

**Capstone project**  
on  
**Face Emotion Recognition**

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(Individual)

# Procedure

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# Problem Statement

- Digital classrooms are conducted via video telephony software program (exZoom). We have to detect emotion of students.
- We will solve this challenge by applying deep learning algorithms to live video data. The solution to this problem is by recognizing facial emotions.
- The main objective is to build a model which can recognize the facial emotion of students through web cam in real time.

# Data Summary

## Dataset taken from kaggle FER2013

- **Emotion** - The dataset consist of emotions that is happy, sad, angry, neutral, surprise, disgust and fear.
- **Pixels** –
- **Usage** – usage are divided into three test that is training test, private test and public test.

# Method

- Clean data
- Data Preprocessing
- Split into train test and validation
- Visualize image through emotion
- Initialize the CNN
- Train the model
- Testing

# Method

## Convolutional neural network

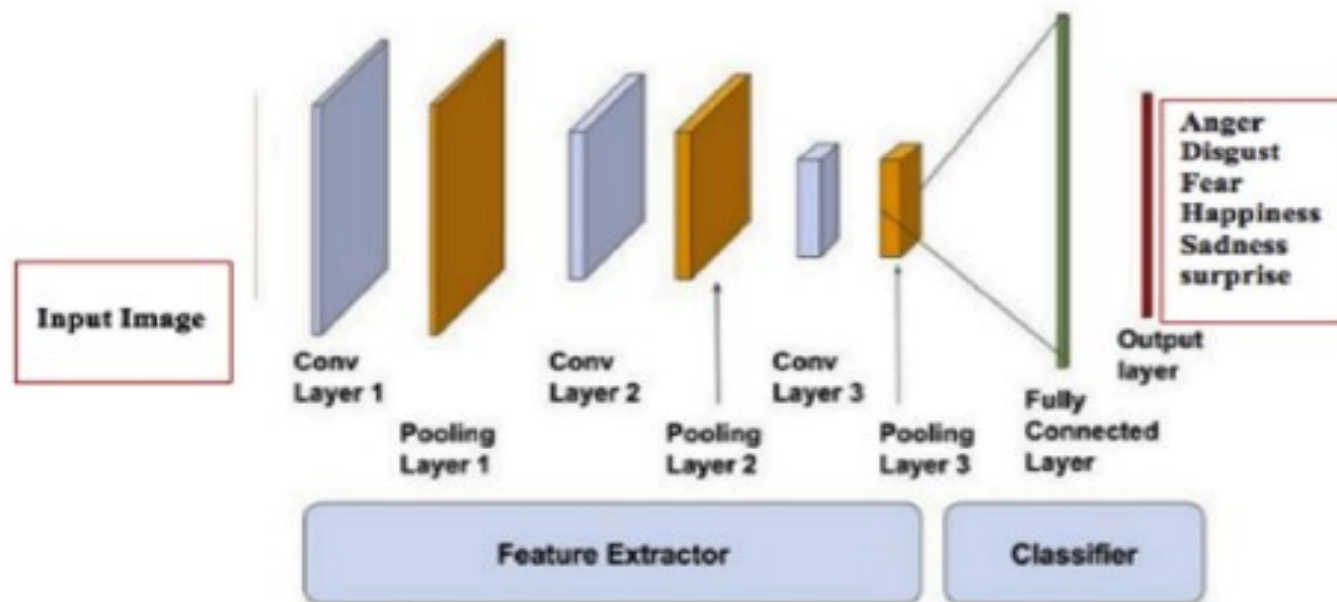


Fig. 6. Facial landmarks system structure.

# Model summary

```
: model.summary()
```

Model: "sequential\_1"

Layer (type)	Output shape	Param #
conv2d_6 (Conv2D)	(None, 46, 46, 64)	640
conv2d_7 (Conv2D)	(None, 44, 44, 64)	36928
max_pooling2d_3 (MaxPooling2D)	(None, 22, 22, 64)	0
dropout_4 (Dropout)	(None, 22, 22, 64)	0
conv2d_8 (Conv2D)	(None, 20, 20, 64)	36928
conv2d_9 (Conv2D)	(None, 18, 18, 64)	36928
max_pooling2d_4 (MaxPooling2D)	(None, 9, 9, 64)	0
dropout_5 (Dropout)	(None, 9, 9, 64)	0
conv2d_10 (Conv2D)	(None, 7, 7, 128)	73856
conv2d_11 (Conv2D)	(None, 5, 5, 128)	147584
max_pooling2d_5 (MaxPooling2D)	(None, 2, 2, 128)	0
flatten_1 (Flatten)	(None, 512)	0
dense_3 (Dense)	(None, 1024)	525312
dropout_6 (Dropout)	(None, 1024)	0
dense_4 (Dense)	(None, 1024)	1049600
dropout_7 (Dropout)	(None, 1024)	0
dense_5 (Dense)	(None, 7)	7175
Total params: 1,914,951		

# Evaluation of model

For face detection OpenCV has been used. Given a real-time live stream, the face detector examines each location of the image and classifies it as a face or no face region.

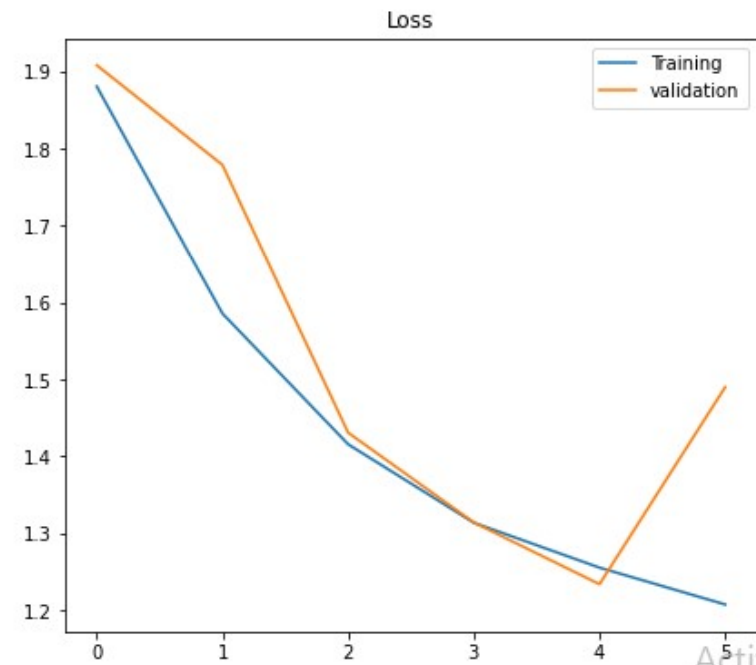
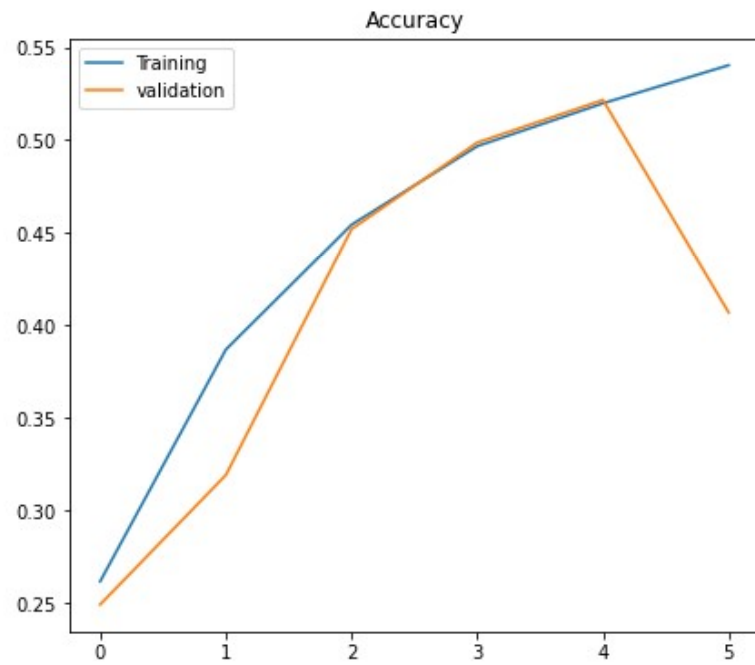
The largest face region is extracted as the region of interest, converted to a grayscale image and resized pixels



# Result

- The emotion of the face is predicted and the label with the largest associated probability is taken. The live stream is displayed in a window with a bounding box around the largest face and the emotion label is shown above the bounding box in real-time
- We get the accuracy of training data is 72% and for test data it is approximately 60%, the accuracy will be better if number of epoch is increased

# Accuracy and Loss



# Confusion matrix

```
[44]: plt.figure(figsize=[15,5])  
sns.heatmap(confusion_matrix(y_test,pred),annot = True, fmt= "d", cmap = "Greens");
```



# Deployment of model

Saving file fer.json and fer2013.h5 model

For the deployment of model we use google cloud platform.

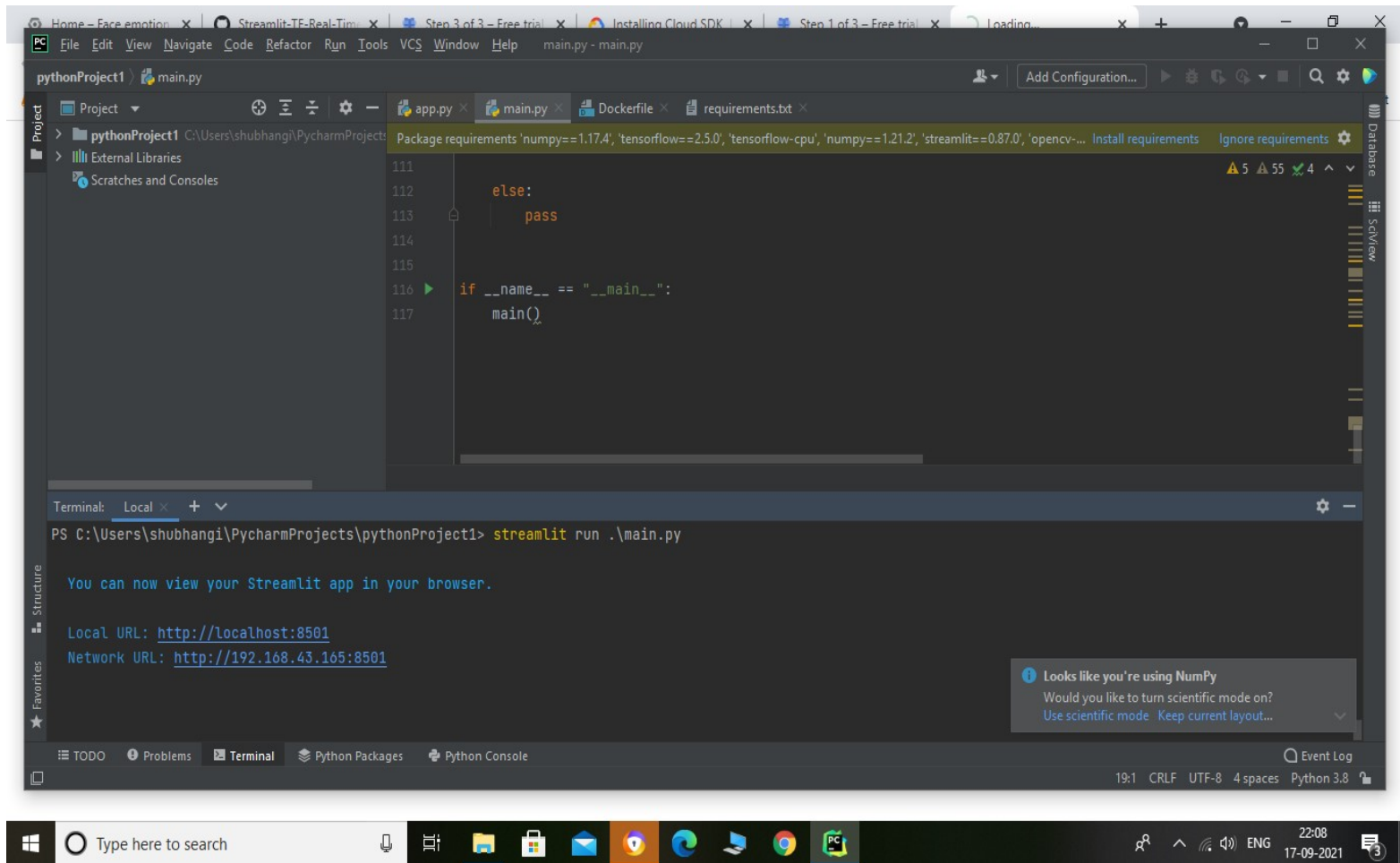
For that we need a docker file for the deployment of the model

**deployment link :**

[<https://face-emotion-detection-326315.as.r.appspot.com>]

# Streamlit

## Demo



# Streamlit app

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Webcam Face Detection

About

## Real Time Face Emotion Detection Application

Face Emotion detection application using OpenCV, Custom CNN model and Streamlit.

The application has two functionalities.

1. Real time face detection using web cam feed.
2. Real time face emotion recognition.

Made with Streamlit

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Webcam Face Detection ▾

Real time face emotion detection

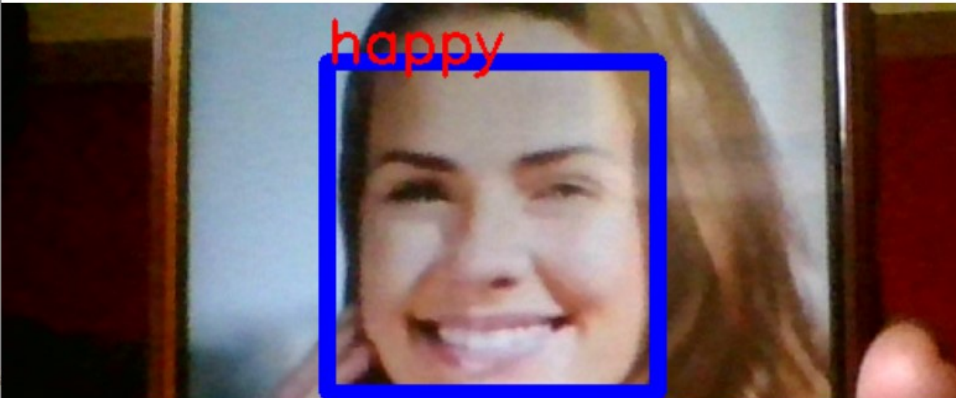
Real Time Face Emotion Detection Application

Webcam Live Feed

Click on start to use webcam and detect your face emotion

start

Facial emotion analysis



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About

Real time face emotion detection

# Real Time Face Emotion Detection Application

## About this app

Real time face emotion detection application.

This Application is developed using Streamlit Framework, Opencv, Tensorflow and Keras library for demonstration purpose.

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# Real Time Face Emotion Detection Application

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Thanks for Visiting



# Conclusions

- The goal of this work has been to design a deep neural network for real time facial emotion recognition.
- We get accuracy 72% for training and 60% in testing at 30<sup>th</sup> epoch.
- By using more types of data augmentation, by increasing number of epoch, increasing the number of layers, deepening the network and adding regularization further better accuracy can likely be obtained.

**Thank You**