

# Capstone Project - 5

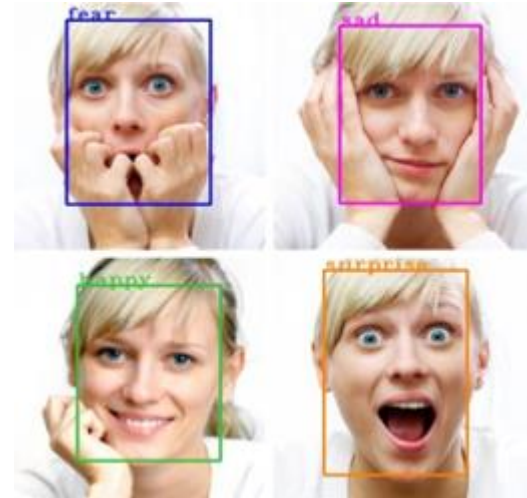
## Live Class Monitoring(Face Emotion Recognition)

Deep Learning and MLE

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## Discussion Points

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2. Problem Statement
3. Data Summary
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5. Model Creation
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8. Challenges
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## Introduction

### What is Face Emotion Recognition?

“Emotion recognition is a technique that allows reading the emotions on a human face using advanced image processing.”

### What is the use and why it is important?

Use of technology to help people with emotion recognition is a relatively nascent research area. Facial expressions are a form of nonverbal communication. Various studies have been done for the classification of these facial expressions. There is strong evidence for the universal facial expressions of seven emotions which include: neutral happy, sadness, anger, disgust, fear, and surprise. So it is very important to detect these emotions on the face as it has wide applications in the field of Computer Vision and Artificial Intelligence. These fields are researching on the facial emotions to get the sentiments of the humans automatically.

## Problem Statement

- Indian education system is moving towards e-learning platforms.
- Digital learning is going to increase in future , but there are some challenges
- Challenge – how to ensure quality learning of students
- In physical class teacher can access the faces and emotions of each student but in digital class its not possible.
- Lack of surveillance
- Lack of attention
- We will solve the above-mentioned challenge by applying deep learning algorithms to live video data. The solution to this problem is by recognizing facial emotions.

## Data Summary

The model is trained on the FER-2013 dataset .This dataset consists of 35887 grayscale, 48x48 sized face images with 7 emotions - angry, disgusted, fearful, happy, neutral, sad and surprised.

Link of Data Set: <https://www.kaggle.com/msambare/fer2013>

Label	Emotion	Number of images for Training	Number of images for Testing
0	angry	3995	958
1	disgust	436	111
2	fear	4097	1024
3	happy	7215	1774
4	sad	4830	1247
5	surprised	3171	831
6	neutral	4965	1233

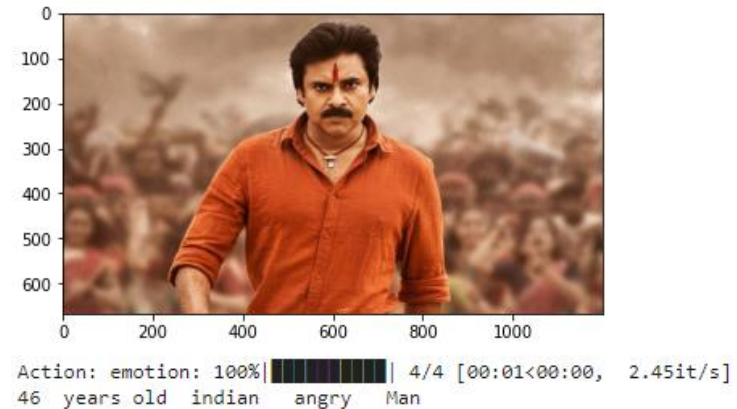
## Dependencies

- **Python-3**
- **OpenCV**
- **Keras**
- **TensorFlow**
- **Streamlit**
- **Streamlit-webrtc**

## Model Creation – Using DeepFace

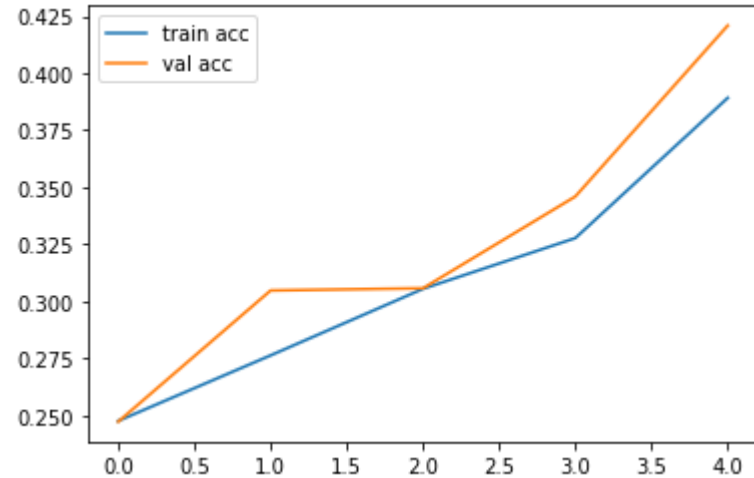
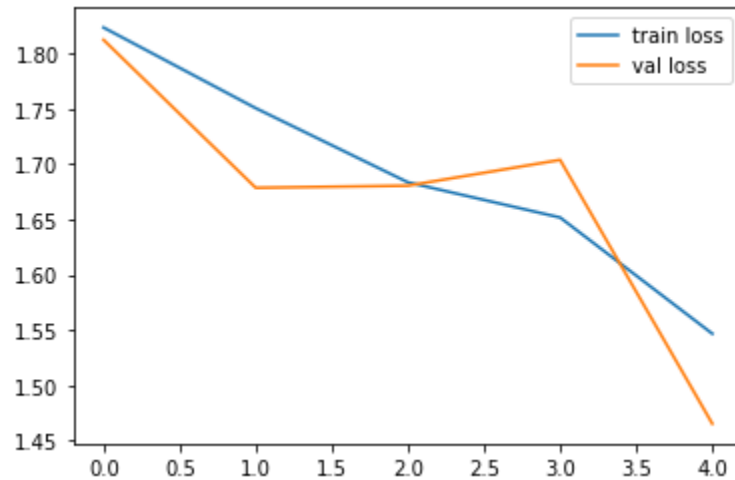
Deepface is a lightweight face recognition and facial attribute analysis (age, gender, emotion and race) framework.

DeepFace model is not giving us good results



## Model Creation – Using VGG-16

Transfer learning (TL) is a research problem in machine learning (ML) that focuses on storing knowledge gained while solving one problem and applying it to a different but related problem.

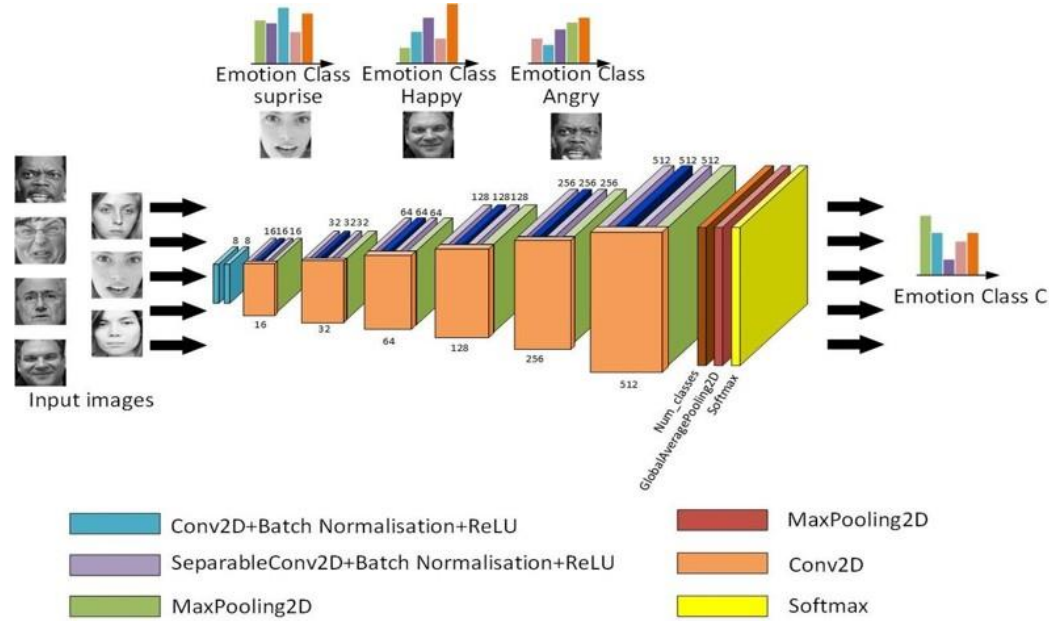




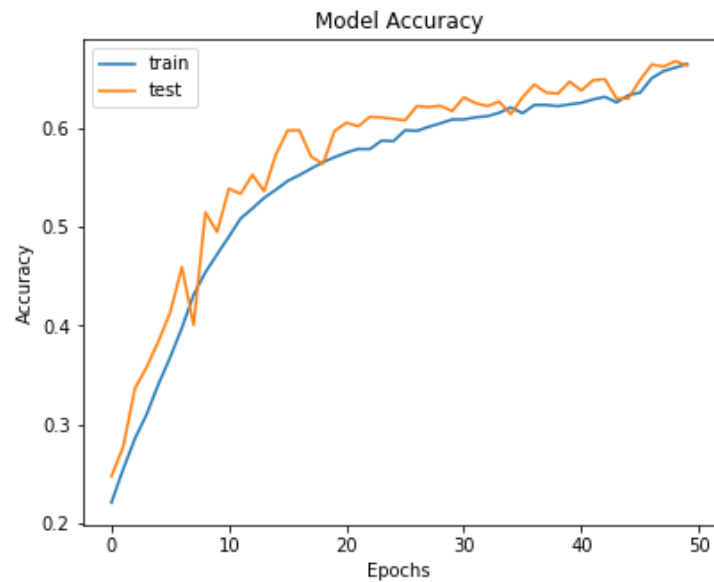
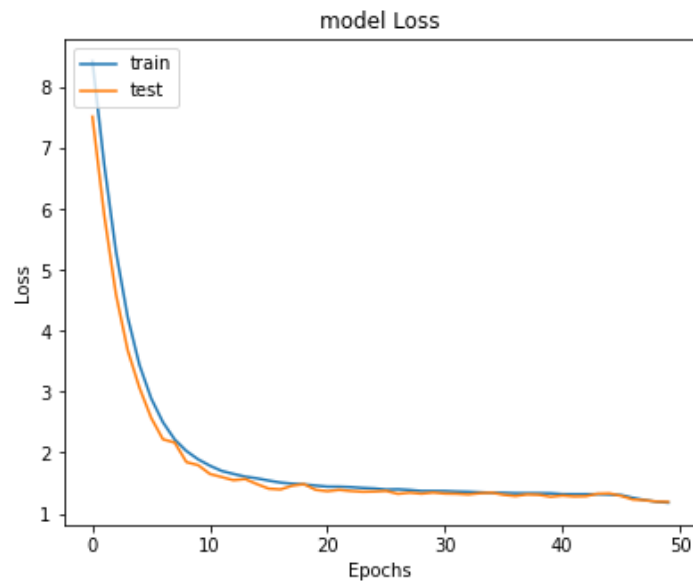
## Model Creation – Using Custom CNN

1. Created a custom CNN model using Conv2D, MaxPooling, BatchNormalization,
2. Dropout and Dense layers.
3. Activation function used - "ReLU" and "Softmax"
4. Output layer has 7 nodes
5. Optimizer used – Adam
6. Epochs - 50
7. Total params: 4,496,903
8. The training accuracy obtained from this model is 66.49% and validation accuracy is 66.32% after 50 epochs. Model is performing good in live video feed. Disgust images are not getting predicted correctly as there were very less images present for that in train dataset.

# CNN Architecture



## Model Evaluation

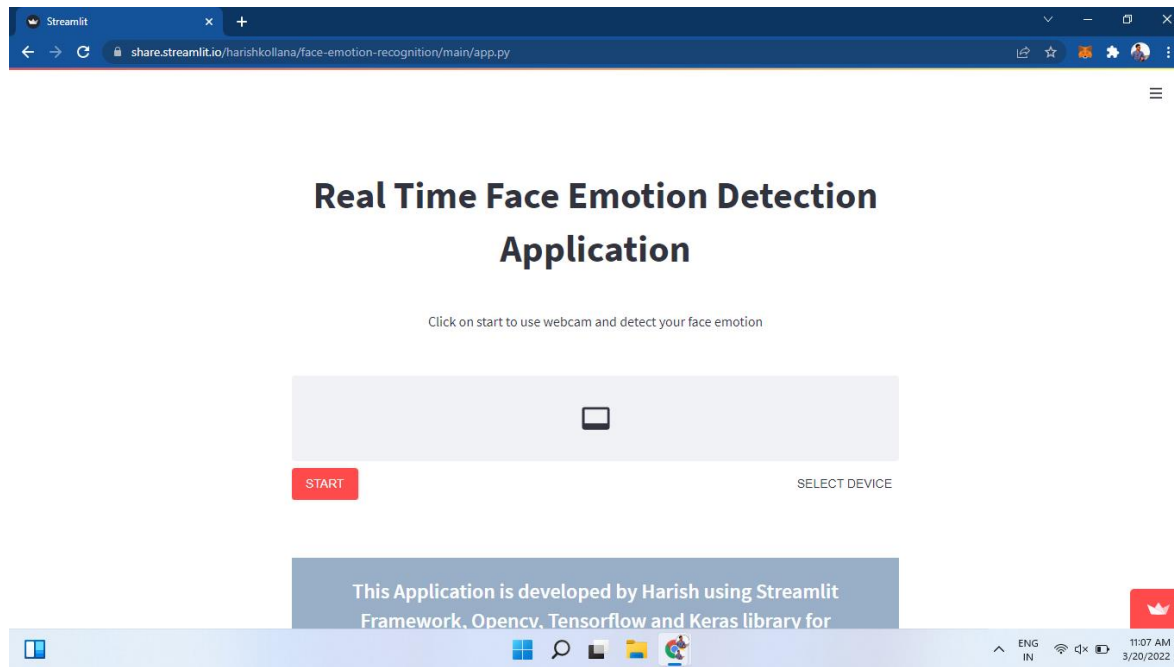


## Creation and Deployment of Webapp

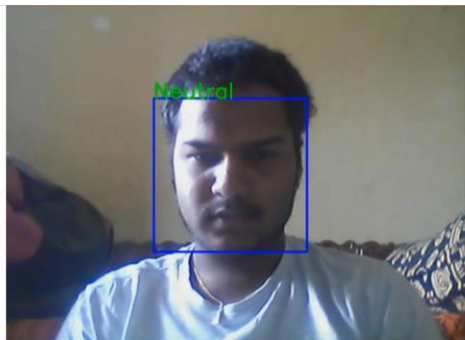
**Streamlit is an open-source python framework for building web apps for ML/DL Dropout and Dense layers.**

- 1. Loaded our trained model**
- 2. • Created a function FaceEmotion to detect multiple faces in videocam which draw a bounding box**
- 3. around faces and predict the face emotion.**
- 4. • Streamlit doesn't provide the live capture feature itself, instead uses a third party API.**
- 5. • Used streamlit-webrtc to deal with real-time video streams.**

## Streamlit App on Cloud



## Sample Images Prediction

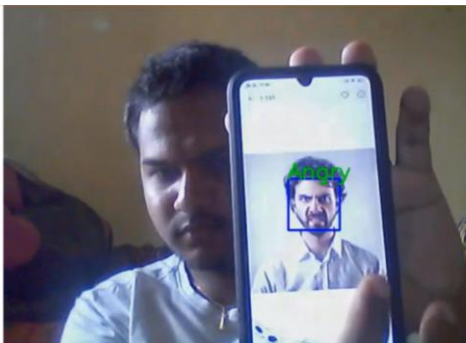


STOP

<http://localhost:8501> is sharing your screen.

Stop sharing

Hide

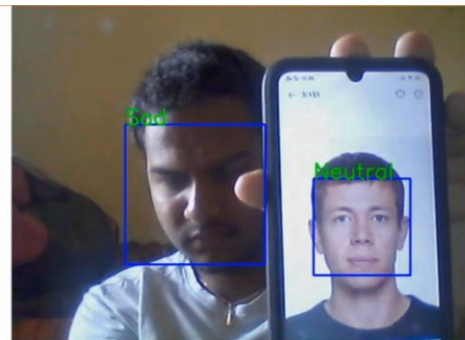


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Stop sharing

Hide



STOP

<http://localhost:8501> is sharing your screen.

Stop sharing

Hide

## Sample Images Prediction



STOP

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STOP

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STOP

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## Challenges

1. Large image dataset with mislabeled data
2. Training model and obtain good accuracy
3. To access webcam in streamlit app



## Conclusion

**Finally build a Face Emotion Recognition webapp using streamlit and deployed on Streamlit Cloud, which predicts the face emotions on live webcam.**

**The model created with CNN layers gave training accuracy of 66.49% and validation accuracy of 66.32% after 50 epochs.**

**Drawback- not classifying well on disgust images**

**Included the video of my webapp working in local – Link in GitHub**

**Thank You**