LIVE FACIAL EXPRESSION RECOGNITION

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

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We hereby declare that, this project has been done by us under the supervision of Dr. Md Zahid Hasan**,** Associate Professor & Coordinator MIS**,** Department of CSE Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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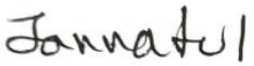

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ABSTRACT

Today, "Live Facial Expression Detection" is a highly common and crucial work. This approach can be used by a lot of businesses to comprehend the feelings of customers after a product introduction. It is also used to determine whether or not the employees are content with the amenities provided by the business. The potential for this discipline to advance human-machine cooperation is enormous. As a result, there is growing interest in precisely reading human expression. The visible representation of an individual's affective state, cognitive activity, intention, personality, and psychopathology is their facial expression, which also serves as a means of communication in interpersonal interactions. It has been researched for a very long time and has made progress in recent decades. Despite significant advancements, it is still challenging to accurately identify facial expressions because of their complexity and variety. There are numerous techniques that can identify facial expressions. Using HTML5, CSS3, Bootstrap, and JavaScript, we developed a system for identifying facial expressions for our thesis project. We used the face-API js JavaScript API and obtained 99.28% accuracy for our system.

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CHAPTER 1

Introduction

1.1 Introduction

Image processing is an additional advancement in terms of innovation. At the moment, this field is quite promising. This place offers a lot of chances. Its image processing capabilities include facial recognition. In various places, there are large, open doors. alternative face recognition Extensions in this field include things like human-machine cooperation, the ability to identify someone's mental state using a facial recognition system, target control of various applications depending on a person's spirit, and climate management. In order to simplify our lives. It will be able to establish a framework for smart house robots that give enhanced functionality based on mood if this facial recognition system can be utilized to fully identify a person's psyche. That person's. Adjust with settings, much like you would with lighting and climate control.

Our goal is to create a facial recognition system that is more accurate than existing methods. Because of this, we investigated various project documents on related subjects to learn about the models and techniques they employed and the degree of accuracy they attained. This enables us to draw conclusions about how the system can operate more effectively.

A visible expression of a person's emotional state, cognitive activity, intentions, personality, and psychopathology is facial expression, which also serves as a means of communication in interpersonal relationships. Much research and progress has been made in recent decades. Despite significant progress, accurately identifying facial expressions remains challenging due to their complexity and variability.

In general, gestures, facial expressions, and unconscious language are all non-verbal ways in which people can express their intentions and feelings. This approach can be a very useful non-verbal communication tool. The accuracy with which the system recognizes or extracts facial expressions from images is very important. The system has attracted attention due to its potential applications in various industries, such as lie detection,

medical evaluation, and human-computer interfaces. A very popular tool for analyzing facial expressions is the facial action coding system "FACS", which Ekman first developed in 1978 and improved in 2002. For example, a smile or upward movement of the corners of the lips is a sign of contentment. Just as one emotion can be distinguished from another by additional transformations inherent in that emotion. Issues surrounding the representation and classification of static or dynamic aspects of these variants of facial pigmentation are addressed in studies on automatic recognition of facial emotions.

Image processing is another revolutionary push. This field is currently very promising. This place offers many opportunities. Image processing features include facial recognition. There are wide open doors here and there. Alternative Facial Recognition Extensions in this area include human-machine collaboration, the ability to use facial recognition systems to recognize a person's mental state, the ability to target different applications depending on a person's mood, and climate management. And so on. To simplify our lives. If we can use this facial recognition system to fully identify a person's psychology, we can create a framework for smart home robots that improve their functionality based on their mood this person. Customize your settings, just like you control lighting and climate control.

Our goal is to create a facial recognition system that is more accurate than existing methods. For this reason, various project documents on related topics were examined to learn more about the models and methods used and the level of accuracy achieved. From this, we can draw conclusions about how the system works more effectively.

1.2 Motivation

The necessity to preserve the security of information or physical property is growing in importance and difficulty in today's networked society. The number of crimes is rising daily in nations like Nepal. There are no automated technologies that can monitor a person's activity. Since facial expressions change while performing various activities, if we were able to track people's expressions automatically, we could locate criminals with ease. Therefore, we made the decision to create a facial expression recognition system. After reading a few publications in this field, we became interested in this topic. The papers on the development of their system and method for developing accurate and dependable face expression recognition systems were published.

A person's mood is greatly influenced by their emotions. The six universal feelings were happiness, sadness, wrath, fear, surprise, disgust, and contempt. It focuses on the four main emotions—happy, sad, angry, and neutral—according to research. Another crucial factor in detecting culprits in front of security cameras is emotion recognition. For instance, the Alarm Trigger System can be useful if someone is afraid. Applications like music suggestions or various camera surveillance systems can use emotion recognition systems as sub-modules.

As a result, we have a strong drive to create a system that can identify facial expressions and monitor an individual's behavior.

1.3 Objectives

The purpose of our project is to build a system that can recognize facial expressions of any person with the highest possible accuracy and in the shortest possible time, regardless of age, gender, skin color, or nationality.

The purpose of emotion recognition is to identify a person's emotions. Emotions can be captured through facial expressions and verbal communication. This work focuses on

identifying human emotions from facial expressions. Facial emotion detection is a useful task and can be used as the basis for many real-time HIS applications. We humans can easily recognize the emotions of others. Detecting emotions automatically from human faces is important because it is used in real-time applications. In particular, functions based on pre-trained CNNs display better images. Pre-trained CNN-based features represent the most salient features and thus can improve performance. To take advantage of deep learning models without large datasets, we recommend using pre-trained models. A pre-trained integrated neural network model (VGG16) was used for feature extraction and the concept of a deep neural network model was used for classification.

1.4 Expected Outcomes

The main goal of this project is to detect human faces and expressions and provide human face detection accuracy and expression accuracy. Human facial expressions are classified into seven basic emotions: Happy, Sad, Surprise, Fear, Anger, Disgust, and Neutrality. The system can identify facial expressions with the highest accuracy in the shortest time regardless of age, gender, race, or nationality, regardless of age, gender, race, or nationality.

1.5 Project Management and Finance

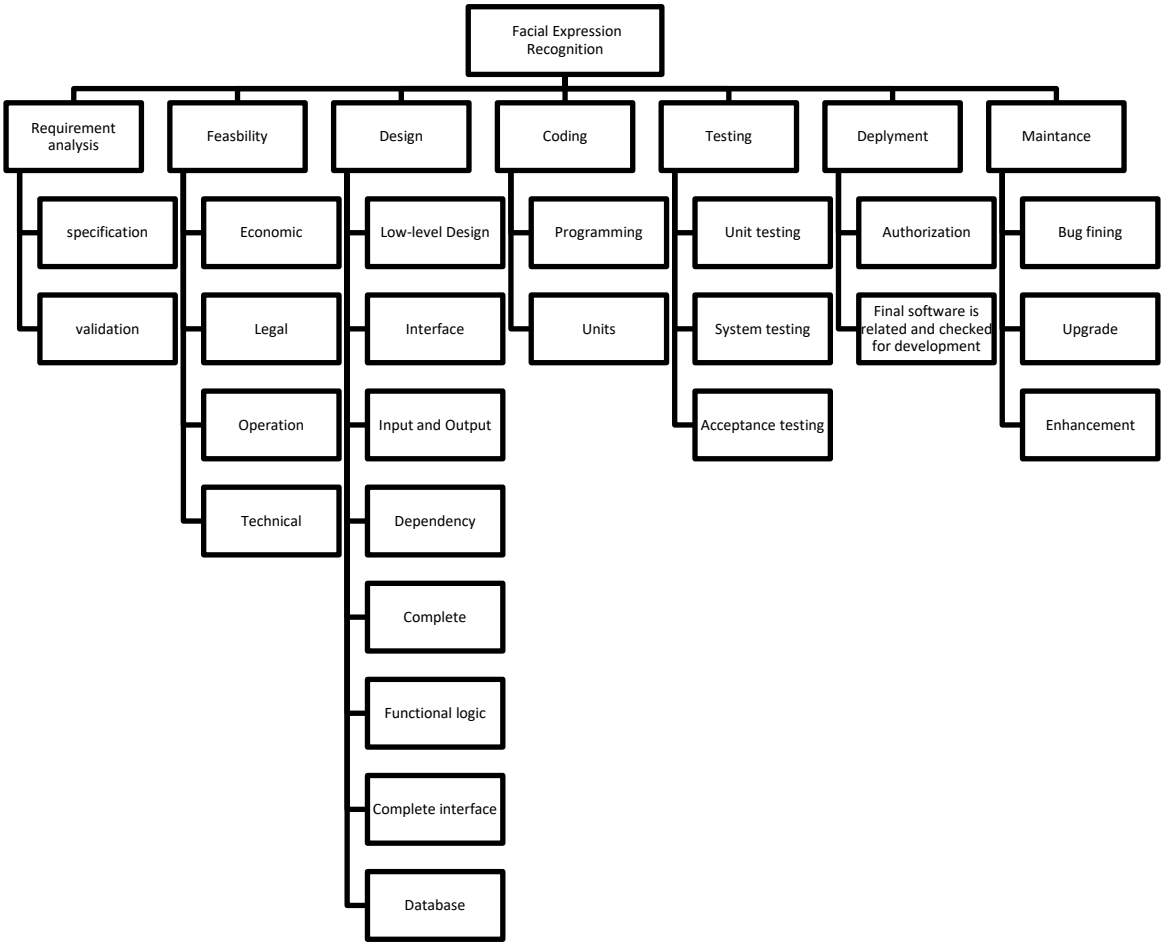

Figure 2.5.1: Project Management and Finance

In this project basically, we didn't have any cost it was mainly done through web programming. Only we completed the said project with our handy laptop/Desktop. Due to this, we didn't have any extra costs and only travel costs when we worked together with our team members. So, these costs are not shown as they are not related to the project.

1.6 Report Layout

This report is planned so that experiencing the report will give a total understanding of the system, how it works and the result of the research. The report observes the standard thesis reporting template given by DIU.

CHAPTER 2

Background

2.1 Terminologies

Facial expressions are recognizable signs of a person's emotional richness, mental behavior, goals, personality, and psychology. Facial expressions represent one or more locations in the muscles beneath the skin of the face. This is the apparent result of the movement of one or more facial muscles. Due to different facial development, the order of appearance also changes. Human facial expressions are classified into seven basic emotions: joy, anger, surprise, fear, anger, disgust, and neutrality.

2.2 Related Works

We've reviewed some papers and concluded the models and techniques they've used and their final results.

2.2.1 Face spoofing detection using LDP-Top

The author of this paper has proposed a simple and effective approach to deal with spoofing called higher-level locally derived models from three orthogonal planes (LDP-TOP). This method consists of three main steps. The first step is to grayscale each image and pass it to the face detector. Then the regions are geometrically normalized. In the next step, it applies the LDP operator to the three orthogonal planes by intersecting the XY, XT and YT directions using T as the sequence of frames. Then I add the extracted graphs in order. The final step is classification. They used SVM (Support Vector Machine) to classify the extracted graphics. We then determine if the entry has been tampered with. They used the Viola-Jones method to recognize and normalize faces.

2.2.2 Facial expression recognition using image processing techniques and neural networks

In this article, they focus on two important parts. The first is Face ID and the second is Facial Expression Detection. For face recognition, they used the traditional method. At first, they extracted the face area, then they cleaned the eyes, mouth and eyebrows area to define the face area. They then extract different features from that particular face. They used these properties to construct a set of vectors. Here they have built a unique visual facial recognition method. This method consists of four parts. They are model-based, knowledge-based, appearance-based, and feature-based.

Here the author used AdaBoost classifier and cascade classifier to find human faces as fast as possible. After extracting features, they apply a neural network algorithm. Face recognition accuracy is 97.4%, then the experimental result is 92.8% in this article. For facial recognition, they used SimNet. SimNet is fuzzy logic combined with artificial neural network. They used SimNet which has two hidden layers. Each layer contains twenty neurons. Their system provides hidden classes with twenty standardized properties. The results of facial recognition experiment in this paper are 96.2%.

2.2.3 Face Detection Algorithm

AdaBoost algorithm, brief for Versatile Boosting, could be a Boosting procedure utilized as an Outfit Strategy in Machine Learning. It is called Versatile Boosting as the weights are re-assigned to each occurrence, with higher weights relegated to inaccurately classified occasions. Boosting is utilized to decrease predisposition as well as fluctuation for directed learning. It works on the principle of learners developing successively. But for the primary, each consequent learner is developed from already developed learners. In basic words, frail learners are changed over into solid ones. The AdaBoost calculation works on the same rule as boosting with a slight distinction.

First, allow us to discuss however boosting works. It makes 'n' range of call trees throughout the info coaching amount. because the initial call tree/model is formed, the incorrectly classified record within the initial model is given priority. solely these records ar sent as input for the second model. the method goes on till we tend to specify variety of base learners we wish to make. Remember, repetition of records is allowed with all boosting techniques.

Model 1,2…,n are individual models

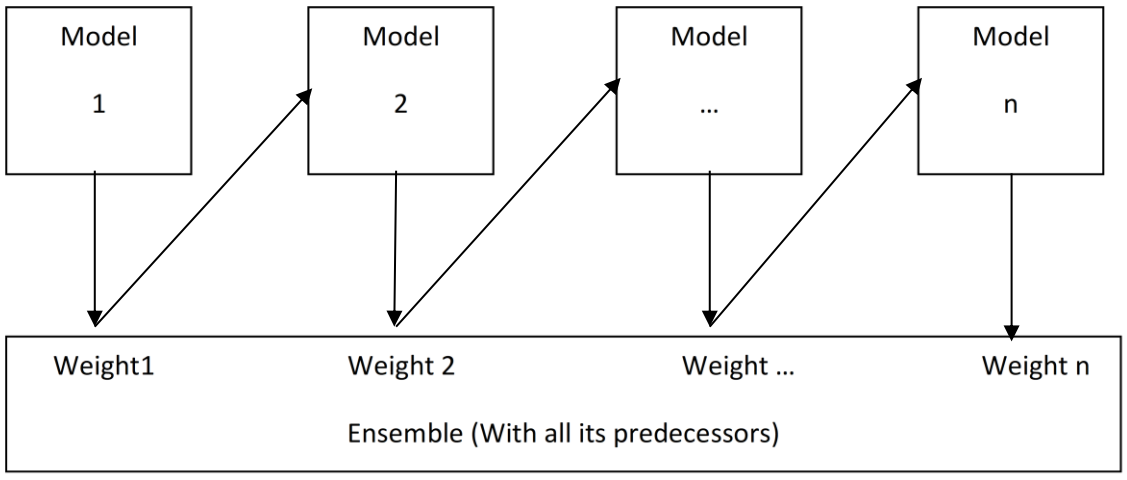

Figure 2.2.3: AdaBoost algorithm model

Step one – making the primary Base Learner:

To create the primary learner, the algorithmic program takes the primary feature, i.e., feature one and creates the primary stump, f1. it'll produce a similar variety of stumps because the variety of options. within the case below, it'll produce three stumps as there square measure solely three options during this dataset. From these stumps, it'll produce 3 call trees. This method is referred to as the stumps-base learner model. Out of those three models, the algorithmic program selects only 1. 2 properties square measure thought of whereas choosing a base learner – Gini and Entropy. we have a tendency to should calculate

Gini or Entropy a similar means it's calculated for call trees. The stump with the smallest amount price are the primary base learner. within the figure below, it will create 3 stumps as there are only 3 features in this dataset. It will create three decision trees. The quantity below the leaves represents the properly and incorrectly classified records. By victimization these records, the Gini or Entropy index is calculated. The stump that has the smallest amount Entropy or Gini are chosen because the base learner. Let's assume that the entropy index is that the least for stump one. So, let's take stump one, i.e., feature one as our initial base learner.

Step 2 – calculating the overall Error (TE):

The total error is that the total of all the errors within the classified record for sample weights. In our case, there's just one error, thus Total Error (TE) = 1/5.

Step three – calculating Performance of the Stump:

Formula for calculating Performance of the Stump is:

Performance of Stump = ½ ln $\frac{[1-\mathrm{TE}]}{\mathrm{TE}}$

Here, **ln** is natural log and **TE** is Total Error.

The algorithmic rule created three decision trees or stumps. The check dataset can suffer all the stumps that are created by the algorithmic rule. Where as passing through the first stump, the output it produces is one. Passing through the second stump, the output generated yet again is one. Whereas passing through the third stump it offers the output as zero. Within the AdaBoost algorithmic rule too, the bulk of votes ensue between the stumps, within the same method as in random trees. During this case, the ultimate output are one. This is often however the output with check knowledge is set.

2.2.4 A Facial Expression Recognition System using Convolutional Neural Network

The engineer developed a facial expression recognition system employing a convolution neural network in this study (CNN). This system's CNN model is built on the LeNet Architecture. This project uses the Kaggle facial expression dataset, which includes seven facial expression features, including pleased, angry, sad, disgusted, surprised, fear, and neutral. On the testing dataset, the system achieved a precision of 0.57 and an accuracy of 56.77%.

2.2.5 Facial Emotion Recognition using Min-Max Similarity Classifier

To reduce the issue of inter-class pixel conflict during classification, the author of this research has put out a simple and effective face emotion detecting algorithm. In the proposed approach, pixel normalization is used in addition to the closest neighbor classifier's effective suppression of attribute outliers to eliminate intensity offsets caused by a Min-Max measure.

One image of each person's emotion is used for testing in this Min-Max classification approach, and the remaining images are used for training. The cross-validation is repeated thirty times to ensure that the recognition system is statistically static and that all of the images in the JAFFE database have at least one opportunity to be tested. Calculating the mean results of the cross-validation trials yields the overall expression detection accuracy of this system.

On the JAFFE database, they examined the Min-Max classification approach, and the results ranged from 92.85% to 98.57%, indicating an improvement in recognition performance.

2.2.6 Improving the Classification Accuracy of Emotion Recognition using Facial Expressions

The authors of this research suggest using PCA and a neural network to detect facial expressions. Actually, the focus of this paper is on the neural network classification accuracy using PCA for attribute selection. Four components are covered in their approach. They are: expression detection, attribute selection, categorization, and picture preparation. Here, image processing uses scaling and rendering to get the face ready for expression recognition. Following the application of the process's methods, the image of the face had been used as input. They extracted features using the PCA technique. For each image, it creates the Eigen faces. The system generates Eigenvectors through these Eigen faces. The neural network with back propagation was then employed for classification. After receiving the results, they came to the conclusion that the technique was 85% accurate.

2.3 Comparative Analysis

Face recognition is the automated identification of a specific individual from a digital image by examining the attributes of that person's face. Face detection, picture processing, and face identification make up the three parts of the face recognition method. Computer learning is used in face detection to locate any faces in an image. Scaling and image rendering are used in image processing to get the face ready for recognition. Face identification establishes the identity of a face by applying mathematical approaches to the pixel values or features in the facial region of an image. Crowd monitoring, video content indexing, personal identification (like a driver's license), matching mug pictures, entrance security, etc. are some of the most beneficial applications. We think that the development of such technology depends on the computer's ability to recognize human face expression. The recognition of human facial expressions by machines has received a lot of attention recently. For more than 40 years, face recognition has been the subject of intensive research. It is currently one of the face research field's most important subtopics [1]–[4]. Face recognition is a system that identifies people based on the image of their faces. There is a chance that conversational and emotional facial signals could be automatically detected

and classified thanks to recent developments in picture analysis and pattern recognition. This paper's objective is to provide a review of the work that has been done to automatically analyze face expressions in facial photographs and image sequences. Face detection in a facial image or image sequence, facial expression data extraction, and facial expression classification are the three fundamental issues with facial expression analysis. Our goal is to investigate the problems associated with developing and implementing a system that could automatically analyze facial expressions.

2.4 Scope of the Problem

Emotion recognition has a broad use in a variety of fields, including biometric security and human-computer interface. In order to replicate the human brain, it uses a variety of supervised and unsupervised machine-learning techniques, which gives us insight into artificial intelligence or machine intelligence. By 2024, 1.3 billion devices are anticipated to have facial recognition software. Companies like iProov and MasterCard are already using face recognition software in mobile phones that is powered by AI to authenticate payments and perform other sophisticated authentication activities. Systems for facial recognition are quite sensitive to changes in stance. When a person's head moves or their point of view shifts, the stance of their face changes. Although it seems simple, face recognition is actually a difficult computational challenge. Because all faces share the same physical characteristics, such as having two eyes above a nose above a mouth, it is challenging.

2.5 Challenges

Facial expression recognition is now highly popular. Because it was difficult to obtain great precision in this project, we used a lot of models. All of the models that were able to reach high accuracy were used, while the models that couldn't were discarded.

CHAPTER 3

Requirement Specification

3.1 Workflow of the model

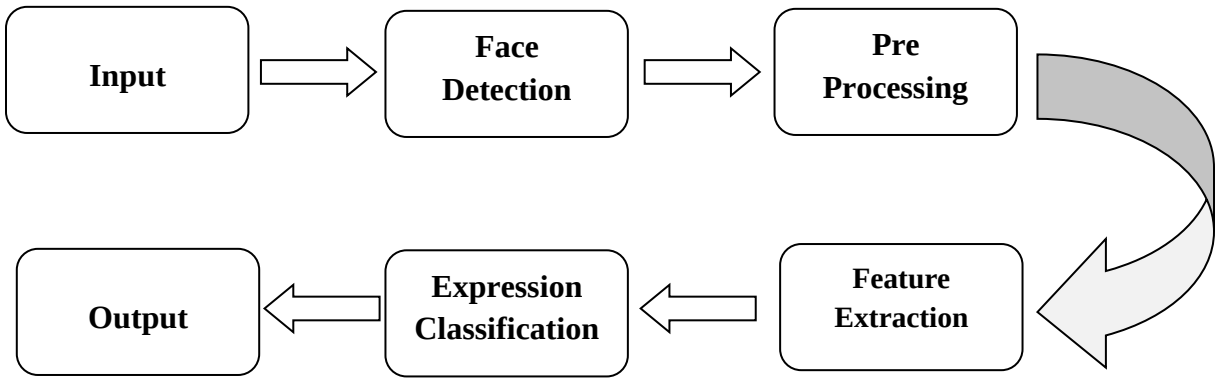

Figure 3.1.1: Total workflow of the model

Here, we take the webcam input, use face detection to determine whether it is a human face, preprocess the input, do feature extraction, and then use expression classification to display the outcome in the output.

3.2 Feasibility Analysis

A feasibility study examines the practicality of a proposed system. Based on how profitable software development will be for the company, it is computed as a percentage. A feasibility study is carried out to ascertain whether software products are appropriate for improvement, implantation, system commitment to the organization, and other criteria.

3.2.1 Technical feasibility

Technical feasibility examines and evaluates the system's hardware and software requirements as well as the technologies needed to build it. The technical expertise of the technical team, the viability of using current technology, the simplicity or difficulty of maintaining and updating the selected technology, as well as other factors, are all taken into account in a feasibility analysis. The "Facial Expression Recognition System,"

HTML5, CSS3, Bootstrap, and JavaScript were all used in its creation. Due to their widespread use in the market today, every person participating in the project's development was able to use at least one of the technologies listed. Thus, it can be concluded that the project is technically doable.

3.2.2 Economic Feasibility

Analysis of the business case for the project's costs and gains. a thorough accounting of the development project's costs, including those necessary for the finished product, comprising: B. The costs of design and development, operating expenses, and necessary hardware and software resources are aids in determining whether it will have a positive economic impact. Consider the fact that developing a face recognition system is not expensive. After more development, we will be able to offer and modify our system to businesses that require it. We just pay for domains and hosting, but when domains expand and the need for very precise facial recognition systems rises, the returns are significantly larger. The aforementioned information indicates that this idea is financially feasible.

3.2.3 Operational Feasibility

Operational Feasibility is a metric used to assess how effectively a proposed system addresses the issue and seizes possibilities indicated during scope definition. Considerations for the project's technical viability included the following:

- The system will recognize and record a face image.
- Following the image capture (identified which category)

3.2.4 Schedule Feasibility

A project's schedule's viability as a measure of its timeliness. Due to the system's ability to complete tasks by the specified time, it has been determined that the schedule is viable.

3.3 Face Detection Models

In this project we use five Models. They are –

- SSD mobilenetv1 model
- Tiny Face Detector
- Sixty-Eight Point Face Landmark Detection Model
- Face Recognition Model
- Face Expression Recognition Model

3.3.1 SSD Mobile net V1

This program uses an SSD (Single Shot Multibit Detector) based on MobileNetV1 for face recognition. The neural network will locate each face in a photo, report the bounding boxes for each face, and calculate the probability for each face. High exactness in face bounding box differentiation is given precedence in this face identifier above expedient derivation. The quantized version of the SSD mobilenetv1 model occupies roughly 5.4 MB. The WIDERFACE dataset was used to train the face localization model.

3.3.2 Tiny Face Detector

In comparison to SSD Mobile net V1 Face Recognizer, Tiny Face Detector is a significantly faster, smaller, and less resource-intensive real-time face recognition engine. As a result, it performs slightly worse at small face detection. This template has excellent web and mobile friendliness. In light of this, it ought to be your face detector for clients who are on the go and have limited resources. The quantization model (tiny face detector model) is only 190 KB in size. On a unique dataset of roughly 14,000 photos identified with inflatable boxes, facial recognition was learned. This method paired with face landmark detection findings provides superior overall results than SSD Mobile net V1. Other than training a model to forecast bounce boxes covering all facial component foci, this method is an improvement over SSD Mobile net V1. This model is a scaled-down variation of the Tiny Yolo V2, using a deep split table spool in place of the traditional Yolo

spool. The Yolo can be easily modified for various input frame sizes due to its full integration, albeit at the sacrifice of accuracy in the power supply (induction time).

3.3.3 Sixty-Eight Point Face Landmark Detection Model

This package includes a 68-point facial landmark detector that is portable, rapid, and accurate. The default model, Face Landmark 68, is only 350 kb in size, while Face Landmark 68 Tiny is only 80 kb. Strongly connected blocks and depth-distinct convolutions are used in both models. Around 35k face images with 68 landmark points on the faces were used to train the models.

3.3.4 Face Recognition Model

A ResNet-34-like framework has been put into place for face recognition to analyze face descriptors (128-value element vectors) from random face photos. It describes the characteristics of a person's face. The set of faces used for training is not the only set the model can use. This implies that you can use your model to identify faces that resemble you. To establish how similar two random faces are, for instance, you may compute the Euclidean distance or use another classifier of your choice. The Face Recognizer Net used in Face Recognition.js and the network used in the face recognition model dlib are analogous to the neural network. Davis King trained the subject, and the model used his LFW (Face Labeled in Nature) standard for face recognition attained his projected 99.38% accuracy. The face recognition model's quantifiable size is typically 6.2 MB.

3.3.5 Face Expression Recognition Model

The face expression recognition model is compact, quick, and precise. The model uses closely connected blocks and depth-wise divisible convolutions, and it is around 310 kilobytes in size. Images from online datasets and publicly accessible datasets were used to train it. It should be mentioned that the precision of the anticipated results may be decreased by wearing glasses.

3.4 System Design and Diagram

3.4.1 System Design

The system's overall design can be seen in the system design. We go into great length on the system's design in this part.

3.4.2 System Diagram

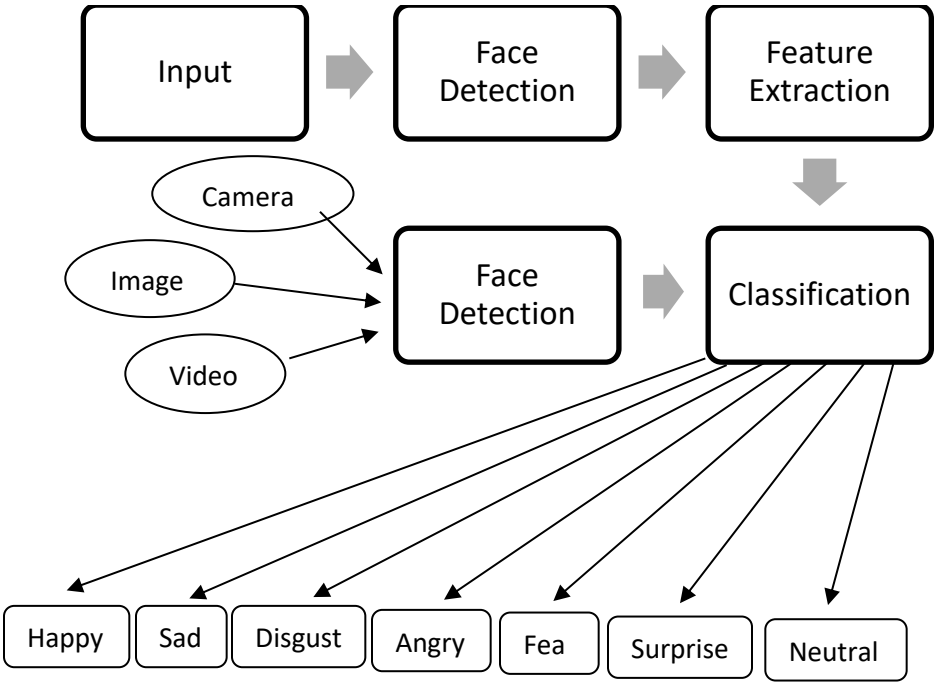

Figure 3.4.2.1: System Diagram of Live Facial Expression Recognition

First, we will take an image input, we can directly input our face through our webcam or we can take a picture input then we will detect if it is a face then we will do face classification through feature extraction. Here we will do seven expression classification Expressions are Happy, Sad, Disgust, Fear, Angry, Surprise and Neutral.

3.5 System Flowchart

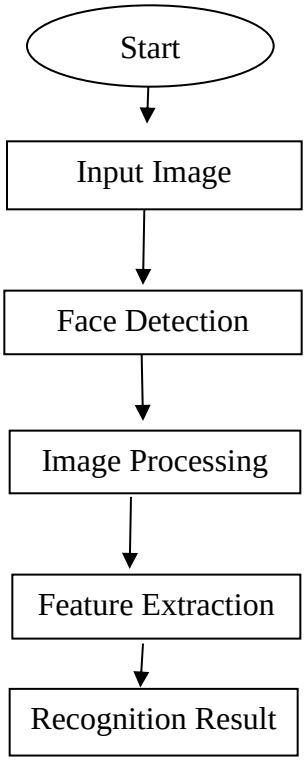

Figure 3.5.1: Flowchart of Live Facial Expression Recognition

CHAPTER 4

Design Specification

4.1 Font-end Design

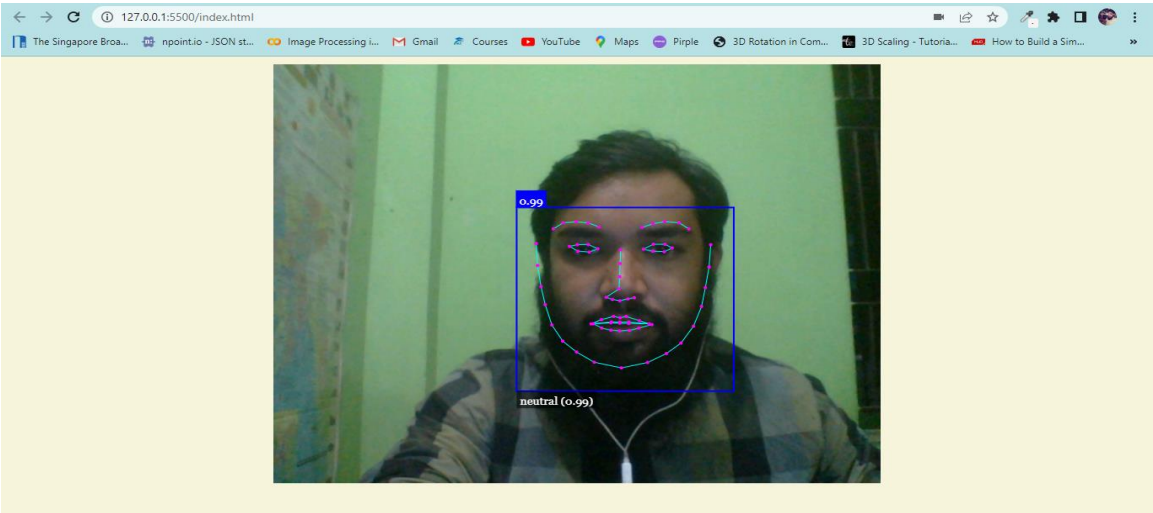

Figure 4.1.1: Font-end (expression-neutral)

There will be a camera portion active when we run the system. When someone accesses our system, exactly this is how our homepage will appear.

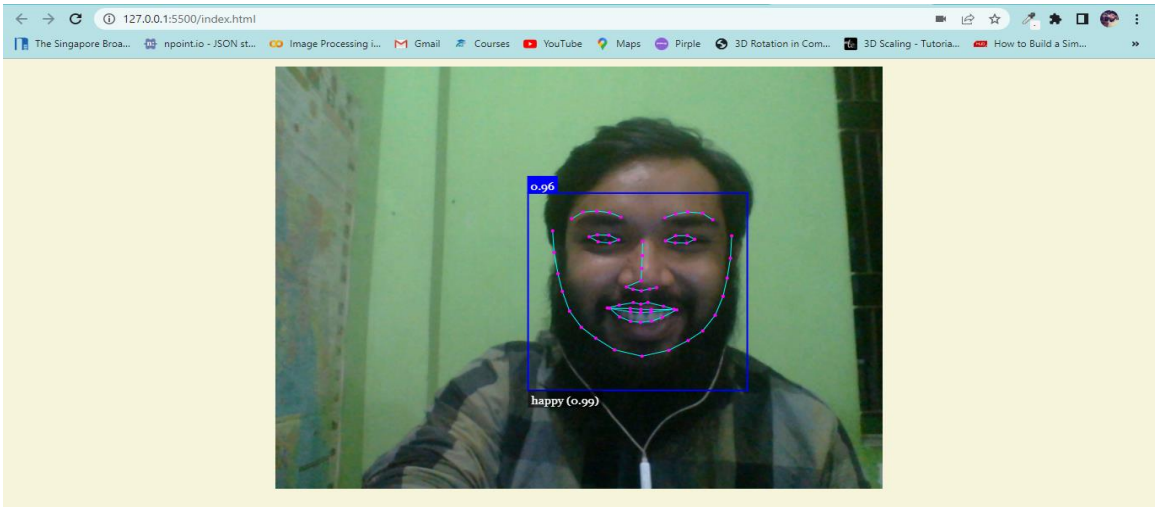

Figure 4.1.2: Font-end (expression-happy)

When the camera portion is activated, it will identify facial expressions if someone displays them. Here is a picture of a happy face.

4.2 Back-end Design

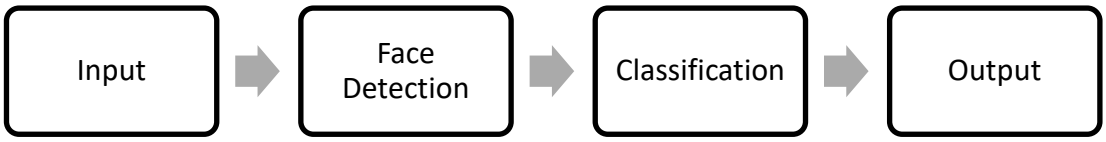

Figure 4.2.1: Back-end

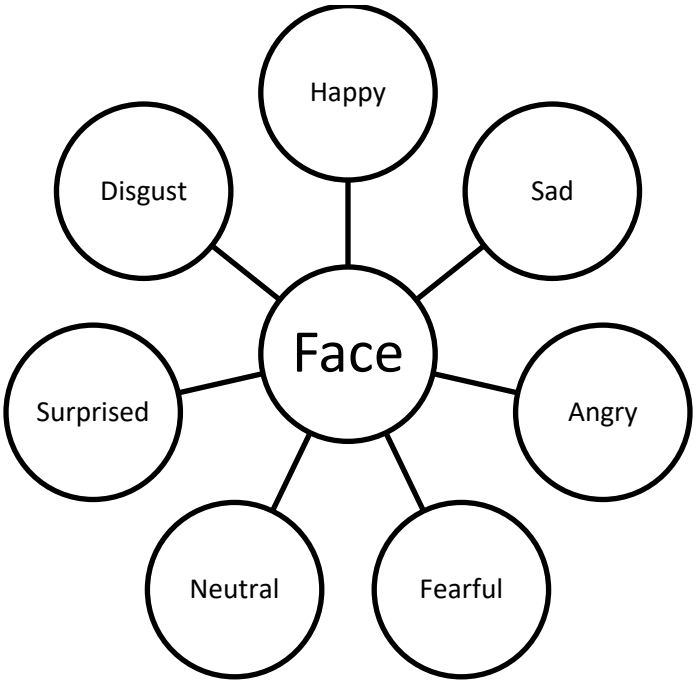

Figure 4.2.2: Face Expression

4.3 Interaction Design & User Experience

Our method allows users to recognize their own faces and recognize their own facial expressions. We collected data from people who attempted to understand their emotions through various facial expressions, and many of them did it for amusement.

4.4 Implementation Requirements

The details system information is given below:

Hardware Requirement (minimum):

Processor:

- 2.4 GHz (minimum) with 4 cores CPU and also multithreading enabled.

GPU:

- At Least NVIDIA GTX1050

Memory:

- Minimum 8 Gigabyte Physical RAM.

Storage:

- Minimum 25 Gigabyte of free space secondary memory (SSD/HDD).

Software Requirement: Operating System

- Linux - Ubuntu 16.04.1 LTS or higher
- Windows - Windows 10 Pro Edition V1609 or higher
- Visual studio code

Required Programming Languages:

- HTML5
- CSS3
- Bootstrap
- JavaScript

CHAPTER 5

Implementation and Result

5.1 Testing Implementation

5.1.1 Responsive Web Design

Utilizing HTML and CSS to automatically resize, expand, conceal, or reduce a website so that it looks excellent on all devices is known as responsive web design (desktops, laptops, mobiles and tablets). Images and text in responsive designs scale fluidly to fit any screen size. Media queries are also frequently used in responsive web designs to resize text and pictures. Media queries are used to provide different styles for different screen sizes.

5.1.2 Web Development Languages Used

HTML5, CSS3, Bootstrap, and JavaScript are the programming languages we used to create our facial expression recognition system.

5.1.3 Server

A computer or computer application that controls access to a network's consolidated resource or asset. The most well-known servers today are Microsoft IIS, Apache, IIS, and Nginx servers. We used a VS Code Live server for our project.

5.1.4 Application Programming Interface (API)

Many conventions, strategies, functions, and orders are utilized while creating programming or when coordinating the use of different frameworks. In general, APIs are helpful for creating GUI (Graphical User Interface) elements and for enabling software to request and receive services from other programs. They are open for usage on both computers and mobile devices. Face-api.js, a JavaScript API for Face Recognition in the Browser built on top of tensorflow.js center, was used in this work. To identify the face, it uses a few convolutional neural networks. This mobile and web API is really sophisticated.

5.1.5 face-API js

Vincent Mühler is the creator of Face-api.js. It is a JavaScript package that utilizes the browser to recognize faces. It is based on the basic API of Tensorflow.js. It supports the detection of faces, faces being recognized, facial expressions, age, and gender. It uses a network of convolutional neural networks (CNNs) created for mobile and online use.

5.2 Test Result

Figure 5.2.1: Neutral

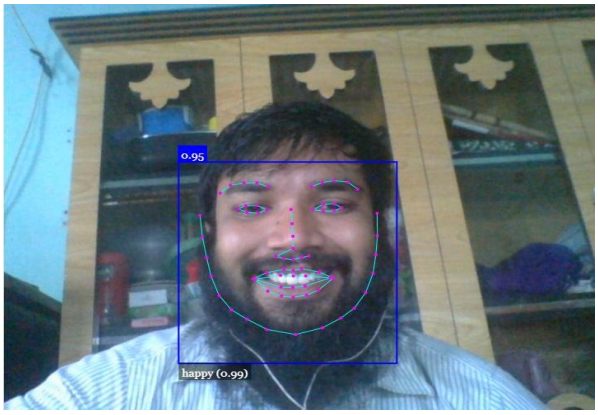

Figure 5.2.2: Happy

Figure 5.2.3: Sad

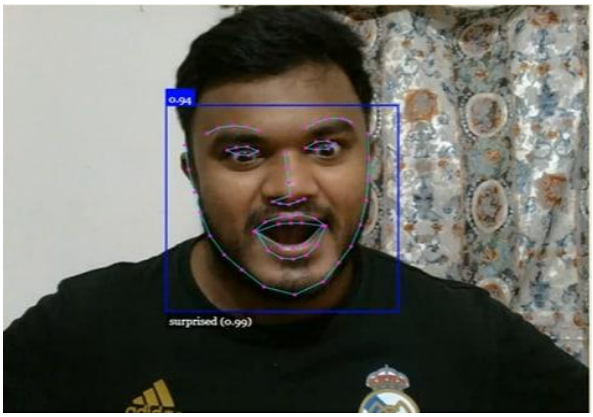

Figure 5.2.4: Surprised

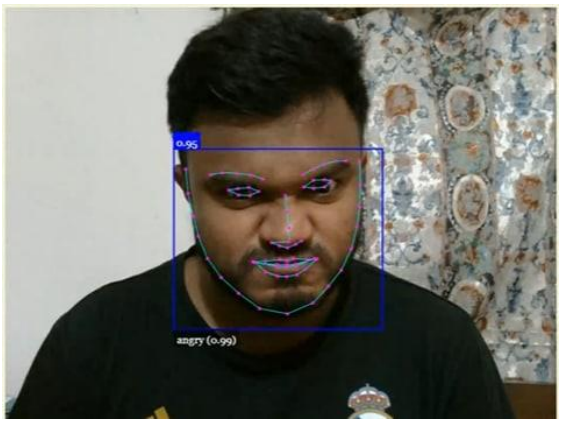

Figure 5.2.5: Angry

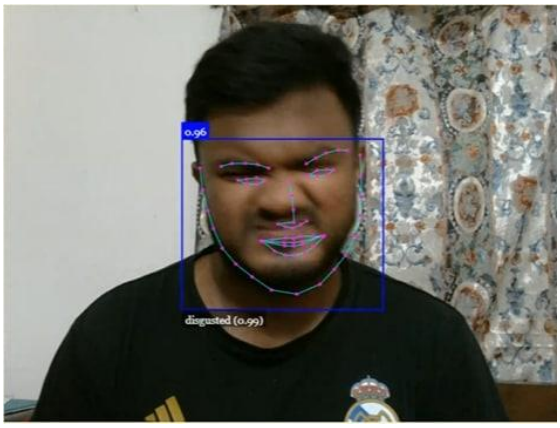

Figure 5.2.6: Disgusted

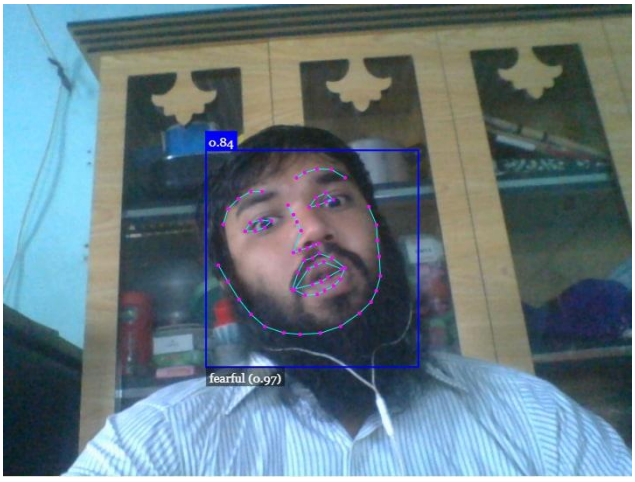

Figure 5.2.7: Fearful

5.3 Test Reports

The system launches in a new browser tab. The application has a button labeled "Open Camera." The webcam on a PC or the camera on a smartphone must be opened by clicking on that button. Users must position the camera in front of the subject's face so that emotion may be recognized. The findings will be displayed as text with an approximate percentage underneath the person's face. such as Joy (99.00%), Sadness (96.32%), Anger (99.27%), and so forth. The live camera detects all six emotions quickly, including joyful, sad, angry, afraid, astonished, disgusted, and neutral expression.

Table 5.3.1: Table of Expression Recognition's Result

Serial	Expression	Input	Correct Result	Incorrect Result
1.	Neutral	100 times	95 times	5 times
2.	Happy	100 times	89 times	11 times
3.	Sad	100 times	86 times	14 times
4.	Surprised	100 times	72 times	28 times
5.	Angry	100 times	60 times	40 times
6.	Disgusted	100 times	63 times	37 times
7.	Fearful	100 times	57 times	43 times

In the table 5.3.1 we can see the list of the Expression Recognition output result.

CHAPTER 6:

Impact on Society, Environment and Sustainability

6.1 Impact on Society

Facial recognition has many advantages for society, from decreasing needless labor and human interaction to detecting crimes and boosting safety and security. In some cases, it can even aid in the support of medical initiatives.

We can learn about a person's mental health from our project. A person is considered to be mentally healthy if they are cheerful, and our facial detection technology can tell if someone is depressed. If we are aware that this person suffers from mental depression, we can recommend him to psychologists. Additionally, if someone is experiencing fear, we can provide them with appropriate care and learn more about our children's mental health. As a result, it is possible to say that the system is crucial for society and will have a favorable effect.

6.2 Impact on Environment

We can infer information about a person's expression immediately from his or her image thanks to our project. Additionally, by immediately detecting a person's image, we can infer information about his actual facial expression. Because the natural world is never the same, our system might not function in a hostile setting. It is frequently impossible to accurately discern a human face in hazardous circumstances. So that our system can detect well, we require a quiet environment. Only when a person's face can be recognized can we determine their emotion. Since the interior and outdoor surroundings are different, our technology could not operate as well and produce different results in settings where there is a lot of movement. Consequently, the environment has a unique impact on our project.

6.3 Ethical Aspects

The accuracy and contribution of facial recognition algorithms to identity fraud have recently come under fire. In some instances, law enforcement officials wrongly charged innocent persons with participating in riots. Additionally, the management and storage of identities are still controversial in the eyes of many, haunting privacy activists everywhere. Racial bias and misinformation, racial discrimination in law enforcement, privacy, a lack of informed consent and transparency, mass surveillance, data breaches, and ineffective legal support are the top six ethical issues with facial recognition technology.

- Racial bias brought on by inaccurate testing
- Discrimination based on race in police enforcement
- Data Privacy
- A lack of transparency and informed consent Mass surveillance
- Data breaches and inadequate legal protection

6.4 Sustainability Plan

In the project, we made use of a number of pre-trained algorithms. We make a plan for the type of algorithm we'll require. Since we were combining multiple models, we had to go through various strategies to determine which model did what. We have employed five different types of models in our technology to test whether they are appropriate for usage with our system. These models include the face detector model, face recognition model, and facial expression recognition model. We have also employed the tiny face model to simultaneously detect numerous faces.

There are various tasks, including the detection of faces and the detection of facial expressions via facial expression recognition models.

CHAPTER 7

Conclusion & Future Scope

7.1 Discussion & Conclusion

In this study, a method for classifying face expressions is proposed. Many applications, including robotic vision, video surveillance, digital cameras, security, and human-computer interaction, benefit from face detection and extraction of facial expressions. The goal of this project was to create a facial expression recognition system that utilized computer visions and improved face expression recognition's advanced feature extraction and classification.

The face is the most significant component of the human body, and because it has distinctive traits, it is even more crucial to a person's sense of self. The accuracy and dependability of face recognition are being improved around the world using a variety of approaches and technologies. Additionally, this new technology is being used in industries that demand higher accuracy, such forensics, transportation, security, and medicine. The development of facial recognition technology, however, faces a number of difficulties, including those posed by emotions like happiness, sadness, amazement, fury, and others, as was already stated in the article.

7.2 Scope for Further Developments

Over the past ten years, face expression recognition technologies have significantly advanced. Posted expression recognition is no longer the main focus; instead, spontaneous expression recognition has taken center stage. Under face registration mistakes, quick processing times, and high correct recognition rates (CRR), promising results can be obtained, and our system's performance can be significantly improved. The system may function with an image feed and is completely automatic. It can identify unprompted facial expressions. Digital cameras that employ our method can only take pictures of people who are grinning. Security systems that can recognize a person in whatever manner in which they choose to portray themselves. When a person enters a room in a house, the lights and

television can be adjusted to suit their preferences. The technique helps doctors comprehend a deaf patient's level of disease or agony. Our system can be utilized in mini-marts and shopping centers to examine client feedback in order to improve the business, as well as to detect and track a user's mental state.

Emotion recognition has a broad use in a variety of fields, including biometric security and human-computer interface. As a result, it sheds light on artificial intelligence, also known as machine intelligence, which simulates the human brain using a variety of supervised and unsupervised machine-learning methods.

The FER method that is being suggested performs better than the current approaches. The mood of a face can be more accurately portrayed by deep neural features than by hand-drawn ones. With the face detection algorithm, which can only crop the facial part, the performance is especially much better. In comparison to constructed features, deep features can more accurately depict facial traits. In the future, we can expand on this and use deep neural network-based classification to boost the algorithm's performance even further.

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