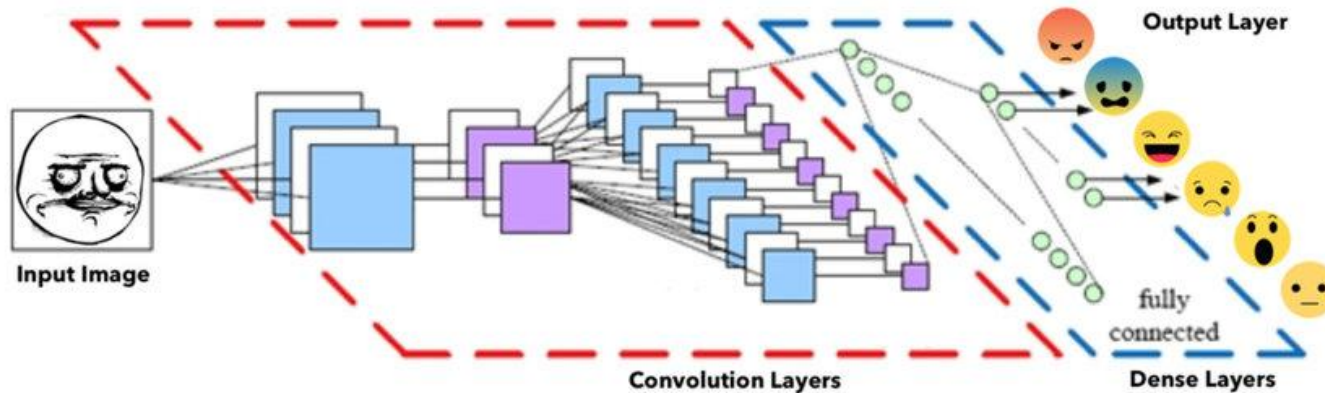
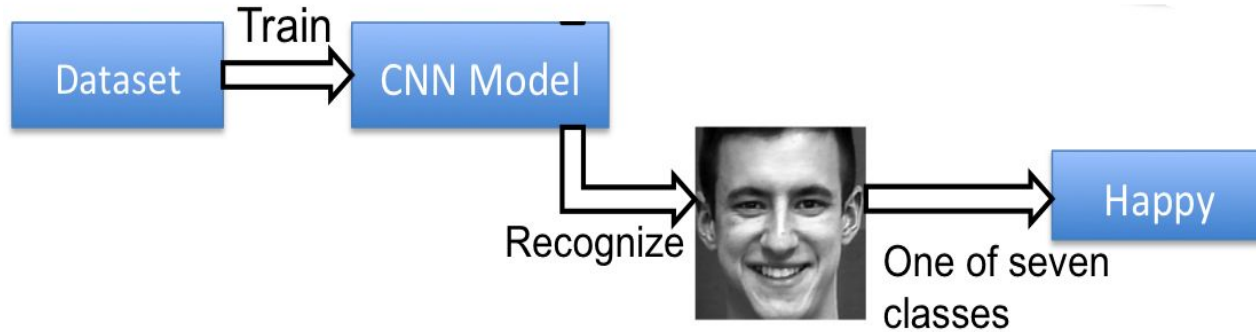
Sample of training Images



Building Model : CNN layers



Building Model : CNN layers



Building Model : CNN Model

Parameters

- Activation Function - ReLu, Softmax
- Epoch - 50
- Optimizer - Adam
- Batch size -128

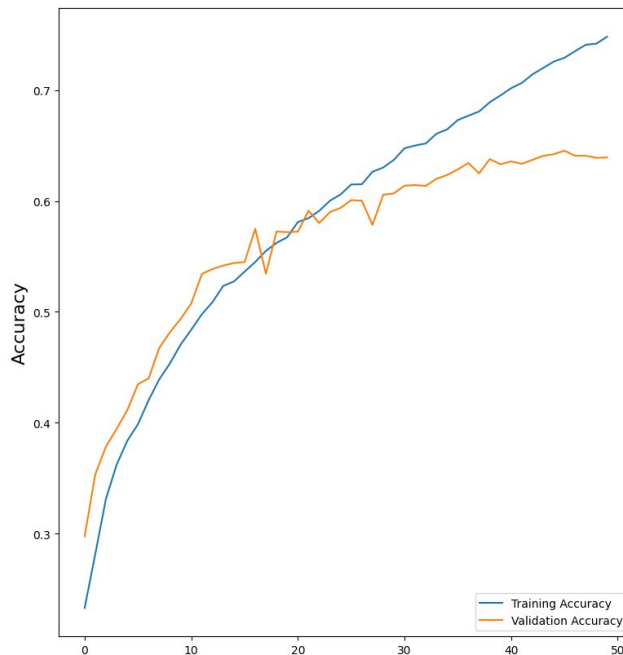
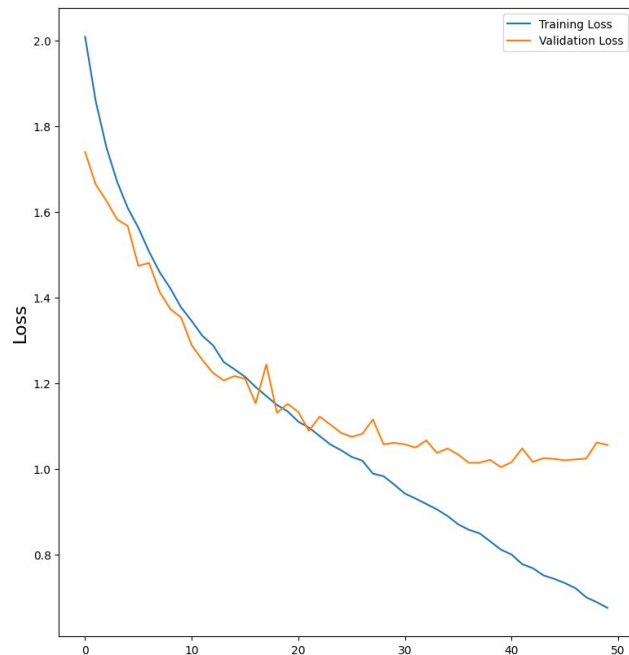
Also we use some common techniques for each layer

- Batch normalization
- Dropout

We choose softmax as our last activation function as it is commonly used for multi-label classification.

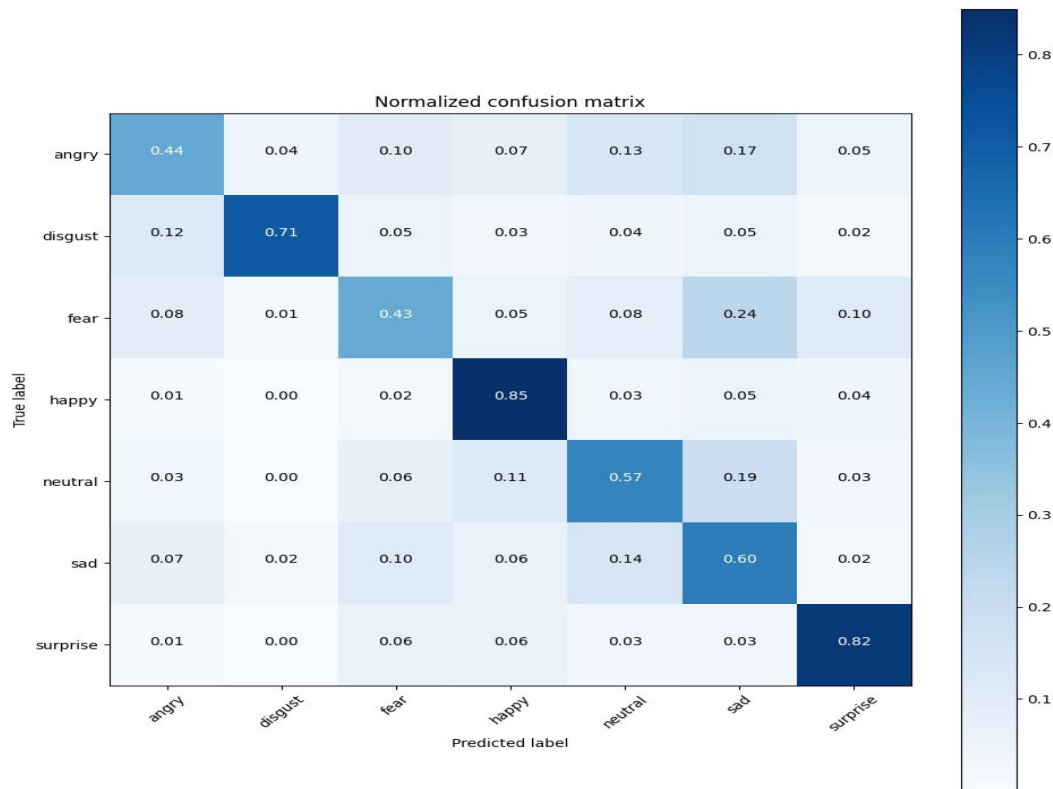
Model Evaluation

Optimizer : Adam



- The training gave the accuracy of 74% and val_accuracy of 63%. It seems good. So, I save the model and detection I got from live video is good.
- The training loss is slightly higher than the validation loss for the first epochs.

Model Evaluation

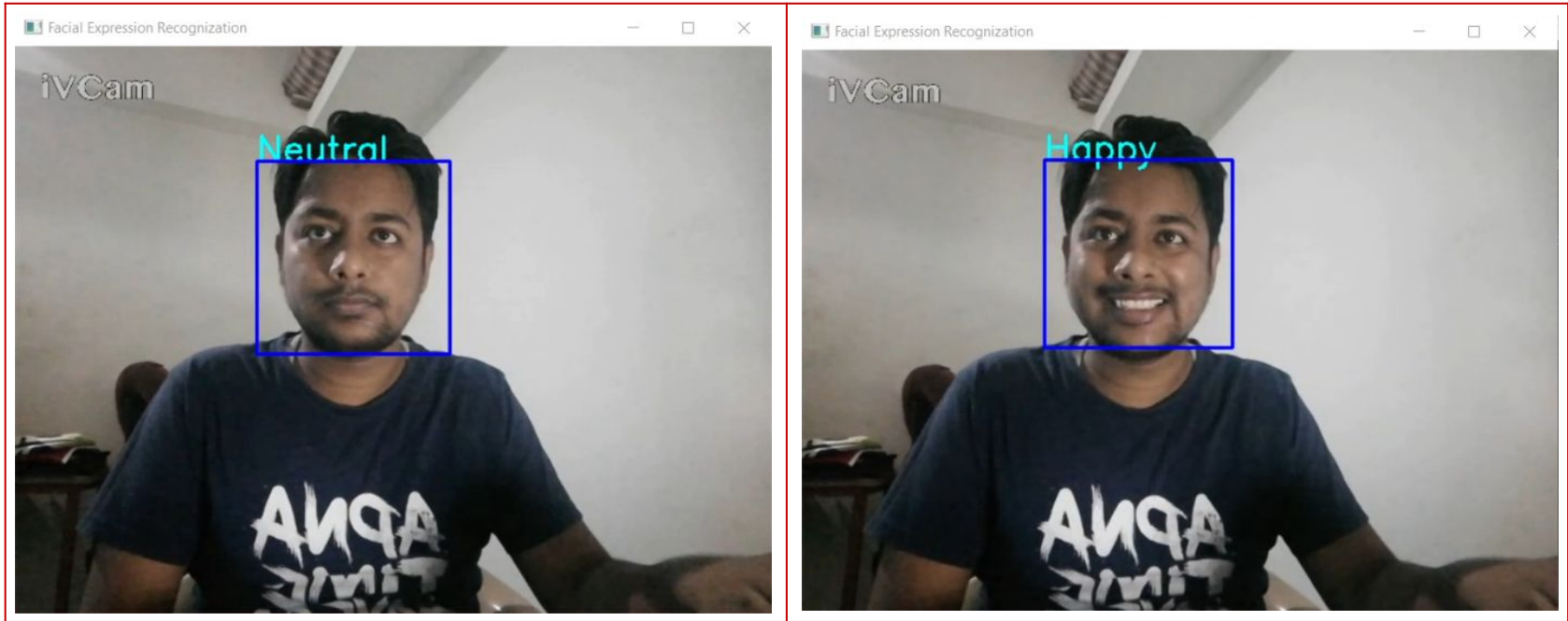


- Our model is very good for predicting happy and surprised faces. However it predicts quite poorly feared faces maybe because it confuses them with sad faces.

Realtime Face Emotion Recognition Demo

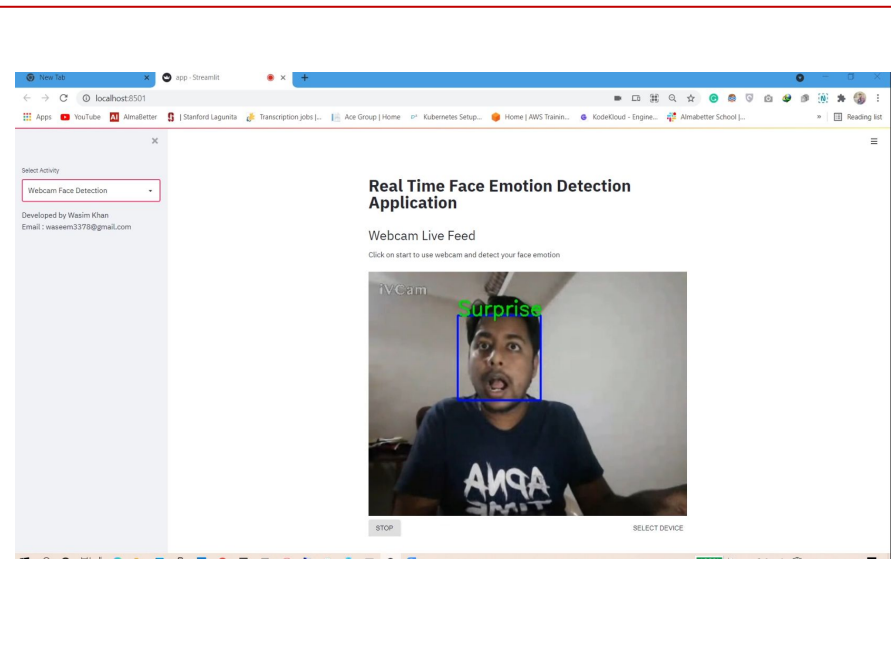
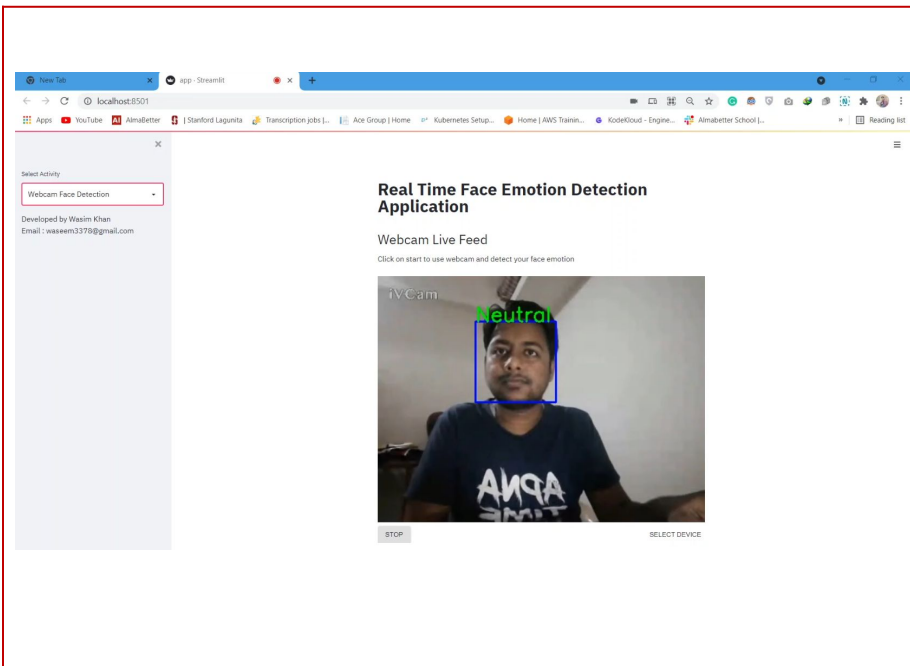
AI

Live demo using Local Webcam:



Build WebApp : Using Streamlit

Live demo using Streamlit WebApp:



Deployment of WebApp :Heroku & Streamlit

Different type of Deployment Platform.

What is Heroku and Streamlit Sharing

Heroku Link: <https://faceemotiondetection-wasim.herokuapp.com/>

Streamlit Link:
<https://share.streamlit.io/wasimkhan33/face-emotion-detection-using-streamlit/main/app.py>

Challenges

- Large dataset folder containing lot of image to handle
- Model training take lots of time and system resource
- Continuous Runtime and RAM Crashes many time till we get the best model
- Code to access webcam using opencv
- Deployment part

Conclusion :

- Our model is giving an accuracy of 74% and is robust in that it works well even in a dim light environment.
- The application is able to detect face location and predict the right expression while checking it on a local webcam.
- The front-end of the model was made using streamlit for webapp and running well on local webapp link.
- Finally, we successfully deployed the Streamlit WebApp on Heroku and Streamlit share that runs on a web server.
- And I believe that through this model teachers can understand the students' perception during online classes and change the way of teaching if needed by understanding the students' motive.

Thank You

Q & A