Capstone Project Submission

Team Member's Name, Email and Contribution:
Name: Aaksh A. Salmuthe **Email:** akashsalmuthe30@gmail.com • Selecting Dataset • Data Description • Data Analysis • Data Pre Processing • Pipeline • Model Training • Model Evaluation • Real Time Face Emotion Detection (locally) • Web app creation • Cloud Deployment • Conclusion

Please paste the GitHub Repo link.
Github Link:- *https://github.com/AkashSalmuthe/Face-Emotion-Recognition*

Please write a short summary of your Capstone project and its components. Describe the problem statement, your approaches and your conclusions. (200-400 words)
Problem Statement: The Indian education landscape has been undergoing rapid changes for the past 10 years owing to the advancement of web-based learning services, specifically, eLearning platforms. Global E-learning is estimated to witness an 8X over the next 5 years to reach USD 2B in 2021. India is expected to grow with a CAGR of 44% crossing the 10M users mark in 2021. Although the market is growing on a rapid scale, there are major challenges associated with digital learning when compared with brick and mortar classrooms. One of many challenges is how to ensure quality learning for students. Digital platforms might overpower physical classrooms in terms of content quality but when it comes to understanding whether students are able to grasp the content in a live class scenario is yet an open-end challenge. In a physical classroom during a lecturing teacher can see the faces and assess the emotion of the class and tune their lecture accordingly, whether he is going fast or slow. He can identify students who need special attention. Digital classrooms are conducted via video telephony software program (ex- Zoom) where it's not possible for medium scale class (25-50) to see all students and access the mood. Because of this drawback, students are not focusing on content due to a lack of surveillance. While digital platforms have limitations in terms of physical surveillance but it comes with the power of data and machines which can work for you. It provides data in the form of video, audio, and texts which can be analyzed using deep learning algorithms. Deep learning backed system not only solves the surveillance issue, but it also removes the human bias from the system, and all information is no longer in the teacher's brain rather translated in numbers that can be analyzed and tracked. 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.

Approach:

- Find a good dataset with number of images which can help to train and test data.

- To begin with, I took a dataset **(FER 2013)** from the Kaggle competition, which included images classified into seven categories and contained almost 36000 images. 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 second step is start training with a CNN Model

- CNN with the following global architecture:
  - 4 convolutional layers
  - 2 fully connected layers

- The file was saved as.h5, which is an HDF format that can hold multidimensional arrays. Following that, tested web application on a local camera, for which we created app.py, requirements.txt, and some other files used in both deployment and testing our model. Next, create web application using streamlit.

- Web app was then created on streamlit and deployed to the website using streamlit-webrtc, which allows us to access the web app on the website, which is a real-time video on the network. Then time to next step, a streamlit web app deployed to Heroku, an easy-to-use cloud platform for deploying web apps.

Conclusion:

- Build a **FER** web app using streamlit and deployed on Heroku, with live webcam detection.
- The model created with CNN layers gave training accuracy of **68%**and validation accuracy of **64%** after 50 epochs.
- Difficult to classify disgust images
- Model also work for multiple face detection.