

Emotion Detection and Recognition using Human Face

Hina Vitthal Bandewar¹, Pranjal Vijay Dhakne²,
Sakshi Sadanand Hiradeve³, Pushpa Tejlal Tandekar⁴

Students, Shri Sai College of Engineering and Technology, Bhadrawati, India¹⁻³

Assistant Professor, Shri Sai College of Engineering and Technology, Bhadrawati, India⁴

Abstract: This project seeks to create a cost-efficient and effective system for real-time emotion detection and recognition of human facial emotions based on a Raspberry Pi platform. Emotion detection from facial expressions is an essential piece in human-computer interaction. The proposed system leverages computer vision techniques and deep learning models to detect and classify emotions based on facial features. Raspberry Pi, a low-cost, credit-card-sized computer, serves as the core hardware platform, making the system accessible and affordable for a general wide range of application.

Keywords: Facial Detection, Emotion Classification, Real-time processing, User Interaction

I. INTRODUCTION

An artificial intelligence system can determine if a customer loves or dislikes a product or service if it can recognise and record real-time emotions from user photos or videos. As we've seen, the primary motivation for identifying someone is security. It may be predicated on voice recognition, passwords, fingerprint matching, retinal detection, etc. To avoid threats, it can also be crucial to determine the other person's intentions. This can be useful in high-risk locations such as airports, arenas, and large public spaces.

Numerous industries that demand extra protection or personal data use human face detection and emotion recognition. It might be thought of as a follow-up to face detection in which we could need to establish a protective layer in which the emotion is recognised in addition to the face. Business promotions are another significant area where emotion detection is crucial. The majority of firms rely heavily on the reactions of their clients to all of their offerings.

II. HARDWARE AND SOFTWARE REQUIREMENTS

The proposed human face emotion detection and recognition using a deep learning System comprises the following key components:

Hardware:

- Raspberry PI.
- Raspberry Pi Camera Module V2 5MP
- USB Cable
- Processor: Any Processor above 500 MHz Ram: 8 GB Hard Disk: 4 GB Dedicated Graphics Card
- Input device: Standard Keyboard, Mouse, and Camera. Output device: High-Resolution Monitor.

Software:

- Raspberry Pi OS (Formerly Raspbian)
- Programming language: Python and related libraries.
- Haar cascade
- CNN



III. IMPLEMENTATION

A. Convolutional Neural Network Architecture

The goal of the suggested CNN architecture is to train the pixel values in the rectangle area that contains the expressions on the face. This happens in three steps, after which the completely connected layers receive it. The three levels of the CNN structure—two convolutional layers with a "real" activation function in each—are made up of facial expression through three fully connected layers with a "real" and SoftMax activation function, as well as max-pooling layers. Each frame feeds into fully connected layers after convolutional and max-pooling layer operations are complete, and the classifier processes the predicted frames as seven distinct emotional states on the face.

B. Networking Training

Tensor Flow, a Python backend for Tensor Flow, was used in conjunction with Keras to build the neural networks. Fifty epochs were used to train the model

C. Networking Training

Real-time testing was done on the trained model following the training of the suggested CNN architecture. Initially, the computer camera used the Haar Cascade library to identify faces. Subsequently, the model was queried for the classes to which the discovered images belong. The likelihood of which class the facial expression on the webcam screen belonged to was determined by the forecasts.

Using OpenCV, a rectangle boundary is drawn around the identified face, and the emotions are shown on the screen along with an emoticon indication that shows the emotion's percentage confidence.

D. Facial Expression Dataset

The literature contains a large number of publicly available facial expression datasets. We have employed a facial expression dataset from Kaggle, which consists of grayscale portraits of faces with 48 by 48 pixels. 28,709 instances

IV. SUMMARY AND RESULT

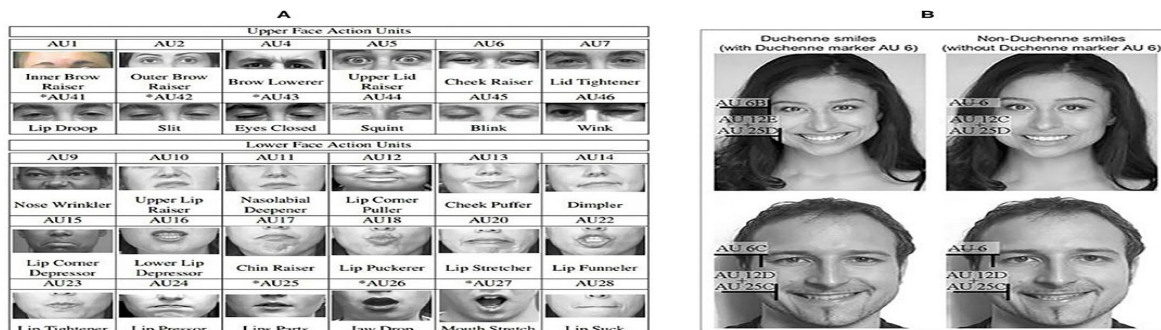


Fig : Emotions

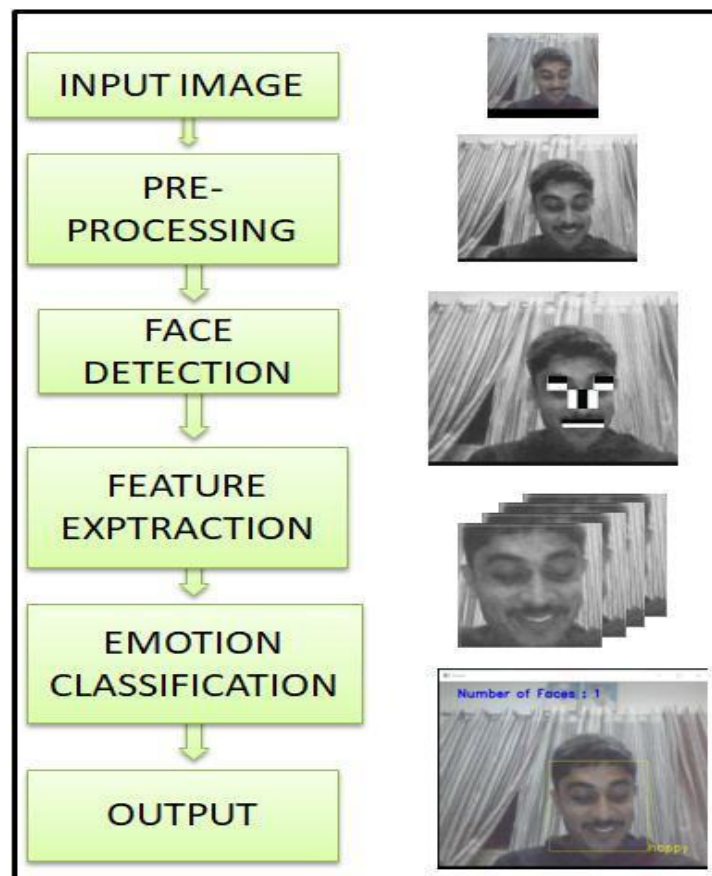
Using these emotions included in the Kaggle database—happiness, anger, sorrow, disgust, neutral, fear, and surprise—we trained our Convolutional Neural Network model. The photos of the faces that were discovered were reduced to 48 by 48 pixels, turned into grayscale images, and then fed into the CNN model. Our achievement in identifying emotions was a 64% accuracy rate. Emotion Recognition in Figure 5.1 In this paper, we presented a button-based desktop programmed that uses a questionnaire that the user must respond to in order to determine whether or not the user is depressed. The user's response is used to determine whether or not they are depressed. Based on internal scores, it was determined whether the individual was experiencing temporary melancholy or depressive symptoms.



V. FUTURE SCOPE

As of the current working, the desktop application is local. In the future days, this application can be hosted on a website using an internet connection. The current application is a screening test before consulting a doctor. In the future days, a video consultancy to doctors can be arranged if the user is detected to be depressed. The project mainly deals with emotion recognition and a depression analyser which is implemented as a desktop application-based chatbot. In the future trends, this desktop application-based chatbot can be implemented as a chatbot using Natural Language Processin representing seven different emotions make up the training set: joyful, sad, astonished, afraid, furious, disgusted, and neutral.

VI. BLOCK DIAGRAM



VI. CONCLUSION

This project on human face emotion detection using a Raspberry Pi has shown the potential of combining cutting-edge technology with real-world applications. By leveraging the power of machine learning and computer vision, we have successfully created a system capable of recognizing and analyzing human emotions based on facial expressions. This project not only demonstrates the versatility of Raspberry Pi but also highlights the importance of emotion detection in various fields, from healthcare to human-computer interaction. As technology continues to advance, the potential for further improvements and broader applications in this area is substantial. Emotion detection using Raspberry Pi is a promising field that can lead to innovative solutions for understanding and improving human well-being.



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