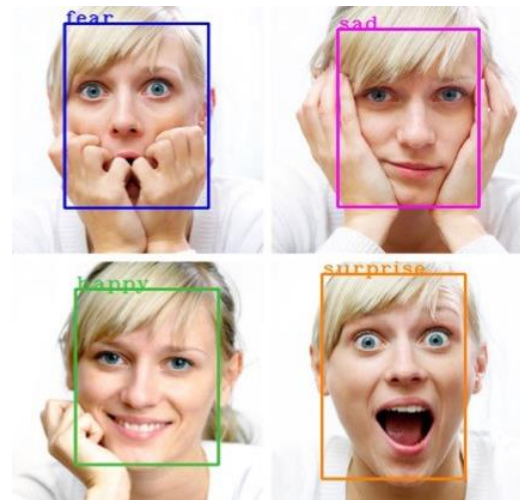# Capstone Project - 5
Live Class Monitoring(Face Emotion Recognition)
Deep Learning and MLE

Individual project:
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Contents

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 Dataset - 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
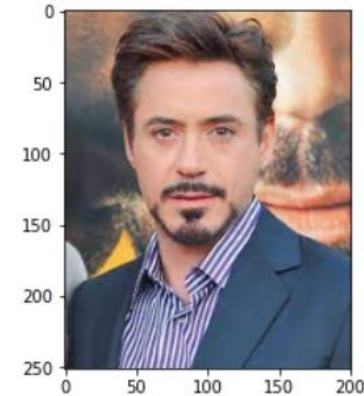

```
Action: emotion: 100%|███████████| 4/4 [00:01<00:00,  2.23it/s]

27  years old  latino hispanic   angry   Man
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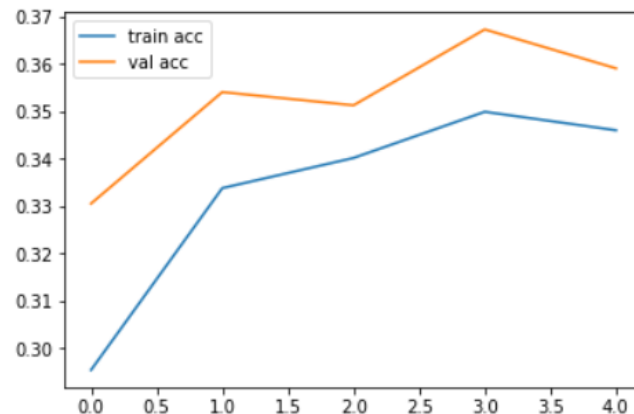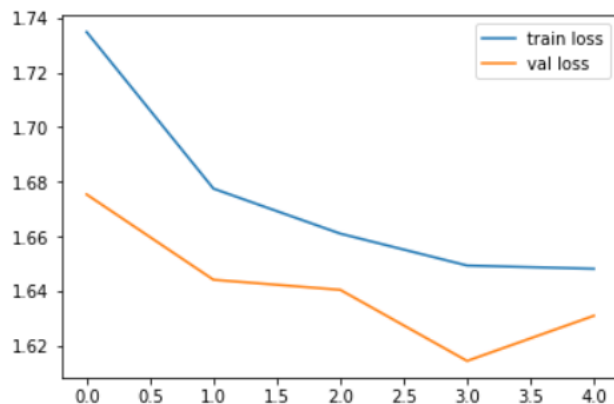
Model Creation

➢ Using Transfer Learning

● 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.
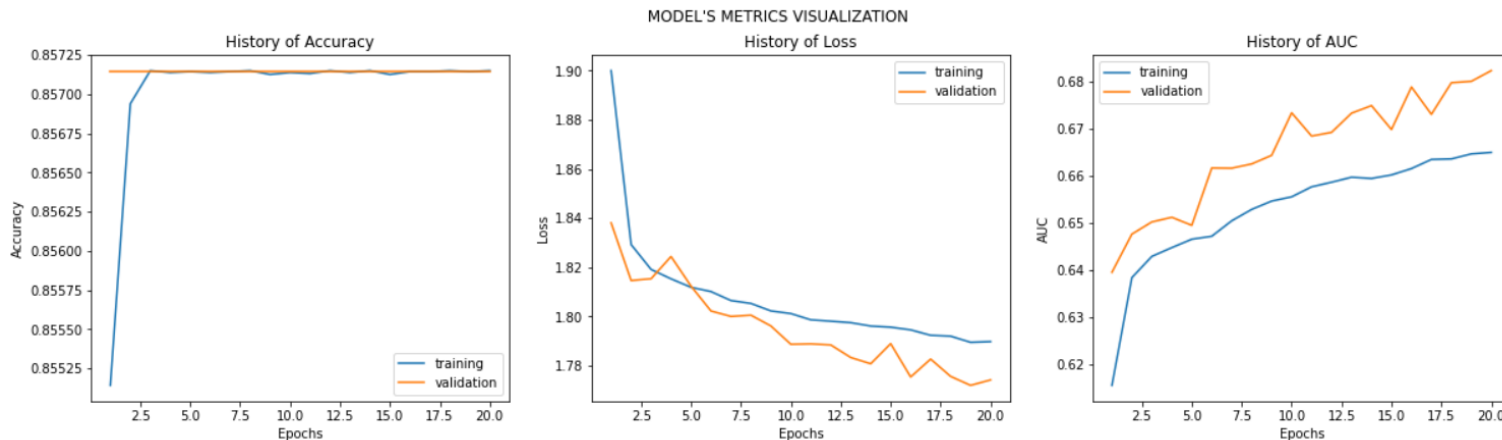
1. VGG-16

Model Creation

2) ResNet-50

The training and validation accuracy is 85.71% and training & validation loss also decreased below 1.80
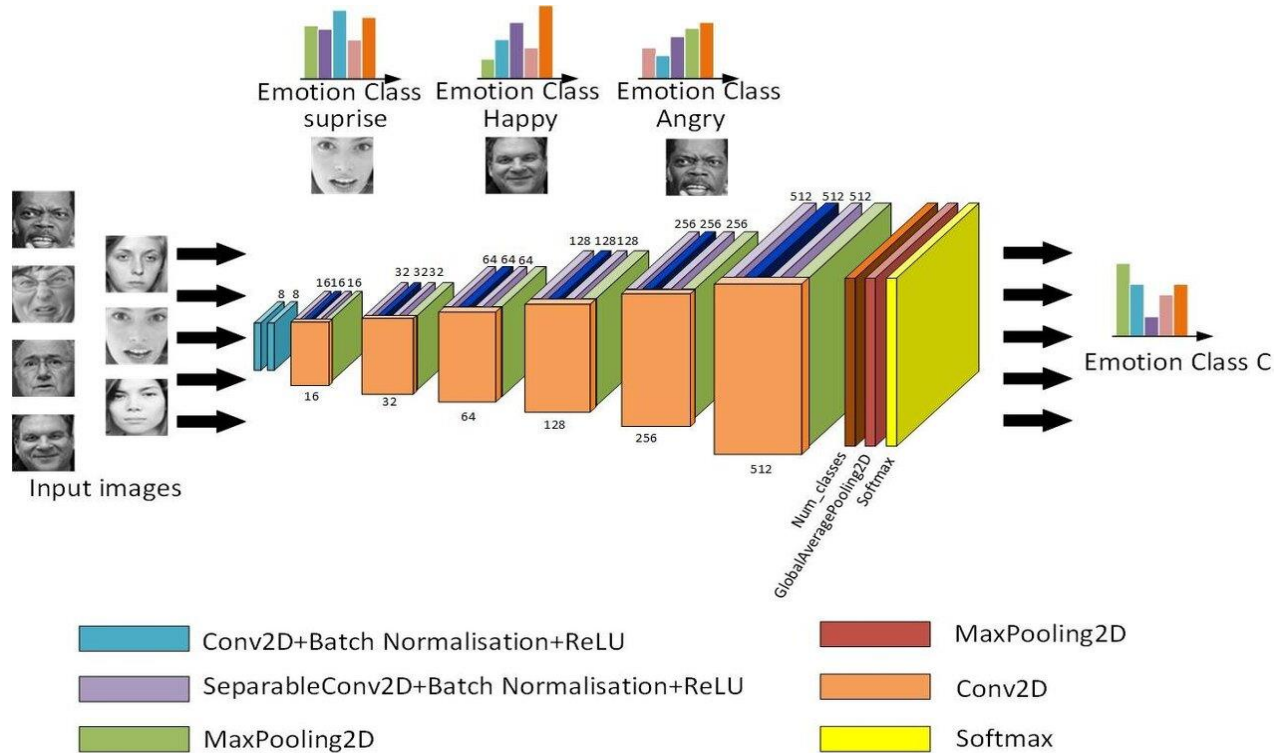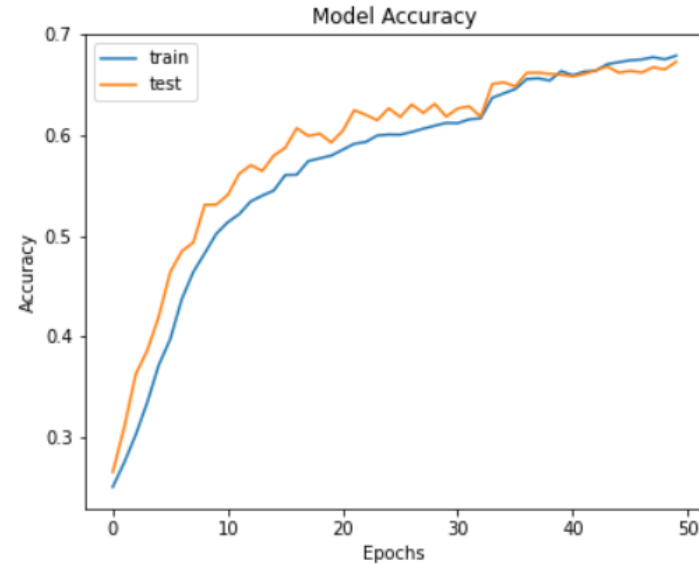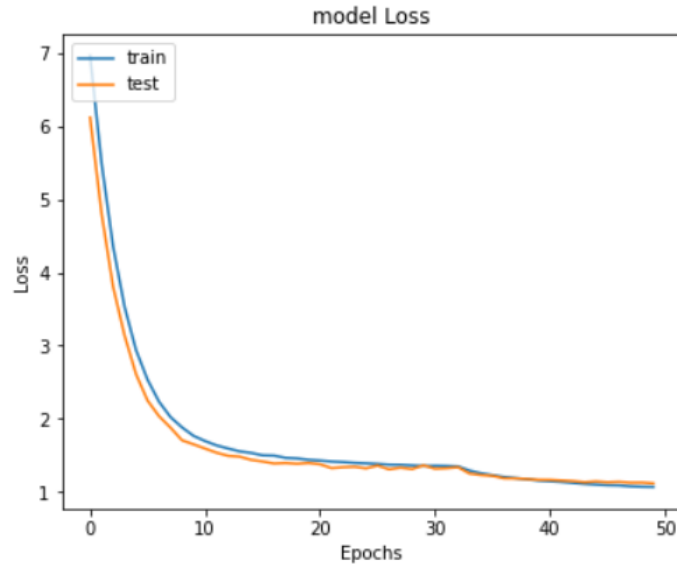
Model Creation

➢ Using Custom CNN Model

● Created a custom CNN model using Conv2D, MaxPooling, BatchNormalization, Dropout and Dense layers.

● Activation function used - "ReLU" and "Softmax"

● Output layer has 7 nodes

● Optimizer used – Adam

● Epochs - 50

● Total params: 4,496,903

● The training accuracy obtained from this model is 66.64% and validation accuracy is 66.10% 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

Evaluation of Model

- Loss and Accuracy plot of Custom CNN Model

Creation of WebApp using Streamlit

- What is Streamlit?
- Streamlit is an open-source python framework for building web apps for ML/DL

- Loaded our trained model
- Created a function FaceEmotion to detect multiple faces in videocam which draw a bounding box around faces and predict the face emotion.
- Streamlit doesn't provide the live capture feature itself, instead uses a third party API.
- Used streamlit-webrtc to deal with real-time video streams.
- Application has 4 sections:
- 1. Introduction – Intro of the project
- 2. Home – steps to use the app
- 3. Webcam Face Detection – face detection and face emotion prediction
- 4. About - general details

Deployment On Heroku

What is Heroku?

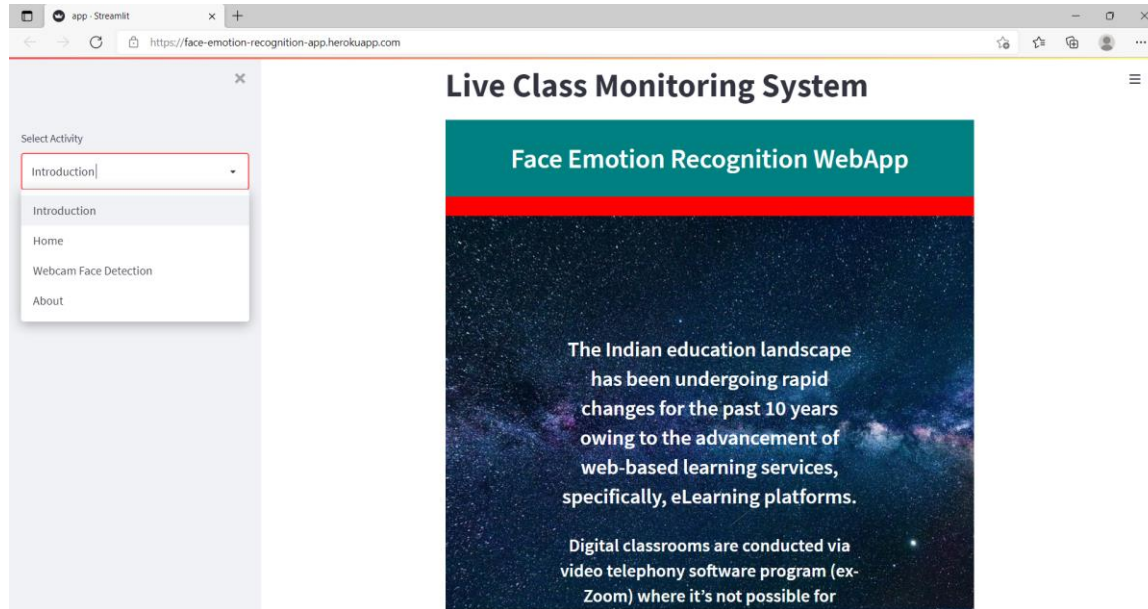Heroku is a platform as a service that deploy apps onto the cloud. It supports several programming languages.

Requirements:
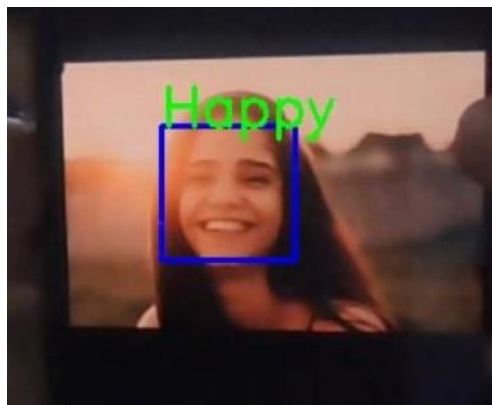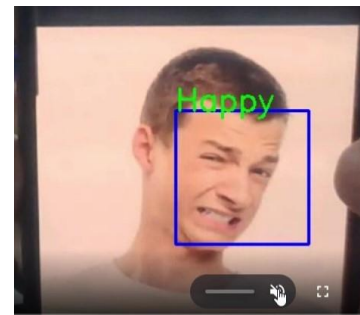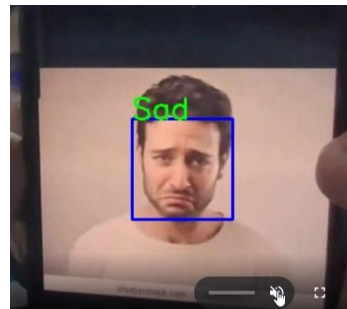- ProcFile
- Requirements.txt
- Setup.sh

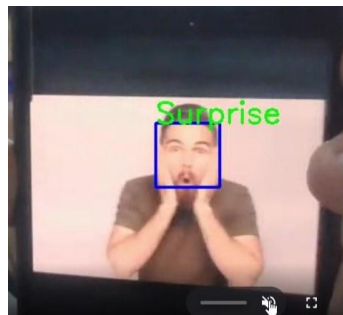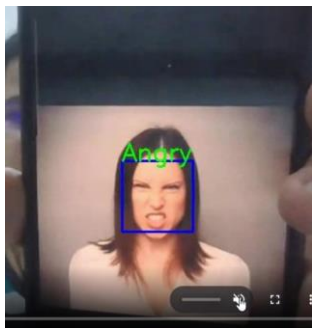Heroku Link: https://face-emotion-recognition-app.herokuapp.com/
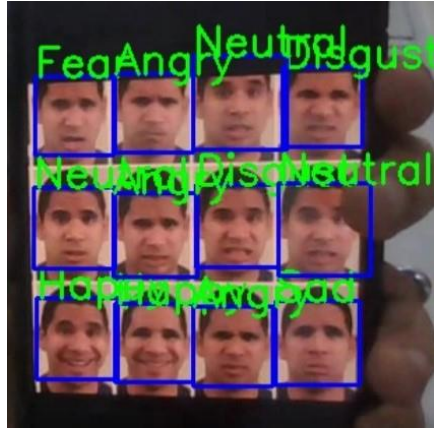
Streamlit app on heroku

- After opening the link in pervious slide, you can see this webapp!!

Sample prediction images

Sample prediction images

Challenges

- Large image dataset with mislabeled data
- Training model and obtain good accuracy
- To access webcam in streamlit app
- Deployment on Heroku – issues with slug size

Conclusion

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

- The model created with CNN layers gave training accuracy of 66.64% and validation accuracy of 66.10% after 50 epochs.

- Drawback- not classifying well on disgust images

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

Thank You