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# REAL TIME-EMPLOYEE EMOTION DETECTION SYSTEM (RTEED) USING MACHINE LEARNING

Omair Quraishi[1], Syed Fawaz Ali[2], Syed Muzaffer Ahmed[3], Syed Juber[4]
[1,2,3]BE, Student, Lords Institute of Engineering and Technology,
[4]Assistant Professor, Lords Institute of Engineering and Technology,
juber@lords.ac.in

**ABSTRACT:** The Real Time Employee Emotion Detection System (RtEED) is a proposed machine learning system that automatically detects employee emotions in real time. This system helps employers monitor employee well-being and informs them of identified emotions through messages. This helps employees make better decisions, improve their concentration, and adopt healthier work styles. The system uses CMU Multi-PIE Face Data to train the machine learning model, and each employee is equipped with a webcam to capture facial expressions in real time. The RtEED system identifies six emotions: happiness, sadness, surprise, fear, disgust, and anger. The results show that the expected objectives are achieved.

**Keywords:** Artificial Intelligence, Emotion Detection , Facial Expression Analysis, Machine Learning.

## I. INTRODUCTION

AI and ML are increasingly utilized in various sectors like healthcare, ecommerce, logistics, supply chain, and agriculture, making them crucial for business leaders to utilize them effectively in all aspects of their operations. Machine learning techniques are widely used in pattern recognition and classification, particularly in recognizing facial expressions and emotions, and are also being applied in the development of smart homes, cities, and companies using IoT technology.

Emotion recognition is the identification of human emotions through facial and verbal expressions, including subtle ones like fear, contempt, disgust, anger, surprise, sadness, happiness, and neutrality. Detecting these emotions is a challenging yet necessary task.

Facial expression is a powerful way for humans to express emotions and intentions. However, in situations like hospitalized patients, employees may be restricted from expressing their emotions. Therefore, a human emotions recognition system is crucial for effective communication and improved results. Identifying emotions hidden in images or videos is a challenging task for humans.

Research has shown that positive employee emotions are crucial for an organization's success, as they directly influence various parameters such as customer care service, employee retention, and capital investment. In the current situation, employee emotion detection plays a significant role in ensuring the success and well-being of both employees and employers, as emotions directly influence various aspects of an organization's operations.

Detecting facial muscle differences is challenging due to the varying expressions and emotions influenced by the environment, resulting in varying expressions for the same person or different individuals for the same emotion.

The paper proposes a Real-Time Employee Emotion Detection System (RtEED) that uses machine learning to

automatically detect employee emotions, enabling employers to monitor employee well-being by sending appropriate messages.

In the study, a Real-Time Employee Emotion Detection System (RtEED) is proposed. RtEED employs machine learning to automatically identify employee emotions, allowing companies to monitor employee well-being by sending the relevant messages.

The paper arranges previous works on employee mood recognition, introduces the suggested system, goes over the experimental design and outcomes, and offers comments at the end.

## II. RELATED STUDIES

Aya Hassouneh and colleagues developed a real-time emotion recognition algorithm for children with autism, using facial landmarks and EEG signals to classify six facial emotions. The study involved 55 undergraduate students.

I.A. Essa and colleagues developed a computer vision system for observing facial motion using an optimal estimation optical flow method and dynamic models. This method produces a reliable parametric representation of the face's muscle action groups and accurately estimates facial motion, avoiding the use of the facial action coding system (FACS).

JuergenLuettin et al. explore automatic facial expression analysis, a research area with potential applications in human-computer interfaces, talking heads, image retrieval, and emotion analysis. They discuss methods for facial motion, deformation extraction, and classification, focusing on face normalization, dynamics, and intensity.

J. Hoey; et al have presented a method for learning decision theoretic models of facial expressions and gestures from video data. The authors argue that the meaning of a facial display or gesture is determined by its relationship to context, actions, and outcomes. The method demonstrates how an agent can learn relationships between unlabeled observations, context, actions, and utility function, focusing resources on useful behaviors.

In this section, we will delve into the comprehensive analysis of the researchers' noteworthy contributions in the field of emotion detection. The exploration encompasses a thorough examination of facial expression representation and the recognition techniques employed, yielding valuable insights for a wide audience.

### A. Facial expression representation

Automatic facial expression recognition is employed [2] with predetermined numerous features from the initial image of the face to accurately portray faces. Using the optimal features minimizes within-class variations of expressions while maximizing between-class variations. Optimal features always led to accurate recognition. The actions of muscles were modeled by flow analysis in studies formerly published [3,4,5,6]. The flow estimations were significantly disturbed by non-rigid motion, fluctuations in illumination, and motion discontinuities. They were also extremely sensitive to inaccurate picture registration and non-rigid motion. Facial geometry analysis, which extracts the locations and shapes of faces for the representation, has been widely employed in facial representation. But the geometric feature-based representation relays on detecting and tracking accurate and reliable facial features, but in many situations it is difficult to accommodate Modeling the face expressions is another technique for depiction. The face expressions were extracted using a holistic spatial analysis [8]. To

extract the facial alterations, Gabor wavelet analysis was performed to the full-face region or to a specific area. In Donato et al. [9], face actions were identified using PCA. When analyzing a face image, Gabor-wavelet representation exhibits the most promising performance when compared to all other methods. The disadvantage of Gabor-wavelet representations involves their memory- and time-intensive calculation requirements. Local Binary Patterns are therefore frequently used[15].

**B. Facial expression recognition**

The classification of facial expressions is done using a variety of methodologies and techniques, such as neural networks, support vector machines, and others. In the work of Lyons et al. [7][13][14], LDA is used to analyze the training images to create discriminant vectors. Since high-resolution video input isn't readily available, recognizing facial expressions at low resolutions is always the main issue for facial expression recognition systems. in the applications for real-time.

The LBP approach is used to tackle this issue, and research demonstrates that it operates reliably and consistently even with face photographs of poor resolution. Another drawback is that facial recognition cannot be done with moving images because they lack the temporal facial expression behaviors. According to Bassili[10], the recognition of facial expressions is more accurate when using dynamic images. The fact that facial expression recognition systems evaluate high-resolution frontal faces that are being collected in a highly controlled environment is another drawback of these technologies. But because they gather the photographs at such low quality, it seems surreal in real time. Expression recognition has evolved into a challenging task in real time as a result of the employment of these low-resolution photos. Viola-Jones algorithm, Haar feature selection, and AdaBoost training method are utilized to recognize the eye and nose regions. But there is a flaw in even this algorithm. Only frontal views are effective[11][12].

## III. THE PROPOSED ARCHITECTURE

**The proposed Algorithm:**

**Algorithm: Real-time Employee Emotion Detection:**

//Recognizes the emotions of the employee in the image captured and displays it.

**Input: Employee image captured using webcam**

**Output: Display of recognized emotions of the employee**

**Step1**: Capture the image of the employee using webcam.

**Step2**: Detect the face in the image and crop it.

**Step2.1: Select Haar-like features**

**Step2.2:** Create an integral image

**Step2.3:** Select subset of features which helps more to identify face in image

**Step2.4:** Create classifier cascades

**Step3:** Pre-process the image for required size.

**Step4:** Find the best match position in the image.

**Step5:** Identify the emotions of the employee by choosing few important best match positions in the image.

**Step6:** Display the recognized emotions and also intimate the same to the concerned authority via message.

**Step7:** End

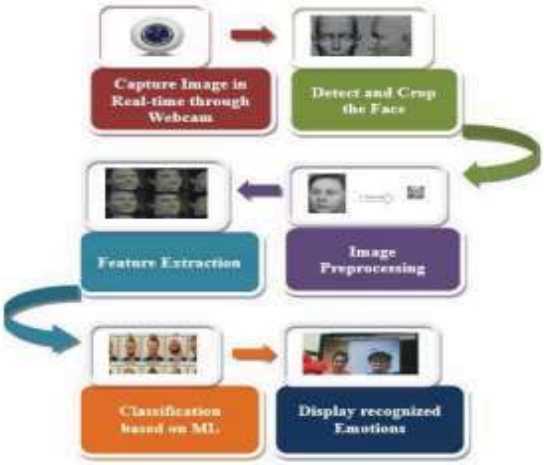


Figure 1. System Architecture of Real-time Employee Emotion Detection System.

## IV. EXPERIMENTAL SETUP AND RESULTS

### A. Setup:

A little computer called the Raspberry Pi exists. The Raspberry Pi receives the entire trained model in one go. Each employee has a laptop computer and a webcam. The RtEED app will be installed on staff PCs, allowing for login by employees alone. He or she will have alternatives to visualize his feelings after successfully logging in, according to the RtEED system. Each employee's webcam will be linked to a Raspberry Pi. Every half an hour, the webcam will record the employee's expression and send it to the Raspberry Pi for further analysis. Depending on the image that was collected, several OpenCV algorithms are employed to determine an employee's feelings. Calculations on the pixel values of an image are done in the back end using a Python framework called TensorFlow. Javascript and Java are used to implement the front end and back end of a web application, respectively. Six emotions, including joy, sadness, surprise, fear, disgust, and rage, are recognized by the RtEED system. RtEED System Experimental Setup is shown in figure 2.

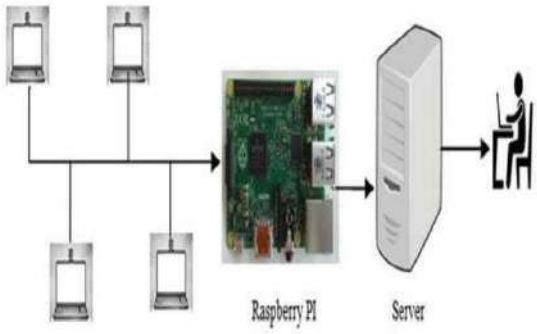


Figure-2. Experimental Setup

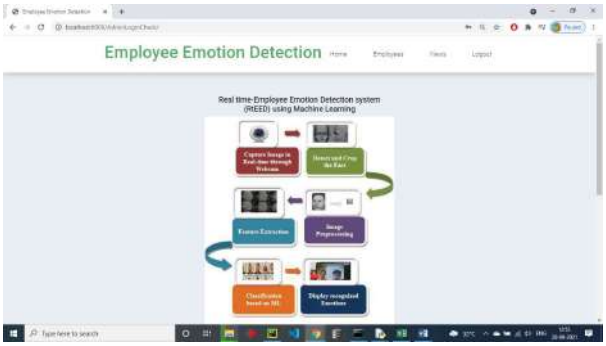


Figure-3. Admin Home Page

**B. Data Source**

Two datasets are need for the RtEED system. A model is trained using one, and its accuracy is tested with the other.

The CMU Multi-PIE Face Database is the existing data source that is used to train the model. Totaling 750,000 photos, it takes into account 337 individuals. The dataset is created by taking pictures in four sessions over the course of five months while taking into account 15 view points and 19 lighting situations. The webcam is used to record employees' facial expressions in real time so that the model may be checked for accuracy.

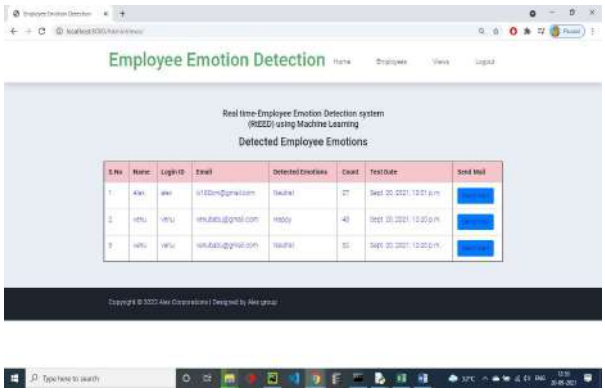


Figure-4. List of Employee Emotions Captured

**C. RtEED System Implementation**

The algoritms used for implementation of RtEED process at each step are discussed below.

1. **Capture an image of an employee using webcam:** Every half an hour facial expression of an employee is captured using webcam.
2. **Find the face in the photo that was taken, then crop it:** In this module, it is necessary to determine whether a face is present in the image that was obtained. The Viola Jones algorithm, a deep learning system, is used to find faces in collected images. The four major steps of this algorithm are to find and crop the face in the captured image.

a. **Choosing Haar-like features:** At this stage, the image can be segmented into lighter and darker sections based on the pixel values.

b. **Constructing an integral image:** The values of nearby pixels are joined together to produce the same feature.

c. **Running AdaBoost exercises:** There are 160,000 distinct traits that can be used to identify a face. However, not all features are equally significant. Therefore, a subset of features that will aid in identifying faces in collected images are chosen using the AdaBoost algorithm.

d. **Creating classifier cascades:** The AdaBoost algorithm evaluates each subregion of an image in relation to the features it has chosen. Every feature is cascaded one after the other, requiring every subregion to go through the cascading process. It is not necessary to compare a sub area to the other features if it does not match one of the selected features. It implies that the subregion and the face are different.

3. **Prepare the image for the appropriate size:** Here, the image will be cropped to the necessary size before being fed into the sobel channel method for edge detection.
4. **Find the best match position in the image:** Determine the place in the image where the model and the acquired image are most similar using Active Shape Model (ASM).
5. **Determining an employee's emotions:** The Ada Boost algorithm is employed to pick out a few crucial best match points in an image. The identified emotion will be one of the six emotions that are thought to exist, including joy, sorrow, surprise, fear, disgust, and anger.
6. **Demonstrate the detected emotions:** The identified emotions will be communicated to those who need to know

via messaging so that remedial action can be implemented.

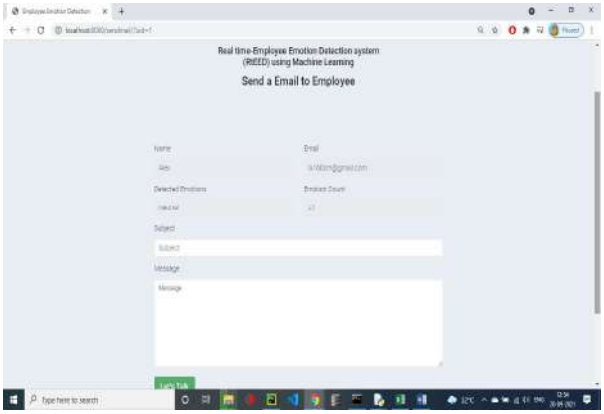


Figure-5. Mailing the Employee Emotions Captured

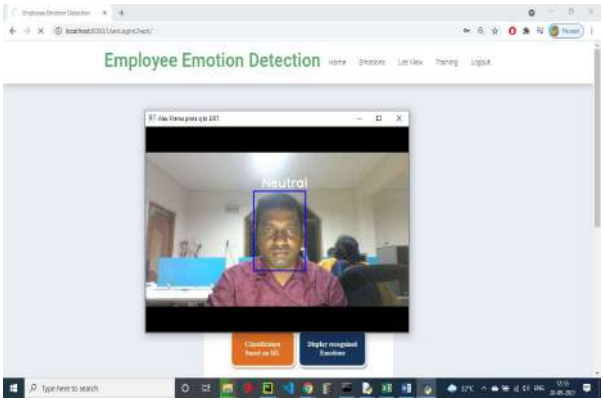


Figure-4. A sample ouput of the RtEE System (a Sample Employee Emotions Captured)

**D. Results**

There are two pages in the dash board of a web application: Manage Employee and Manage Report. managing employees The emotional information of many employees is displayed by date. The aggregate percentage of various emotions demonstrated by various employees over a specified period is shown in Manage Report. This knowledge enables the company to make decisions about the emotional health of their workforce. The Home Page for the RtEEd system is shown in Figure 3. The list of employee emotions identified by the RtEED system is displayed in Figure 4 along with the option to mail the emotions recorded. Figure 5 displays the RtEED system sending mail to the employee, including the identified emotion that was shown to the employee. Figure 6 shows a sample output of our System and the picture of the Employee Emotion captured. the text message that was delivered to the employee inquiring about his or her emotional state.

## V.CONCLUSION

Today, a key factor in many firms' success and wealth is the ability to recognize an employee's emotions. In this work, the RtEED system is presented to use machine learning techniques to detect an employee's emotions in real

time. The RtEED system demonstrates its effectiveness in real-time webcam image capture for a set amount of time, image cropping, and precise employee emotion detection. so that the employer can decide what is best for the welfare of their workers.

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