

Facial Emotion Recognition



Our Team



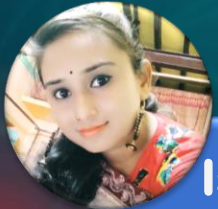
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Introduction

Facial Emotion Recognition is the process of identifying human emotions or, the technology that analyses facial expressions from both static images and videos in order to reveal information on one's emotional state.

We have used Deep Learning approach with Convolutional Neural Network (CNN) training model to train dataset for different emotions to get the most accurate result.

Some of the different emotions are -

1. Angry
2. Disgust
3. Fear
4. Happy
5. Neutral
6. Sad
7. Surprise



Objective

Our objective for the project is used to detect the user's emotion from a video captured from the webcam by extracting frames on the embedded system using machine learning and we used the Deep Learning with CNN dataset training model for getting the best accuracy.

Methodology

Importing Libraries:

- NumPy - NumPy is a Python package, it is used as a library consisting of multidimensional array objects.
- Initialize - Initialize is a procedure to set the weights of a neural network to small random values that define the starting point for learning or, training of the neural network model.
- Predict - Predict function used to predict the labels of the data on the basis of the trained model.
- OpenCV - OpenCV is an open-source library for computer vision, machine learning and image processing.
- Matplotlib - Matplotlib is an amazing visualization library in Python for 2D plots of arrays.
- Scikit-Image - Scikit-image is a collection of algorithms for image processing.
- Pillow - Pillow is built on the top of PIL (Python Image Library) and is considered as the fork for the same as PIL supports many image file formats including BMP, PNG, JPEG, and TIFF.
- Keras - Keras is a neural network library while TensorFlow is the open-source library for a number of various tasks in machine learning.
- TensorFlow - TensorFlow is an end-to-end open-source platform for machine learning. It's a comprehensive and flexible ecosystem of tools and libraries.
- Augmenter - Augmenter is a python package used for the artificial generation of image data for machine learning tasks.

Load Dataset:

On internet there were several datasets like Keras, MNIST, Kaggle dataset. But we preferred to create our own dataset. So first we had taken photos of each classified facial expression. Data variety was needed therefore we all captured photo of our own face emotions. After collecting all of our facial emotions we learned that wasn't enough, so we had to augment the data. After augmenting we had a fixed amount of data for each class. Then we converted them into grayscale and resized them into 64 shapes. Then we put all the data into same place and made the X.npy file and Y.npy file. X.npy is our training dataset and we also created another npy file for the testing set. We used one hot method to create the Y.npy as testing set.

Preprocess the Data:

The image data cannot be fed directly into the model so we need to perform normalization operations then we resized and grayscale the images and after this processing our images data is ready for our neural network. The dimension of the training data is (30000,64,64), The CNN model will require one more dimension so we reshape the matrix to shape (30000,64,64).

Create the model:

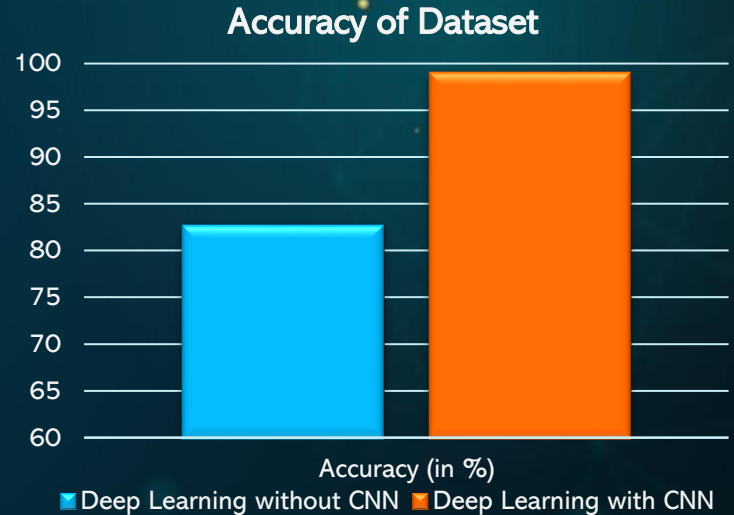
Now we will create our CNN model in python for Facial Emotion Recognition project. A CNN model generally consists of convolutional and pooling layers. It works better for data that are represented as grid structures; this is the reason why CNN works well for image classification problems.

Train the model:

We trained the dataset then we validated data by the number of epochs and test size. It takes some time to train the model for better accuracy. The accuracy came of 99.75%.

Evaluate the model:

We have 30,000 images in our dataset which will be used to evaluate how good our model works. The testing data was not involved in the training of the data therefore, it is new data for our model. At first we trained the dataset with deep learning dataset training model where we got the accuracy of 82.58% then we implemented deep learning with CNN module dataset training model where we got the accuracy of 99.75%.

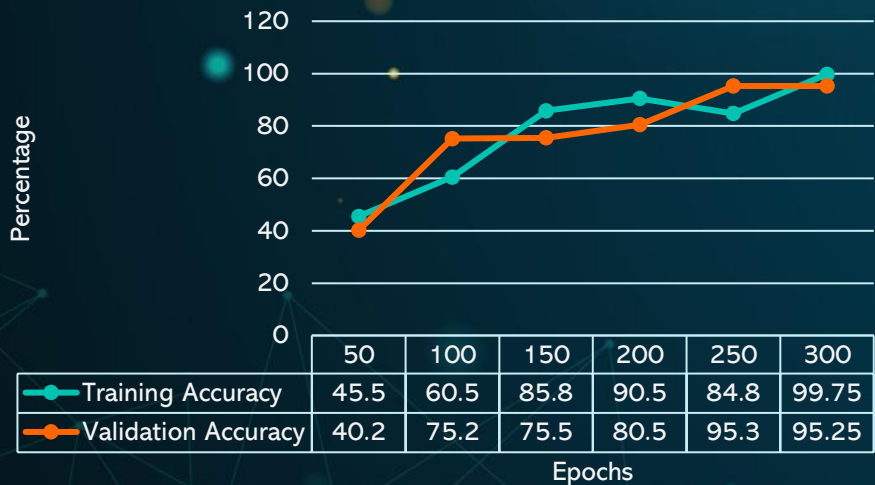


Real-time recognition system:

A real time face recognition system is capable of identifying persons emotion from the webcam by capturing videos and extracting frames. To recognize the face emotion in a frame, first we checked whether the face is present in the frame. If it is present then mark it as a region of interest (ROI) as the yellow square box then extract and process it for facial emotion recognition system. After processing the image then it shows on the screen which emotion the person is having right now.

Accuracy and Loss Graph

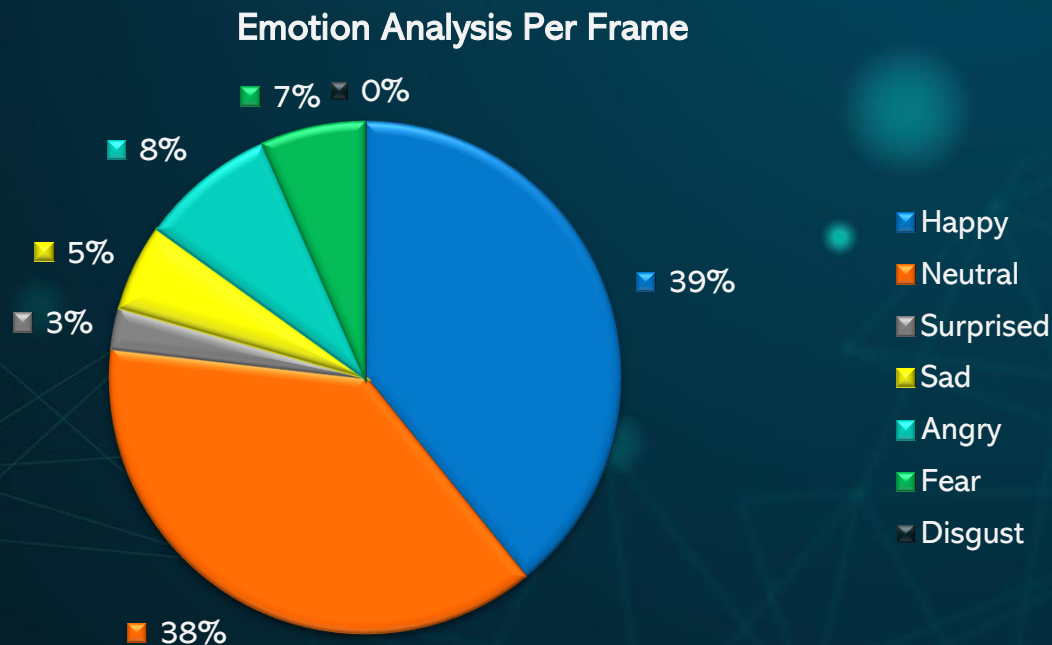
Accuracy



Loss

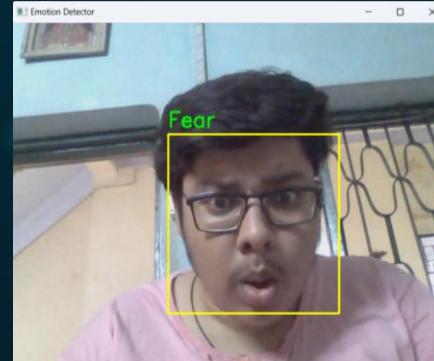
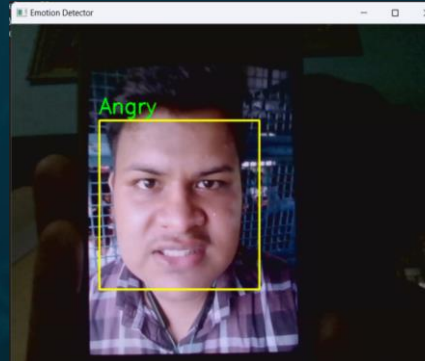
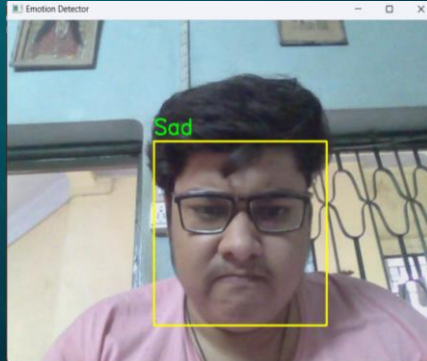
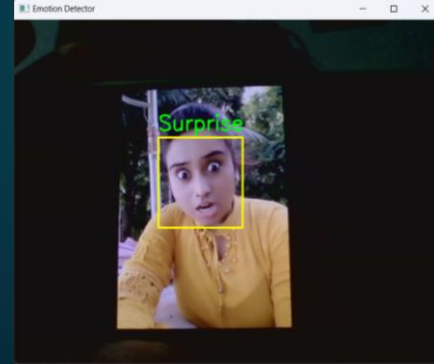
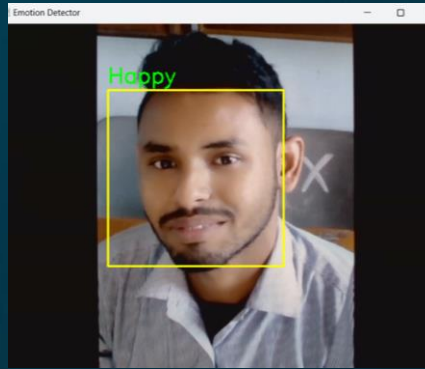
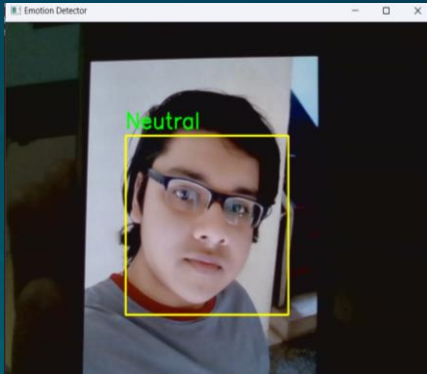


Video Analytics Graph

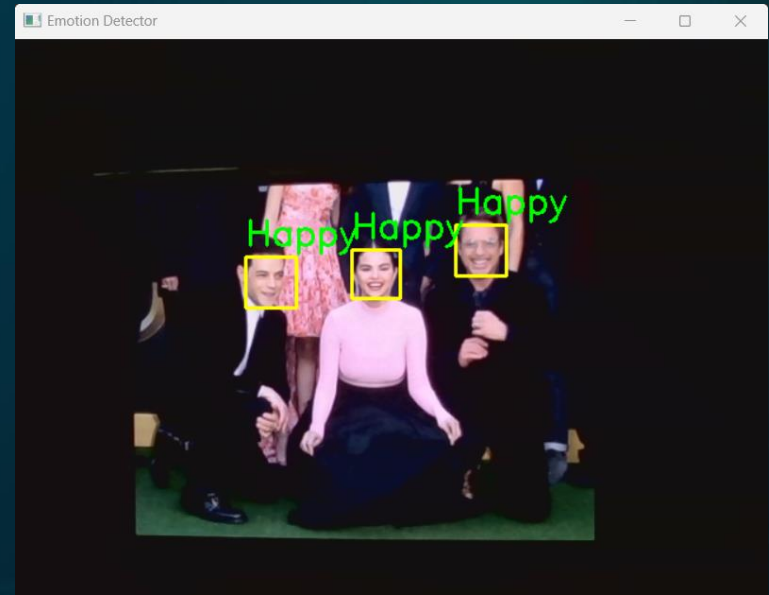
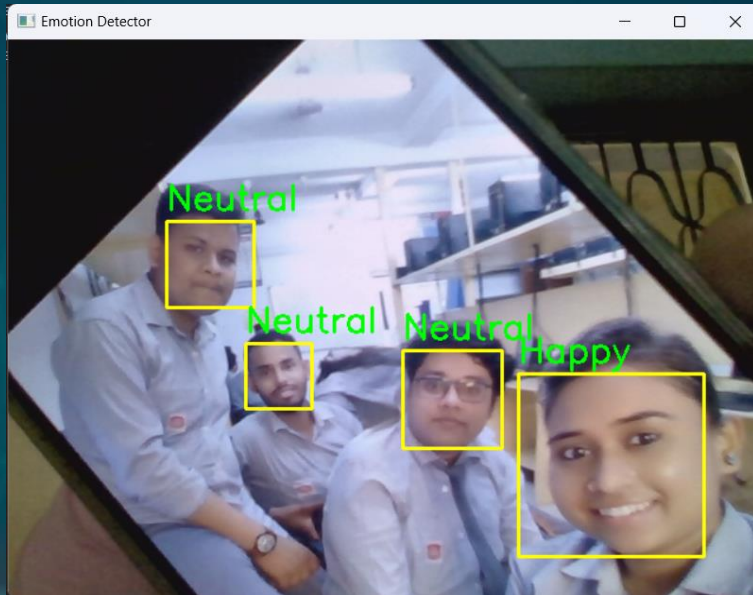


Outputs Of The Emotion Detection

Single Face Detection:



Multiple Face Detection:



Advantages and Disadvantages

Advantages: -

- Real time emotion-based analysis creates opportunities for automated customer service agents to recognize emotional state of the callers through video.
- This technology help children and elderly people by providing timely medical care and assistance by alerting to their caregivers or other family members.

Disadvantages: -

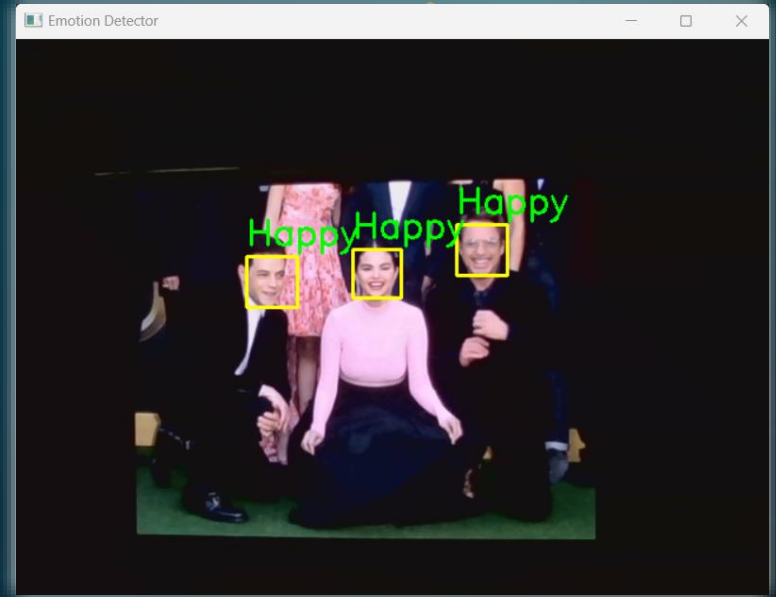
- Performance and results of the emotion sensing system depends on accuracy of the sensors such as cameras, thermal image sensors, facial recognition algorithm used and so on.

Tools Used

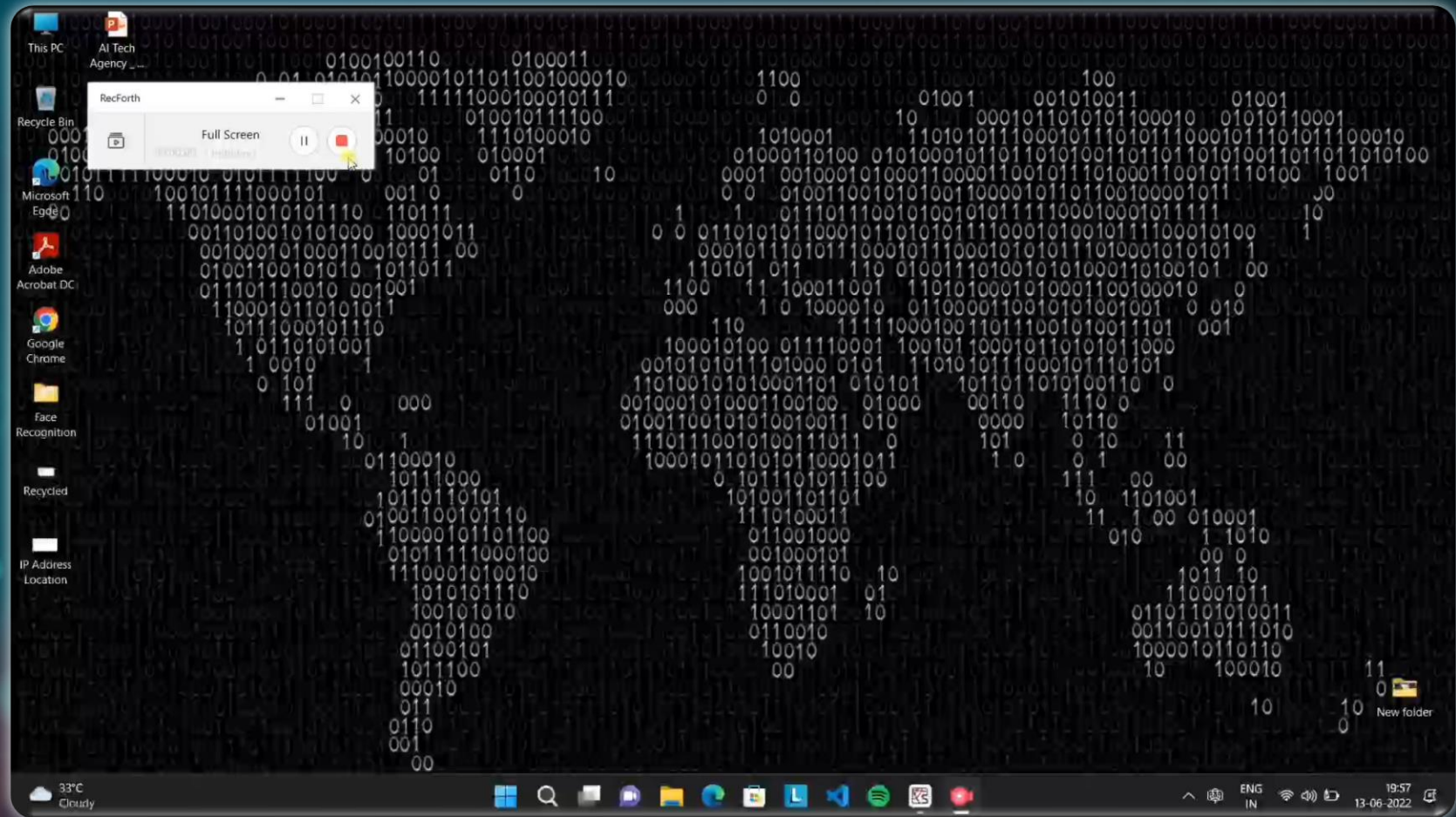


Applications

1. For marketing purpose, the emotion recognition is also used.
2. In e-learning teacher can understand the emotion of the students.
3. It will be helpful of the aptitude round of any company to understand the emotion and behaviour without observing on his aptitude round camera recording.



Video Demonstration



Future Work

1. To decrease the rendering speed as to get result on a faster way.
2. To remove the webcam noise which is Gaussian Noise.
3. To develop this facial emotion recognition project in Android Studio for accessing it from the mobile phone by several users.

Conclusion

Facial Emotion Recognition using Machine Learning is used to identify different emotion of the humans by their unique characteristics of their faces. Facial Emotion Recognition is an image classification problem located within the wider field of Computer Vision. So, we are creating this project to enhance the work efficiency any company for keeping an eye on their employees' behaviour. Facial expressions can be detected by analyzing the various features of human faces viz, the movements of eye, nose, lips, etc. and then classify them by comparing with trained data using a suitable classifier for expression recognition. At first we installed some libraries to make our project by using python. Then we created a training module and loaded the datasets which we created on different emotions as grayscale images, 64x64 pixels in training module as train and test datasets and then tested the accuracy through the CNN module, but at first we didn't got the accuracy well as we had implemented deep learning only, we increased the dataset to 30000 images and implemented deep learning with CNN then the accuracy came near about 99.75%.

THANK YOU

