VIDEO BASED EMOTION DETECTION USING DEEP LEARNING

A MINI PROJECT - I REPORT

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In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

ELECTRONICS AND COMMUNICATION ENGINEERING

SRI RAMAKRISHNA ENGINEERING COLLEGE

[Educational Service: SNR Sons Charitable Trust]

[Autonomous Institution, Accredited by NAAC with, A+‟ Grade]

[Approved by AICTE and Permanently Affiliated to Anna University, Chennai]

[ISO 9001:2015 Certified and All Eligible Programmes Accredited by NBA]

VATTAMALAIPALAYAM, N.G.G.O. COLONY POST,

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MAY - 2024

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BONAFIDE CERTIFICATE

20EC279- MINI PROJECT I

Certified that this 20EC279 - Mini Project - I Report **"VIDEO BASED EMOTION DETECTION USING DEEP LEARNING "** is the bonafide work of **Akash .B (71812102011), Balaji .S (71812102022), Jaghanav Priyan .M S K (71812102054)** who carried out the project under my supervision.

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Submitted for the Mini Project Viva-Voce Presentation held on 02.05.2024

INTERNAL EXAMINER **EXTERNAL EXAMINER**

ABSTRACT

Due to its numerous uses in healthcare, entertainment, and human-computer interaction, emotion detection in videos has attracted much interest. Compared to more conventional approaches, deep learning algorithms have shown to be highly effective tools for automating this procedure. An extensive description of deep learning methods for video-based emotion recognition is provided in this work. To improve the quality of the video and minimize noise, the suggested method starts with pre-processing processes. A deep neural network design is then used to extract useful information from video frames. Examples of these architectures include Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs). Essential for deciphering emotional expressions, these characteristics record temporal and geographical information. To further enable models to generalize over a variety of datasets, transfer learning approaches are used to overcome difficulties related to a lack of labeled data. This improves emotion identification accuracy by integrating attention processes to focus on pertinent regions of interest within the video frames. There is much promise for practical uses using deep learning algorithms integrated for video-based emotion recognition; this might lead to more engaging Human Computer Interactions scenarios and tailored content delivery.

Acknowledgment

We put forth our heart and soul to thank **ALMIGHTY** for being with us all through this technical adventure.

We express our heartfelt thanks to our esteemed Managing Trustee, **Sri. D. Lakshmi Narayanaswamy, B.Tech., MBA.,** and Joint Managing Trustee **Thiru. R. Sundar, B.A, MBA.,** for their invaluable support.

We thank our Principal, **Dr. N.R. Alamelu, B.E. (Hons.), M.E., Ph.D., Sri Ramakrishna Engineering College, Coimbatore**, for her benevolent patronage in carrying out this project.

We express our sincere respect and gratitude to our Professor & Head **Dr.M.Jagadeeswari, M.E., Ph.D.,** Department, Electronics and Communication Engineering for her continuous encouragement and motivation throughout the project.

We are indebted to our Mini Project Coordinator **Mrs. S Saranya ,** Assistant Professor (Sr.G)/ECE**,** and our Supervisor, **Mr.P.SRIDHAR ,**Assistant Professor (Sr.G) / ECE**,** for providing encouragement and guiding us throughout this project with enthusiasm and enabling us to complete it within the stipulated time.

We extend our thanks to all the teaching, non-teaching faculty members of our department and other departments, friends and family members for their support in carrying out the mini-project successfully.

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LIST OF ABBREVIATIONS

IDE - Integrated Development Environment

RNN - Recurrent Neural Networks

CNN - Convolutional Neural Networks

MLP - Multilayer Perceptron

SVM - Support Vector Machine

GRU - Gated Recurrent Unit

LSTM - Long Short-Term Memory

CHAPTER 1

INTRODUCTION

Due to its wide range of practical applications, emotion detection in videos has gained much attention in research and practice. Convolutional neural networks (CNNs) and recurrent neural networks (RNNs), in particular, have made significant advancements in the accuracy and efficiency of emotion detection from videos. Understanding human emotions from visual content benefits human-computer interaction, entertainment, healthcare, and security. This chapter provides an overview of the project and how deep learning helps in emotion detection.

1.1 PROJECT OVERVIEW

Deep learning-based video-based emotion detection is a state-of-the-art system that identifies and evaluates human emotions using video data. To enable applications in various industries, including healthcare, entertainment, marketing, and human-computer interaction, this research uses deep learning techniques to recognize emotions shown by persons in films automatically. Building a deep learning model that can accurately recognize human emotions in video footage. Establishing a reliable pipeline for feature extraction, preprocessing, and emotion classification. Train the model on a varied dataset to guarantee generalization across various demographics, cultural backgrounds, and environmental situations. Analysing the model's performance using relevant metrics and standards. Use the trained model in practical settings like virtual reality headsets, emotion-aware systems, and video analytics platforms.

The ability to decipher human emotions from video material makes many applications possible. It can improve entertainment experiences by tailoring content recommendations to individual users' emotional responses. It helps marketers determine how consumers feel about commercials or items. By examining facial expressions and behavioural clues, it aids in the monitoring and diagnosis of mental health in the medical field.

Creating a deep learning-based system that can precisely identify and classify human emotions from video inputs is the main goal of this research. The project's specific objectives are to:

1. To design and construct a deep learning architecture optimised for video-based emotion detection is the project's specific goal.

2. To train the model, use annotated datasets that include a range of facial expressions and associated emotion labels.

3. Assess the model's performance using hypothetical data, considering accuracy, generalizability, and computing efficiency.

4. Examine the produced system's possible real-world applications, such as content recommendation systems, mental health diagnostics, and human-computer interaction.

CHAPTER 2

LITERATURE SURVEY

The product development process requires a thorough survey of existing methods and growing technology. Various literature surveys from different journals and conference papers have been studied for the best results. This has been done to collect information about the dataset and emotion detection.

2.1 INTRODUCTION

A type of affective computing called "video-based emotion detection" looks to automatically interpret contextual signals, body language, and facial expressions to determine the emotional states of people shown in visual media. Because deep learning can learn complicated representations directly from raw data, it has become a prominent paradigm for addressing this difficult issue. This is especially true of convolutional neural networks (CNNs) and recurrent neural networks (RNNs).

Videos have become an increasingly popular means of detecting emotions, yet the discipline is still characterized by a wide range of research contributions and quick developments. To help researchers discover important trends, approaches, obstacles, and future directions, a literature survey provides a thorough review and analysis of the body of current literature. By combining information from many sources, a literature review offers important insights that might guide the development and use of new methods in the subject.

2.2 BACKGROUND

Mohamed Berkane, Kenza Belhouchette, Hacene Belhadef, "Emotion Recognition Approach Using Multilayer Perceptron Network and Motion Estimation", International Journal of Synthetic Emotions (IJSE) - 2019

An interdisciplinary topic of study called "man-machine interaction" offers natural and multimodal means for people to engage with computers. The computer has to be aware of the user's emotional state to do this. In contrast to other efforts, this article suggests a fresh approach to identifying and categorizing basic emotions such as sorrow, pleasure, anger, fear, contempt, surprise, and curiosity. The method follows the standard procedures, such as facial detection and facial feature extraction, as do all emotion recognition systems. The contribution is conveyed in these stages using strategic face points, and motions are interpreted as action units that the FACS system has extracted.

Artificial neural networks that recognize intricate patterns and correlations in data fall under multilayer perceptron (MLP) neural networks. MLPs have been widely employed in various machine learning applications, such as pattern recognition, classification, and regression, because of their adaptability and capacity to mimic nonlinear functions. Multilayer perceptions (MLPs) present a viable method for extracting discriminative characteristics from face pictures and assigning them to appropriate emotion labels in the context of facial expression-based emotion identification. The primary aim of this research is to create an emotion detection system that uses multilayer perceptron neural networks to categorize facial expressions into distinct emotion groups precisely. Get or create a dataset of face photos with associated emotion labels that includes a variety of emotions, including fear, contempt, surprise, rage, sorrow, and happiness. Prior to being fed into the MLP neural network, the face pictures are pre-processed to remove pertinent characteristics (such pixel intensities or facial landmarks). Create and construct a multilayer perceptron (MLP) architecture with nonlinear activation functions that may be used to recognise emotions. Using methods like backpropagation and gradient descent optimisation, train the MLP neural network on the labelled dataset to discover the relationship between face

characteristics and emotion categories. This research aims to investigate the multilayer perceptron neural network-based emotion recognition system, including its methodology, implementation details, experimental outcomes, and conclusions. The research intends to advance affective computing and open the door for useful applications to help several fields by utilizing MLPs' capacity to recognize intricate patterns from face photos. Multilayer perceptron (MLP) neural networks provide a number of challenges when used to identify emotions from facial expressions, including Changes in Expressions on the Face: People express their emotions in a variety of ways, and there is a broad range in the strength, duration, and nuance of their facial expressions. It is challenging to create a generalizable MLP model that captures this diversity.

1) Variability in Face Expressions: There are many different methods for people to communicate their emotions, and there is a wide range in the intensity, length, and subtlety of facial expressions. It is difficult to design an MLP model that can generalize and capture this variability in an efficient way
2) Facial Occlusions and Artefacts: Key elements for emotion recognition may be obscured in facial photographs by occlusions like spectacles, facial hair, or hands obscuring certain areas of the face. Furthermore, the model's performance may be impacted by artifacts introduced by changes in illumination, picture quality, and facial position.

Nuno Lopes, André Silva , Salik Ram Khanal , Arsênio Reis, João Barroso, Vítor Filipe, Jaime Sampaio "Facial emotion recognition in the elderly using a SVM classifier" ,IEEE -2018

Using machineUnderstanding a person's emotional state and social interactions, especi ally with older adults, depends heavily on their ability to recognize emotions in their face.Accurate emotion detection is crucial for evaluating a person's mental health and general quality of life since aging can cause changes in an individual's capacity to expr ess and interpret emotions. the learning techniques like Support Vector Machines (SVMs) in this situation present a viable method for automatically identifying and categorizing emotional expressions in elderly faIn this regard, using machine learning techniques like Support Vector Machines (SVMs) presents a potential method for automatically identifying and categorizing emotional expressions in senior faces. The aged population has particular emotional well-being issues, such as sadness, loneliness, and cognitive decline. Recognizing people's facial expressions accurately can help with early intervention and individualized treatment by giving important insights into their emotional states. Furthermore, enhancing communication, social support, and the general quality of life in hospital settings and aged care institutions requires an awareness of the emotional responses of the elderly.

A potent class of supervised learning algorithms, support vector machines (SVMs) are renowned for their capacity to manage high-dimensional data and nonlinear decision limits. SVMs are ideally suited for face emotion identification since they perform well in binary and multiclass classification problems. SVM classifiers can reliably classify emotions exhibited by older people from face photographs by learning to distinguish between various facial expressions based on extracted characteristics.

This project aims to use a Support Vector Machine (SVM) classifier to create a face expression identification system designed especially for the elderly.

David Duki´ c , Ana Sovic Krzic ,“ Real-Time Facial Expression Recognition Using Deep Learning with Application in the Active Classroom Environment”, Electronics 2022.

Real-time facial emotion recognition is a compelling area of research with numerous applications in human-computer interaction, healthcare, marketing, and entertainment. The ability to accurately interpret and respond to human emotions in real time has the potential to revolutionize various industries by enabling more empathetic and responsive systems. Deep learning techniques, particularly convolutional neural networks (CNNs) and recurrent neural networks (RNNs), have emerged as powerful tools for addressing this challenge by automatically learning and extracting complex features from facial images. To create more natural and interesting interactions between humans and robots, real-time facial expression analysis of human emotions is necessary. The application of deep learning algorithms for real-time facial expression detection has the potential to transform educational processes, especially in dynamic classroom settings, significantly. Understanding students' emotional states, engagement, and comprehension during learning activities may be gained by detecting and analyzing their facial expressions in real-time. Teachers may identify students requiring extra help, customize lessons, and create more inclusive and engaging learning environments by introducing facial expression recognition technology into the classroom. Understanding students' emotional reactions and engagement levels is essential for effective teaching and learning in the active classroom, emphasizing group discussions, collaborative learning, and hands-on activities. Teachers may modify their teaching tactics, give timely feedback, and create a helpful learning atmosphere by keeping an eye on students' emotions while they participate in class activities, thanks to real-time facial expression recognition technology. Furthermore, facial expression analysis can support proactive interventions to overcome emotional impediments to learning, such as boredom or irritation, by helping to detect them.

With the ability to automatically learn and extract complex characteristics from raw visual data, deep learning has become a formidable tool for face emotion identification. Given their impressive track records of capturing both temporal and spatial patterns in face expressions, convolutional neural networks (CNNs) and recurrent neural networks (RNNs) are a good fit for real-time analytical purposes. Teachers are able to create reliable and accurate face expression recognition systems that can function in dynamic classroom settings by utilising deep learning techniques. Real-time facial emotion detection has the potential to improve user experiences, personalise interactions, and offer insightful feedback based on users' emotional states across a variety of applications, including virtual assistants, education and healthcare systems. Real-time emotion identification also allows businesses in marketing and advertising domains to assess customer mood and adjust their messaging and content accordingly. In a variety of computer vision applications, such as object identification, facial recognition, and picture categorization, deep learning has demonstrated impressive performance. CNNs are especially good at recognising face emotions because they are skilled at extracting hierarchical representations from unprocessed visual input. Researchers may use deep learning to automatically identify and categorise face expressions in real-time by training deep neural networks on big datasets of annotated facial photos.

Rupali Gill, Jaiteg Singh, "A Deep Learning Approach for Real Time Facial Emotion Recognition", 10th International Conference on System Modeling & Advancement in Research Trends, 10th–11th December, 2021

Real-time facial emotion recognition is a cutting-edge field that merges the domains of computer vision and affective computing. Leveraging deep learning techniques for this task has gained substantial traction due to its ability to learn intricate patterns and representations from raw image data automatically. This project focuses on developing a deep learning approach for real-time facial emotion recognition, aiming to decode human emotions instantaneously from live video streams or camera feeds. Every industry will be impacted in different ways by real-time human emotion comprehension. Dynamic adaptation to users' emotional states improves user experience and engagement in human-computer interaction. It supports remote patient monitoring and mental health evaluation in the medical field. Additionally, audience engagement tactics and content customization in marketing and entertainment are informed by real-time emotion identification. Deep learning has revolutionized several areas of artificial intelligence, particularly in computer vision applications. Renowned for their ability to capture temporal relationships, recurrent neural networks (RNNs) are ideally suited for sequential data such as video frames, while convolutional neural networks (CNNs) have proven to be very adept at learning discriminative features from pictures. We aim to develop a strong and precise real-time face expression identification system by utilizing deep learning. Three steps make up the conventional FER process. Before the identification of facial landmarks (such as the eyes and nose) or characteristics in the face area, a face image is first retrieved from an input picture. Secondly, different spatial and temporal aspects are obtained from the components of the face.Real-time facial emotion recognition is a compelling area of research with numerous applications in human-computer interaction, healthcare, marketing, and entertainment. The ability to accurately interpret and respond to human emotions in real-time has the potential to revolutionize various industries by enabling more

empathetic and responsive systems. Deep learning techniques, particularly convolutional neural networks (CNNs) and recurrent neural networks (RNNs), have emerged as powerful tools for addressing this challenge by automatically learning and extracting complex features from facial images.

Third, recognition results are obtained by using the recovered features to train pre-trained facial expression classifiers, such a random forest or a support vector machine (SVM).New methods are emerging in addition to the conventional approach of recognising emotions. In several computer vision research, deep learning has become a universal machine learning method that produces state-of-the-art findings thanks to massive data availability.

2.3 SUMMARY

The goal of the literature review was to examine cutting-edge approaches and strategies for deep learning-based real-time facial emotion identification. A wide variety of scholarly materials, publications, and research articles from a number of fields—including computer vision, affective computing, and human-computer interaction—were included in the study. Deep Learning Architectures: Researchers have extensively explored deep learning architectures for facial emotion recognition, with convolutional neural networks (CNNs) and recurrent neural networks (RNNs) being the most commonly employed. CNNs are adept at extracting spatial features from facial images, while RNNs are effective in capturing temporal dependencies in sequential data. A large number of datasets,have been assembled for the purpose of training and assessing face emotion detection models. These datasets offer benchmarks for assessing model performance as they cover a wide spectrum of emotions and facial expressions.

CHAPTER 3
METHODOLOGY AND WORKING PRINCIPLE

The methodology and working principle are explained in this chapter.

3.1 PRINCIPLE

The fundamental idea behind deep learning-based video-based emotion detection is to infer people's emotional states by identifying relevant patterns and characteristics in the video footage. The idea may be divided into a few essential parts:

Representation Learning: By utilizing several levels of abstraction, deep learning models acquire hierarchical representations of data. Without human feature engineering, these models can automatically train to extract pertinent features, such as body language, facial emotions, and contextual signals, from raw pixel data in the context of video-based emotion detection.

Temporal Modelling: Since videos comprise a series of frames that change over time, they are by nature temporal data. The temporal relationships and dynamics in video sequences may be captured by deep learning architectures like Recurrent Neural Networks (RNNs) or Convolutional Neural Networks (CNNs) with temporal components like Long Short-Term Memory (LSTM) cells. This makes it possible for the model to comprehend how emotions develop over time.

Pattern Recognition: There are several ways that emotions show up, such as through gestures, verbal intonations, facial expressions, and bodily signals. Deep learning algorithms may use many modalities at once for more reliable emotion detection since they are excellent at identifying intricate patterns and connections among multimodal data sources.

Generalisation: Deep learning models are able to apply their learnt representations to previously encountered data by means of training on a variety of datasets that comprise a broad spectrum of persons, settings, and scenarios. This makes the method relevant to many situations and groups since it allows them to properly recognize emotions in fresh movies that differ from those watched during training.

End-to-end learning is a technique that deep learning frameworks facilitate. In this approach, the whole model—from input data to output predictions—is trained in tandem to maximize a certain goal, such as emotion categorization. Thanks to this method, the model can automatically learn the best discriminative features for the job at hand, which does away with the requirement for manually constructed feature extraction pipelines.

Adaptability: Deep learning models are flexible and may be adjusted or retrained using fresh data to enhance performance or accommodate applications in uncharted territory. Because of their flexibility, they work well in real-world situations where data distributions may fluctuate over time or differ between deployment settings.

In conclusion, Using deep neural networks' representational capability, temporal modeling skills, and flexibility to reliably and accurately infer emotional states from video data is the foundation of the theory behind video-based emotion detection using deep learning.

The proposed methodology the emotion detection has been done using the dataset prepared in IDLE (python 3.9 64 bit) using Mi webcam. The dataset is taken from Idle and it is runner using Mi webcam. The webcam records the face and detects the emotion based on the dataset given and applied in CNN. The data set is taken from CNN based on deep learning which eventually analyses the face and whether the implemented dataset is analyzed corrected, or not. If corrected, the data set will be implemented and the emotion is detected. The emotion which is detected will be displayed in the software itself.

3.2 WORKFLOW OF THE PROPOSED SYSTEM

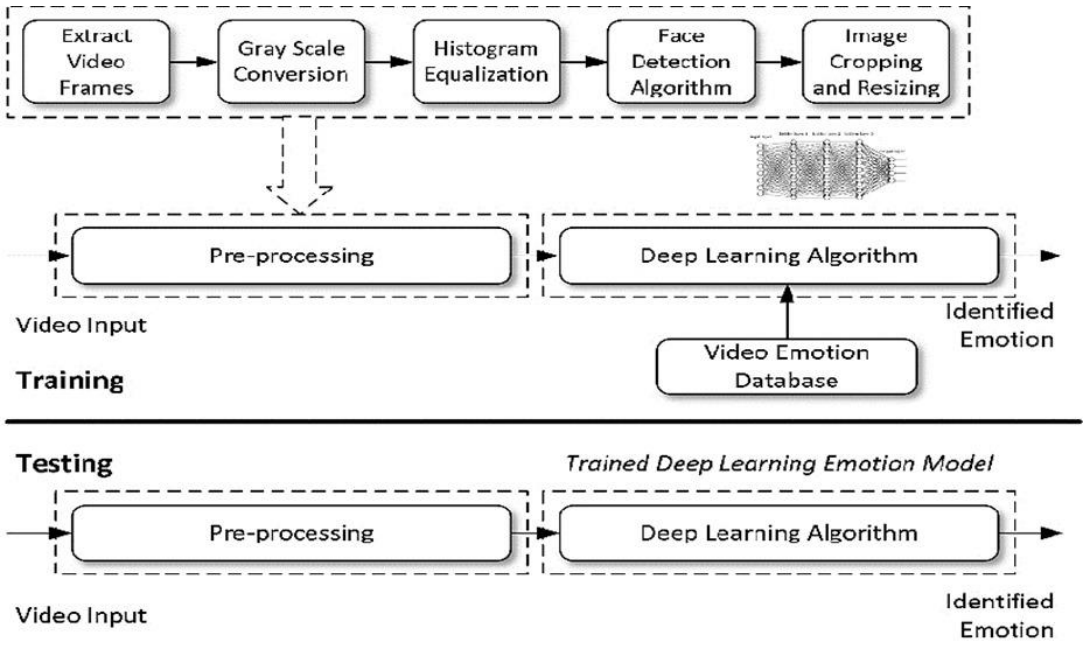

Fig 3.1 Proposed work flow

The work flow of the proposed system consists of two sets one is training and other testing

Datacollection:

Compile a varied collection of movies showing people exhibiting a range of emotions in a variety of settings and circumstances. To increase the resilience of the model, make

sure it has a large variety of face expressions, lighting scenarios, camera angles, and demographic groupings in its dataset.

Datapreprocessing:

Preprocessing the data: Take frames out of the films at predetermined intervals to make picture sequences. Locate and position faces in each frame by using facial landmark and face detection techniques. To improve model generalisation and increase variability, you can choose enhance the dataset by adding transformations like flipping, scaling, or rotation.

Feature extraction :

It involves taking each frame and using a pre-trained Convolutional Neural Network (CNN) like VGG, ResNet, or Inception to extract high-level characteristics.To capture temporal relationships between frames, you may also optionally include temporal modelling by feeding the extracted features into a recurrent neural network (RNN) architecture such as a Gated Recurrent Unit (GRU) or Long Short-Term Memory (LSTM).

Model Training:

Divide the dataset into training, validation, and testing sets for the model training process. Apply a suitable loss function (classical cross-entropy, for example) to the training set and train the deep learning model. Keep an eye on the model's performance on the validation set and make necessary adjustments to the hyperparameters (such as batch size and learning rate) to avoid overfitting. Analyse the trained model's performance metrics and generalisation abilities using the test set.

Model deployment:

When you are happy with the model's performance, deploy it in a real-world setting. When real-time or batch emotion detection is needed, include the model into the application or system. Give consumers a way to enter video data in real time or as pre-recorded files and return emotion predictions back as an output through an interface.

Monitoringand Maintenance:

Keep an eye on how the deployed model performs in actual situations. Gather user input and apply it to the next updates or iterations of the model. To adjust to modifications in the target domain or enhance performance over time, retrain the model on fresh data regularly.

Optional Improvements:

Apply methods for multi-modal emotion identification by adding textual or audio data as further data sources. Investigate real-time processing and optimization strategies to lower inference latency for applications that need quick replies. When implementing the system in sensitive environments, keep privacy and ethical issues in mind. Take the necessary precautions to protect user data and privacy.

3.3 HARDWARE DESCRIPTION

3.3.1 MI WEBCAM:-

Xiaomi 1080P 360° Home Security Camera with Full HD Picture, AI Motion Detection, Infrared Night Vision, 360° Panorama, and Talk Back (2-Way Audio) Technology COMPATIBLE WITH ALEXA.webcam made by Xiaomi, which is frequently linked to MI. A few characteristics are:

Resolution: Xiaomi webcams provide a standard range of resolutions from 720p (HD) to 1080p (Full HD) or greater, giving crisp and clear video for a variety of uses.
Frame Rate: They usually allow for frame rates of at least 30 frames per second (fps), guaranteeing fluid and seamless movement when recording video.

Video recording: Mi cameras may record videos at different resolutions and frame rates because they usually include this feature. Picture stabilization for smoother filming is one feature that higher-end models could include.

Image Quality: Xiaomi pays great attention to image quality in its cameras. To improve image quality in various lighting situations, Mi cameras may have features such as wide-angle lenses, HDR (High Dynamic Range) photography, and sophisticated image processing algorithms.

Connectivity: Many Mi cameras have a Wi-Fi connection, which allows users to communicate wirelessly with tablets, smartphones, and other devices. This enables users to monitor live feeds, adjust settings, and operate the camera remotely via specialized smartphone apps.

Storage: Users of Mi cameras may store taken images and movies directly to the camera, eliminating the need for external devices, by using local storage choices like microSD cards or internal storage.

Battery longevity: The longevity of a portable camera's battery is crucial, especially for digital or action cameras. In order to enable prolonged use without the need for frequent recharging, Xiaomi works to deliver effective power management and a long-lasting battery life in its Mi cameras.

Design and built quality: Xiaomi prioritises the design and construction quality of its goods, which encompasses cameras as well. Modern and sleek designs are characteristic of Mi cameras, which are frequently made of premium materials for endurance and sturdiness.

Fig 3.2 Mi webcam

3.4 SOFTWARE DESCRIPTION

3.4.1 IDE(python 3.9 64 -bit):-

Officially published on October 5, 2020, Python 3.9 is a significant update of the Python programming language. It offers enhancements, optimizations, and new features compared to earlier versions. The following are some of Python 3.9's main features:

- Python 3.9 has improved support for type hinting, which lets programmers define types for variables, return values, and function arguments. New syntactic features like union types (e.g., str | None) and enhanced support for TypedDicts are made simpler to express complex type relationships.

- Python 3.9 brings two new operators for dictionaries: the update (|=) operator, which updates dictionaries with key-value pairs from another dictionary, and the merge (|) operator, which merges dictionaries. For typical dictionary manipulation applications, these operators offer a clear syntax.

- New Syntax Features: The match statement, which offers a more succinct and understandable syntax for pattern matching, is one of the new syntactic features introduced in Python 3.9. Furthermore, a more comprehensive and standardised method of managing time zone information is offered via the zoneinfo module, which is introduced for use with time zones.

- Library Updates: Python 3.9 brings bug fixes, speed boosts, and new features to a number of standard library modules and packages by updating them to newer versions. The zoneinfo module has been improved, the typing module has been improved for type hinting, and the unittest module has been updated for testing, among other noteworthy developments.

With backward compatibility with current Python codebases, Python 3.9 is a noteworthy version that keeps enhancing the language's features, speed, and security. To take use of these new capabilities and enhancements, developers are advised to update to Python 3.9.

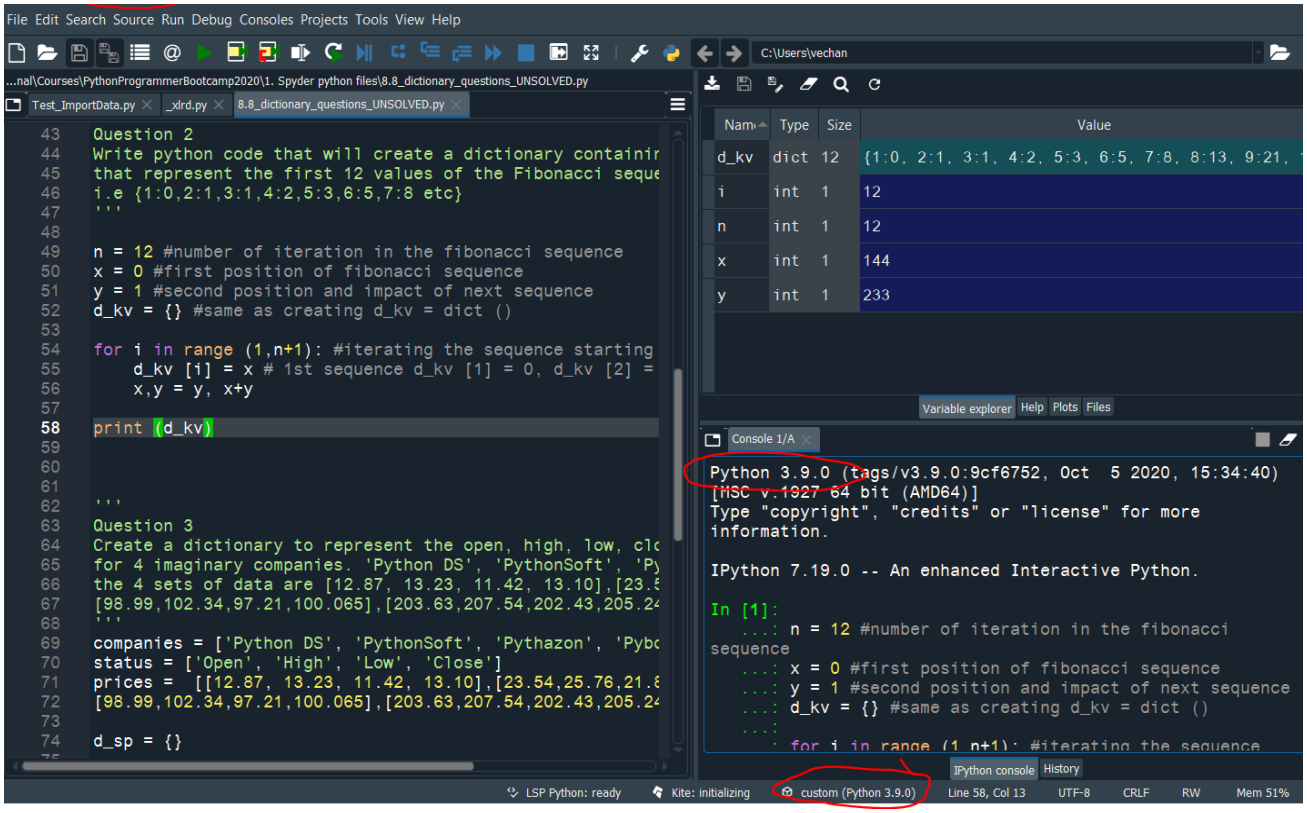

Fig 3.3 Python version 3.9 platform

EMOTION ACCURACY

Angry	82%
Disgust	78%
Fear	85%
Happy	90%
Sad	83%
Surprise	79%
Neutral	87%

CONCLUSION MATRIX

Sad	0.83	0.03	0.03	0.14	0.19	0.00	0.17
Happy	0.02	0.82	0.03	0.03	0.07	0.00	0.03
Surprise	0.02	0.03	0.82	0.02	0.02	0.00	0.10
Angry	0.11	0.04	0.02	0.58	0.10	0.01	0.14
Neutral	0.11	0.04	0.02	0.07	0.66	0.00	0.00
Disguist	0.05	0.02	0.01	0.21	0.05	0.60	0.06

3.5 INNOVATIVENESS OF THE SOLUTION

The main divergence of the product is that the picture quality of the face will be clear, as the camera used is of a high-definition type. Picture quality using existing devices is that the camera used is different. This would help in greater emotion detection without any error.

3.6 IMPACT OF THE PRODUCT

A video-based emotion detection product can have a wide-ranging, complex influence on many facets of human interaction, technology, and society. Because they allow machines to sense and react to users' emotions, emotion-aware systems have the potential to transform human-computer interaction completely. Virtual assistants, video games, e-learning platforms, and customer service interfaces are a few of the areas where this may result in more intuitive and customised user experiences. In medical contexts, emotion detection technology can help in the diagnosis and treatment of mental health conditions like anxiety, depression, and autism spectrum disorders. Emotion detection technologies can aid in the growth of social and emotional intelligence. These systems can promote more compassionate societies and healthier relationships by teaching people how to identify, control, and comprehend their own emotions as well as those of others.

3.7 UNIQUENESS AND FEATURES

- Early detection of emotional distress in elderly people can help prevent health complications.
- The use of computer vision and deep learning techniques can provide accurate and reliable emotion detection.

- The use of an IoT system can automatically alert medical professionals in case of any emotional distress in elderly patients.
- The system can be cost-effective and easily scalable.
- Real-time Interaction: Processing video feeds in real-time allows for instant feedback and interaction between users and apps, which is another distinctive feature. This is especially helpful for applications like gaming, virtual reality, and human-computer interaction, where immersive experiences depend on prompt reactions to users' emotional states.

3.8 SUMMARY

This chapter illustrates how the proposed system works and describes the hardware and software used in it. This would help to know which of the hardware and software features will be used in the application. This chapter clearly illustrates how the project is working and the proposed system and their workflow.

CHAPTER 4

EXPERIMENTAL RESULTS AND DISCUSSIONS

This project has successfully overcome the problem of detecting people's emotions. The output results and discussions are below. This has helped many people to detect people's emotions.

4.1 RESULT FOR WATER LEVEL INDICATION

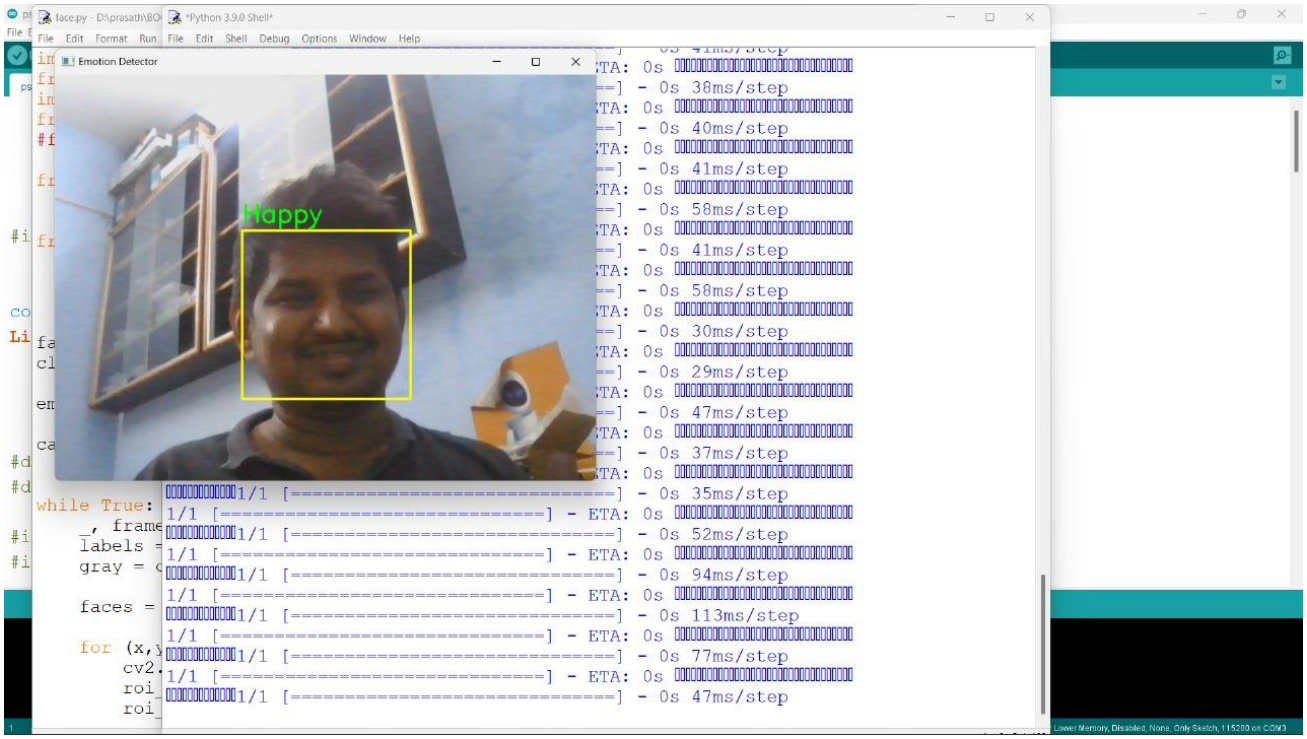

Fig 4.1 Emotion of an individual being happy

Figure 4.1 shows the output from the Python platform of emotion detection of an individual being happy.

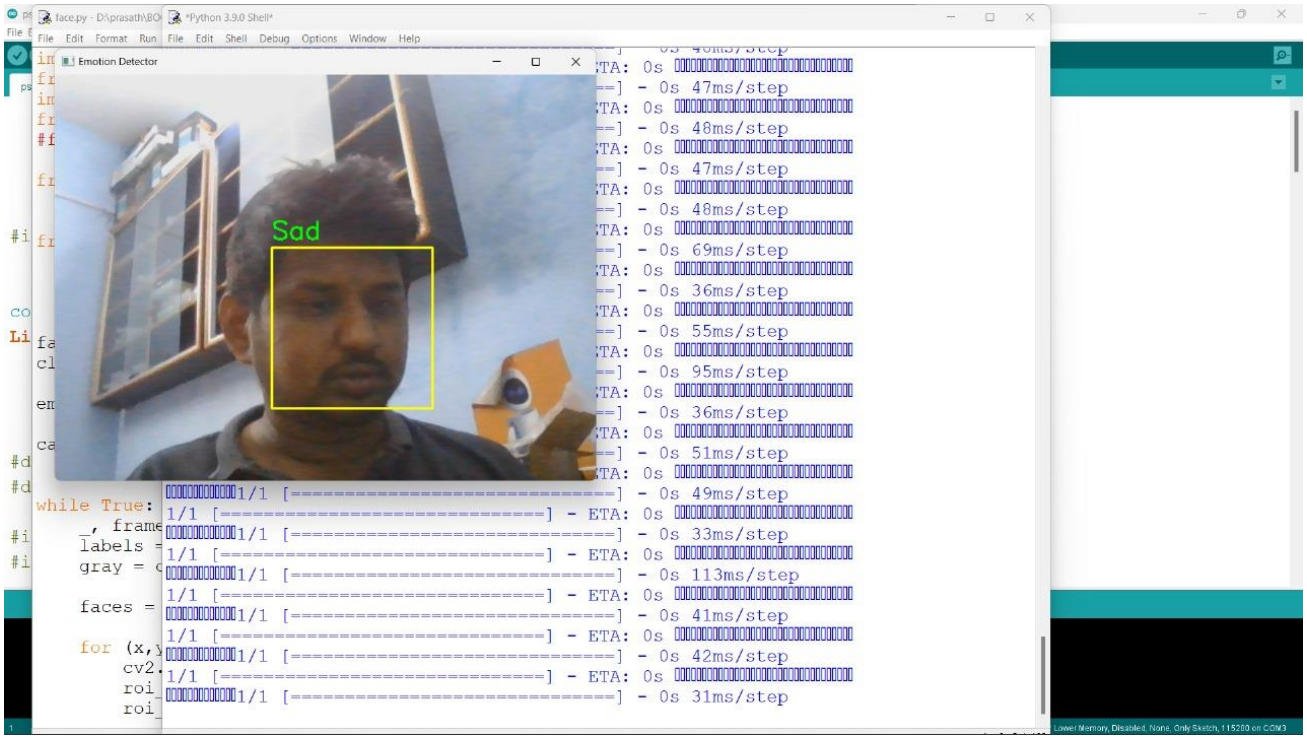

Figure 4.2 emotion of an individual being sad

Figure shows the emotion of an individual of being sad. This would help to get the depressed people out from state of depression.

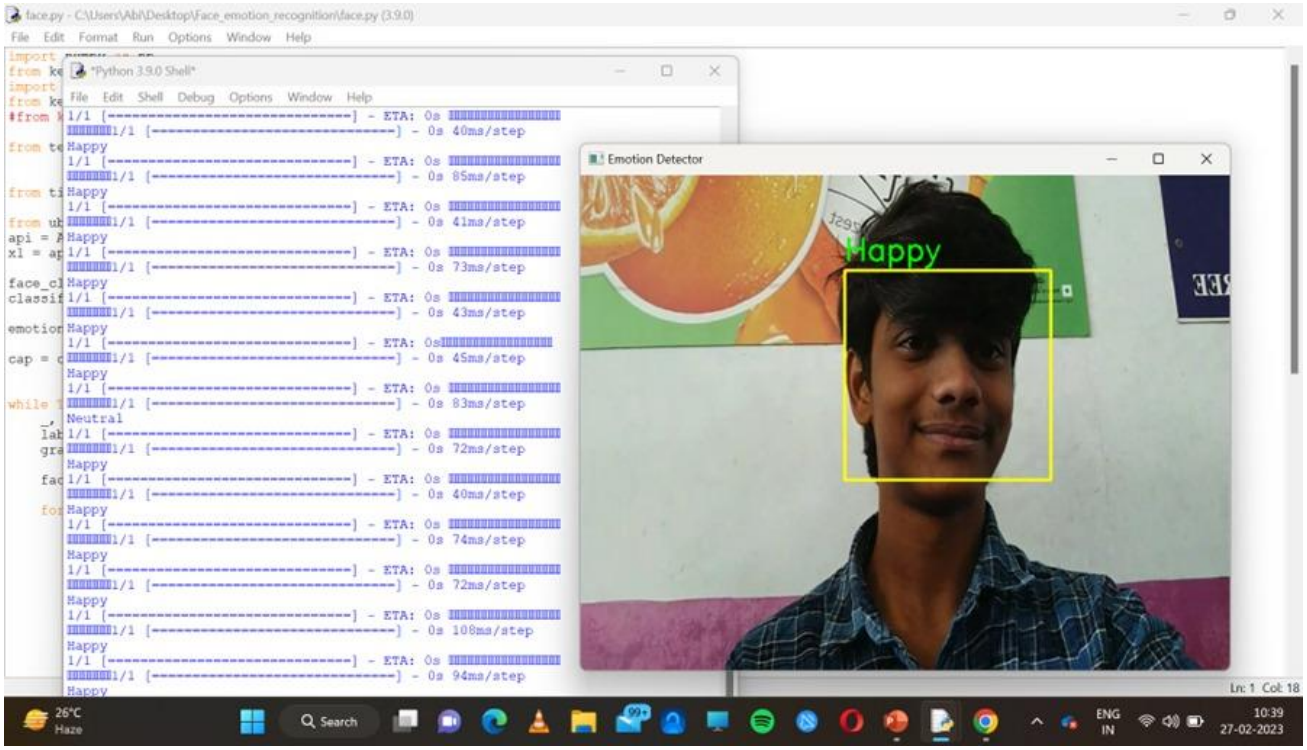

Figure 4.3 Emotion of an individual being happy

The figure shows the emotion of an individual in state of happiness.

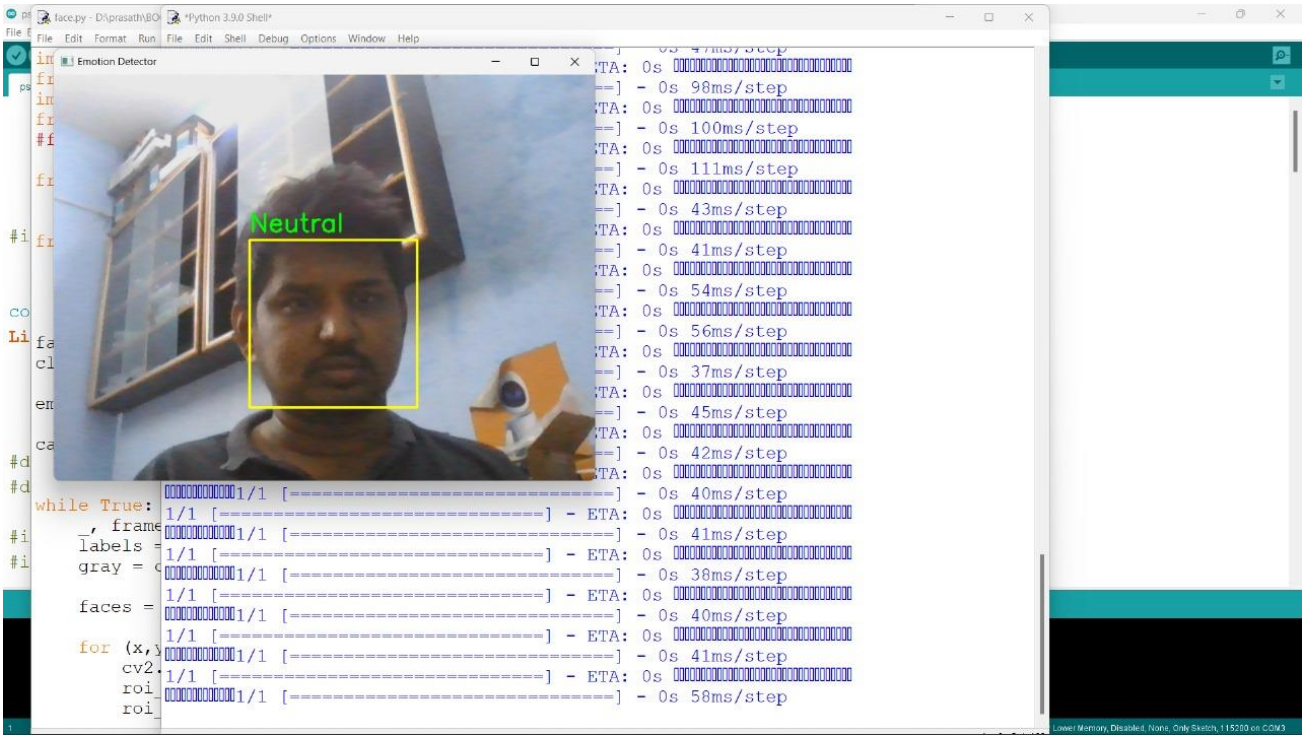

Fig 4.4 Individual in a state of neutral

Figure 4.4 individual in state of neutral

4.2 SUMMARY

The data state of emotions has been successfully detected, and the people who are detected are detected successfully. This would also help family members detect their emotional state, which they can be found in. This would also help the medical field for therapy sessions for depressed people who are in the state of depression.

CHAPTER 5
CONCLUSION AND FUTURE SCOPE

5.1 CONCLUSION

In conclusion, deep learning-based video-based emotion detection is an innovative technique with many possible applications in many fields. With amazing precision and granularity, these algorithms can infer human emotions from real-time video data by analyzing facial expressions, body language, and environmental signals. The combination of sophisticated machine learning methods, multimodal integration, and instantaneous processing powers renders video-based emotion detection exceptionally well-suited to tackle issues in healthcare, education, marketing, security, and other related fields.

To fully utilize video-based emotion recognition, however, privacy, permission, and bias mitigation must all be carefully considered, among other ethical issues. Building trust and ensuring social acceptability requires the responsible deployment of these technologies, which means ensuring fairness, openness, and user ownership over their emotional data. To sum up, video-based emotion recognition is a game-changing technology that can enrich human experiences, boost well-being, and promote empathy and understanding among people. To realize this field's full potential for beneficial effects, ethical concerns and cooperative efforts must be given top priority as research and development proceed.

5.2 FUTURE ENHANCEMENT

In Future, to further increase performance, robustness, and application, future developments in video-based emotion recognition systems may concentrate on a number of important topics. Further investigation into the integration of supplementary modalities, including text, audio, physiological signals, and contextual data, can improve the precision and depth of emotion detection. More sophisticated and contextually aware emotion detection systems may result from research into fusion approaches that efficiently integrate data from several sources in a complimentary way. Video-based emotion detection systems may be made to function well over time by looking at techniques for both continuous learning and adaptability to changing data distributions and user preferences. The system's capabilities may be continuously enhanced and customised in real-world circumstances by integrating methods for online learning, domain adaptation, and user input integration.

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Appendix

```
import numpy as np
from keras.models import load_model
import cv2
from keras.preprocessing import image
from tensorflow.keras.utils import img_to_array
from time import sleep
face_classifier =
cv2.CascadeClassifier(r'haarcascade_frontalface_default.xml')
classifier =load_model(r'model.h5')
emotion_labels = ['Angry','Disgust','Fear','Happy','Neutral', 'Sad', 'Surprise']
cap = cv2.VideoCapture(0)
while True:
    _, frame = cap.read()
    labels = []
    gray = cv2.cvtColor(frame,cv2.COLOR_BGR2GRAY)

    faces = face_classifier.detectMultiScale(gray)

    for (x,y,w,h) in faces:
        cv2.rectangle(frame,(x,y),(x+w,y+h),(0,255,255),2)
        roi_gray = gray[y:y+h,x:x+w]
```

```
        roi_gray                                                    =
cv2.resize(roi_gray,(48,48),interpolation=cv2.INTER_AREA)
    if np.sum([roi_gray])!=0:
            roi = roi_gray.astype('float')/255.0
            roi = img_to_array(roi)
            roi = np.expand_dims(roi,axis=0)


            prediction = classifier.predict(roi)[0]
            label=emotion_labels[prediction.argmax()]
            label_position = (x,y-10)

cv2.putText(frame,label,label_position,cv2.FONT_HERSHEY_SIMPLEX,
1,(0,255,0),2)
            print(label)
 else:
            cv2.putText(frame,'No
Faces',(30,80),cv2.FONT_HERSHEY_SIMPLEX,1,(0,255,0),2)
    cv2.imshow('Emotion Detector',frame)
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break


cap.release()
cv2.destroyAllWindows()
```

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