# Capstone Project - 5

## Face Emotion Detection

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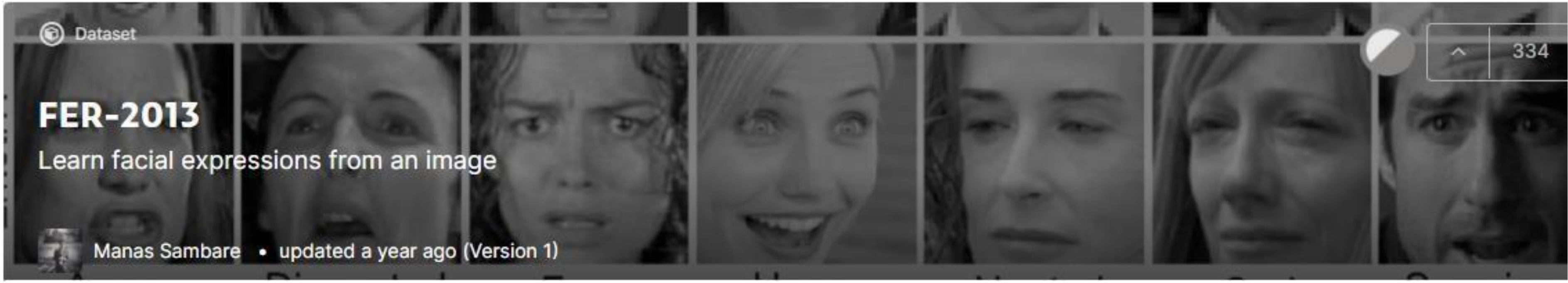
# Problem Statement

- 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

Kaggle Link-
https://www.kaggle.com/msambare/fer2013



FER-2013

Learn facial expressions from an image

Manas Sambare • updated a year ago (Version 1)

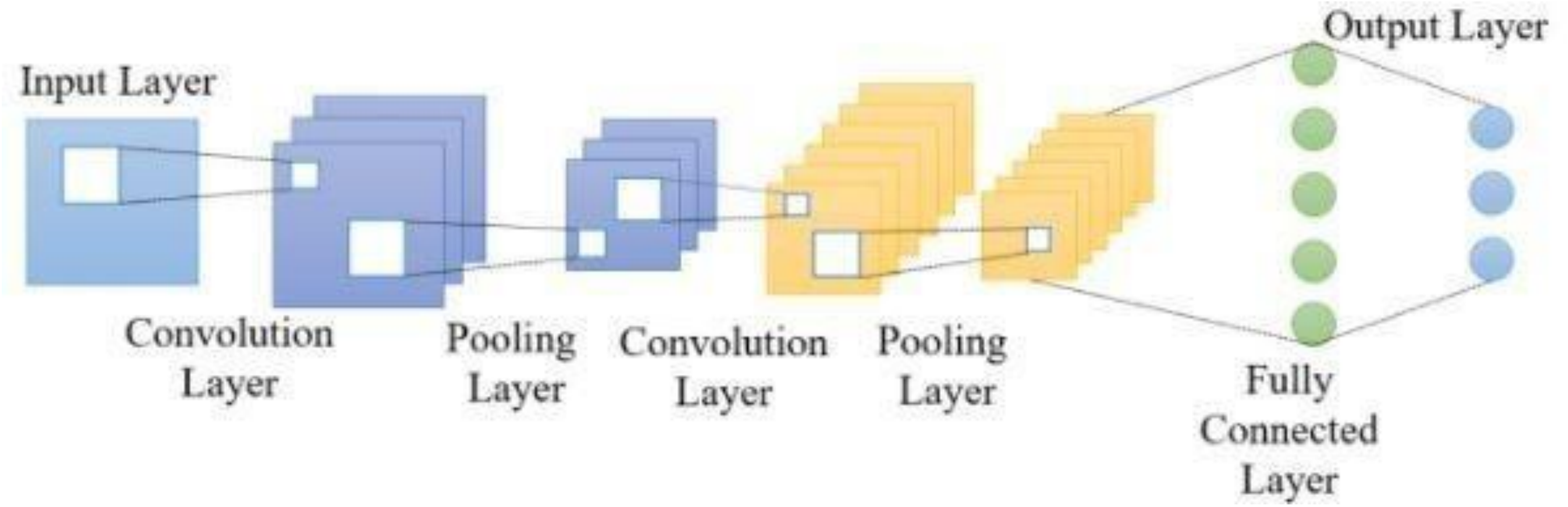
- The data consists of 48x48 pixel grayscale images of faces. The faces have been automatically registered so that the face is more or less centered and occupies about the same amount of space in each image.

# Data Summary

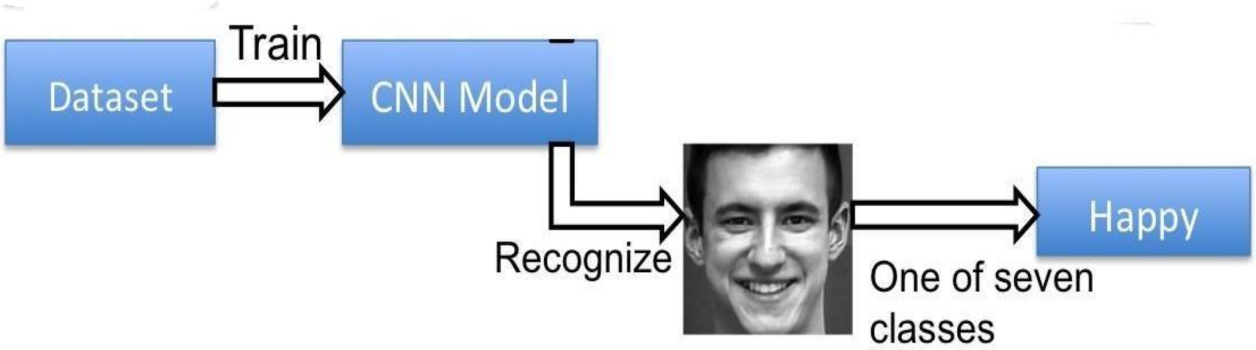
- Each image corresponds to a facial expression in one of seven categories (0=Angry, 1=Disgust, 2=Fear, 3=Happy, 4=Sad, 5=Surprise, 6=Neutral). The dataset contains approximately 36K images.
- Data is converted into raw images and splitted them in multiple folders.

| | 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 |

# Building Model : CNN layers



# Building Model : CNN layers



Dataset

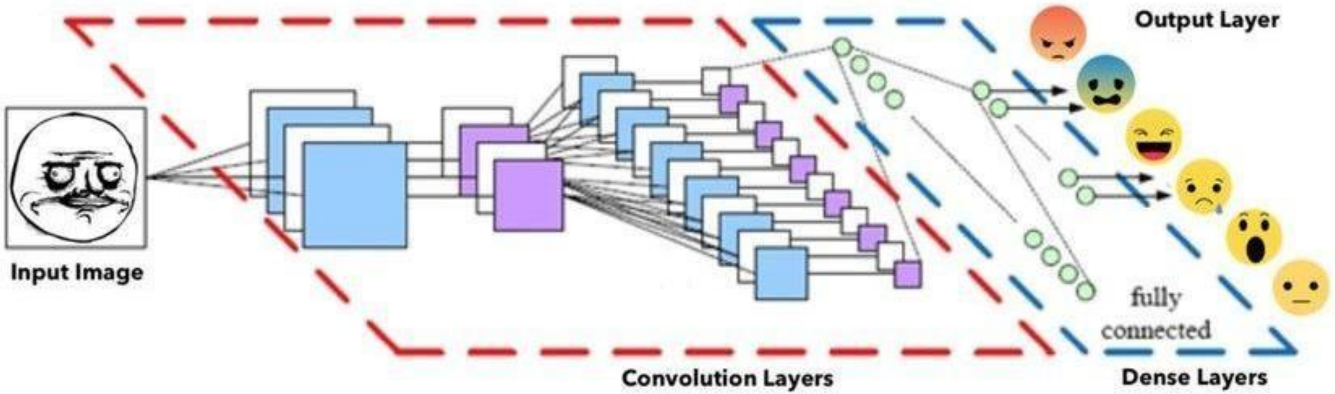
Train

CNN Model

Recognize

Happy

One of seven classes



# Building Model : CNN Model

Parameters

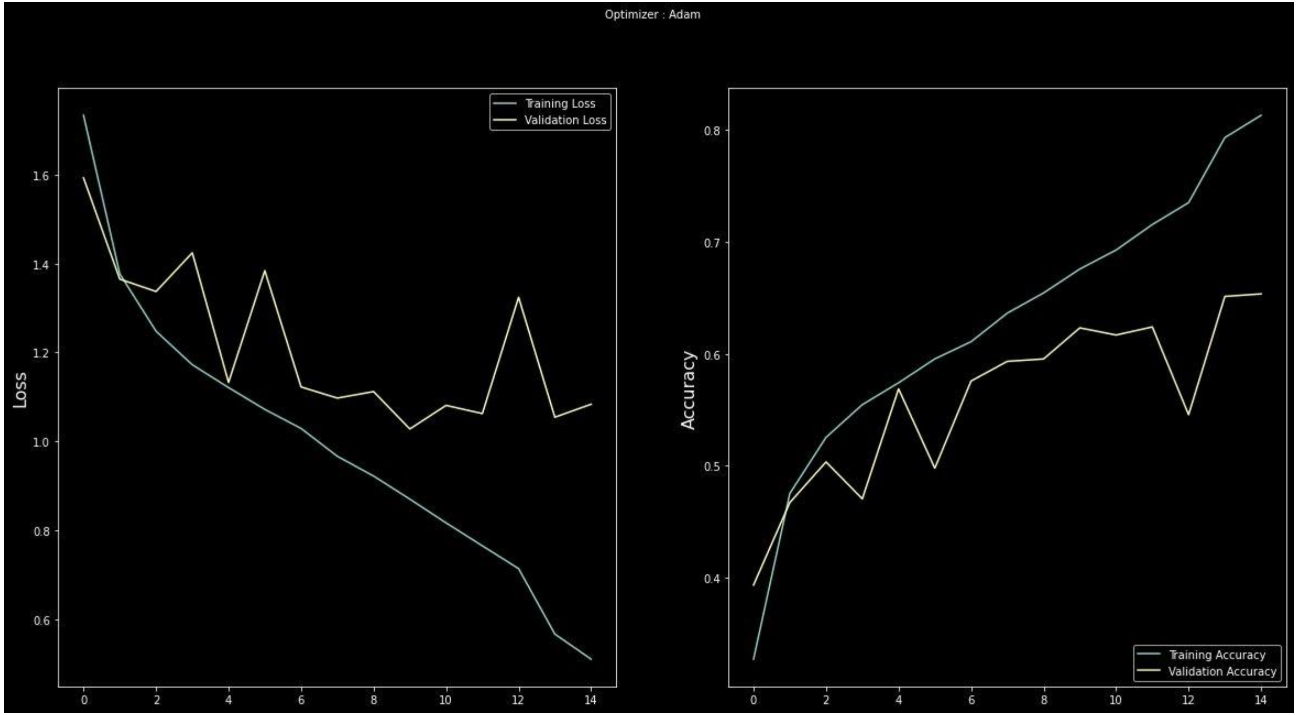
- Activation Function - ReLu, Softmax
- Epoch - 40
- Optimizer - Adam
- Batch size -32

Also we use some common techniques for each layer

- Batch normalization
- Dropout

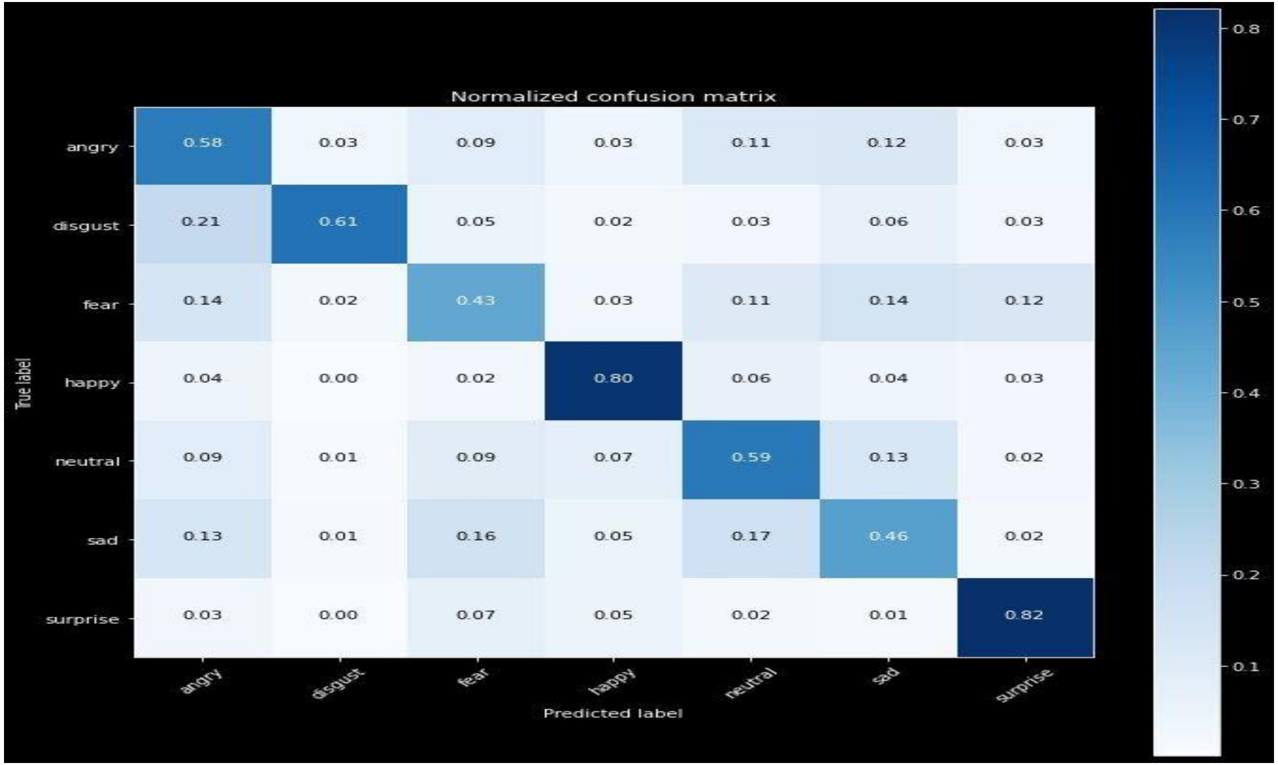
We choose softmax as our last activation function as it is commonly used for multi-label classification.

# Model Evaluation



- The training gave the accuracy of 81% and val_accuracy of 65.43%. 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.**

# Creating Web App Using Streamlit

Streamlit is an open-source python framework for building web apps for Machine Learning and Data Science. We can instantly develop web apps and deploy them easily using Streamlit. Streamlit allows you to write an app the same way you write a python code. Streamlit makes it seamless to work on the interactive loop of coding and viewing results in the web app.

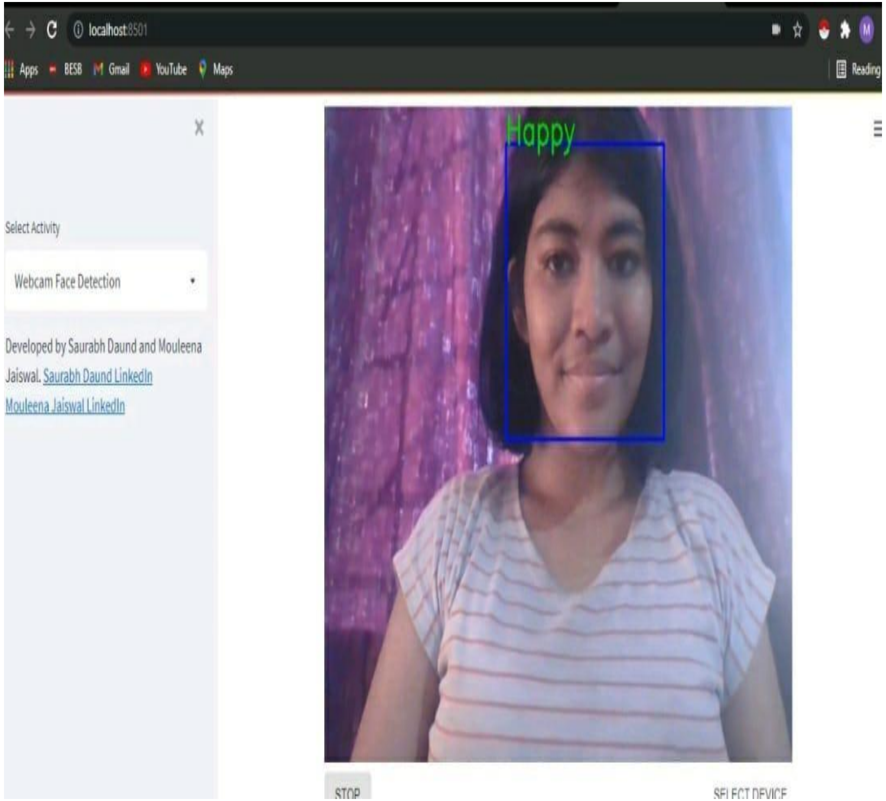
https://share.streamlit.io/saurabhdaund76/face-emotion-recognition/main/app.py

# Creating Web App Using Heroku

Heroku is a cloud platform as a service supporting several programming languages. One of the first cloud platforms, Heroku has been in development since June 2007, when it supported only the Ruby programming language, but now supports Java, Node.js, Scala, Clojure, Python, PHP, and Go.

https://face-emotion-recognition-proj.herokuapp.com/

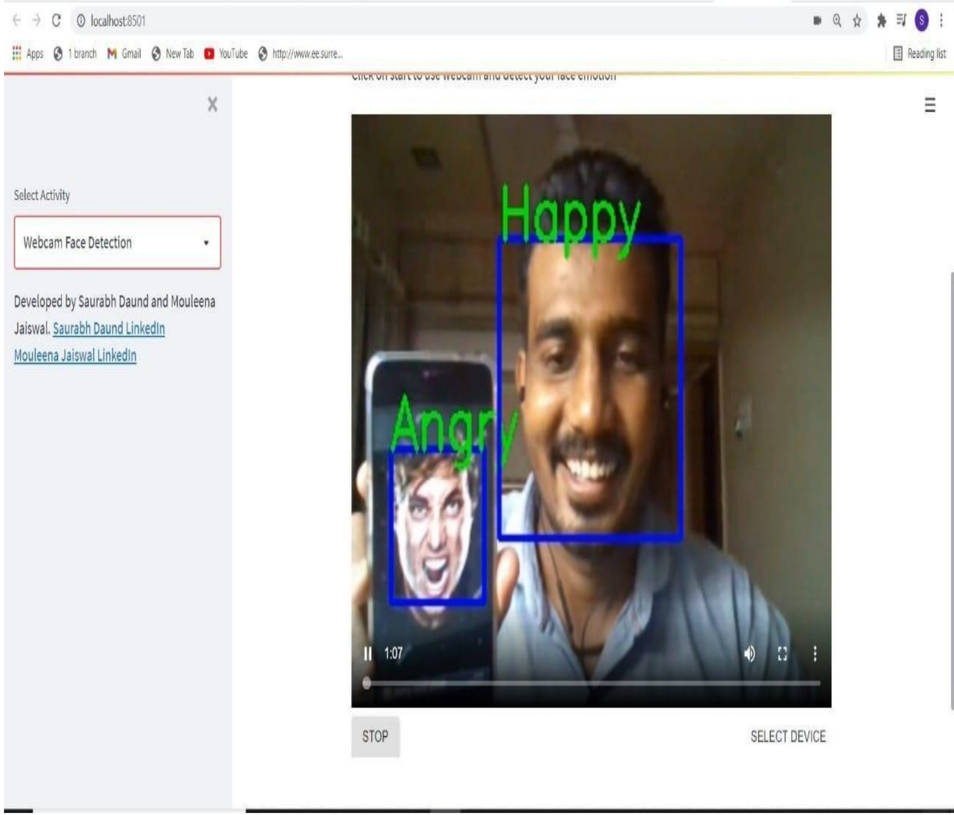
# Output



Select Activity

Webcam Face Detection

Developed by Saurabh Daund and Mouleena Jaiswal. Saurabh Daund LinkedIn Mouleena Jaiswal LinkedIn



Click on start to use webcam and detect your face emotion

Select Activity

Webcam Face Detection

Developed by Saurabh Daund and Mouleena Jaiswal. Saurabh Daund LinkedIn Mouleena Jaiswal LinkedIn

# Challenges

- Large dataset folder containing lot of images 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 81% 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 we 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