

# Detection and Recognition of Human Emotion using Machine Learning

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## ABSTRACT

This paper describes an emotion detection system based on real-time detection using image processing with human-friendly machine interaction. Facial detection has been around for decades. Taking a step ahead, human expressions displayed by face and felt by the brain, captured via video, electric signal, or image form can be approximated. To recognize emotions via images or videos is a difficult task for the human eye and challenging for machines thus detection of emotion by a machine requires many image processing techniques for feature extraction. This paper proposes a system that has two main processes such as face detection and facial expression recognition (FER). This research focuses on an experimental study on identifying facial emotions. The flow for an emotion detection system includes the image acquisition, preprocessing of an image, face detection, feature extraction, and classification. To identify such emotions, the emotion detection system uses KNN Classifier for image classification, and Haar cascade algorithm an Object Detection Algorithm to identify faces in an image or a real-time video. This system works by taking live images from the webcam. The objective of this research is to produce an automatic facial emotion detection system to identify different emotions based on these experiments the system could identify several people that are sad, surprised, and happy, in fear, are angry, etc.

**Keywords :** Emotion Detection, Haar Cascade, KNN, Face Detection, Machine Learning.

## I. INTRODUCTION

Human Emotion Detection is applied in many areas where additional security or data about the person is a big requirement. To set up, the second layer of

security gives the opportunity to not only detect face with emotion but can be useful to verify whether it is a 2-dimensional representation or a particular person standing in front of the camera. Besides this, another advantage of using EMS using machine learning is for

business promotions. Many large-scale businesses thrive on customer responses to their services or products such as OTT platforms, movie theaters, etc. The objective is to create a GUI which can capture the facial expression of the person and based on that calculate, produce the output. The result can be calculated based on real time image. Currently the camera need to be placed exactly in front of the person mentioned in the software, so that software works correctly. Based on this if everything goes write it will give us the output. Humans can easily understand emotions but machines can't do that very well. So we are trying to detect the emotions which are not based on only facial expressions. The ubiquitous computing paradigm is becoming a reality, with an automation level in which people and devices interact seamlessly. Ironically, one of the main challenges is the the difficulty of users interacting with these systems due to their increasing complexity. Endowing machines with the ability to be aware of user emotions (especially frustration, fear or dislike) is thus of major importance for the next generation of user interfaces.

## II. RELATED WORK

### 1) Human Emotion Detection System

Author: Dilbagh Singh

In this paper I am going the purpose a system (by using an existing simulator) which is capable for achieving up to 97 percentage result and easy than Emotion recognition using brain activity system. This purposed system depend upon human face as we know face also reflect the human brain activities or emotion. In this paper I have also tried to use neural network for better result by using a existing system simulator

### 2) Emotion Detection From Facial Expression

Author: S.Srivastav, S.Agrawal, V.Saxena

The project aims to develops automatic emotion detection system using machine learning algorithm for facial expression recognition.

### 3) A Literature review on Emotion Detection Recognition For various Facial Emotion Extraction

Author: G.Kalaivani, S.Sathyapriya, Dr.D.Anita

The main aim of this research work is to classify the emotional expression from the mouth region of the human face. As the initial task is to extracted the mouth region from the facial image, a survey on various existing research works to segment the face expression image is reviewed and discussed.

### 4) Literature survey on face and face expression recognition

Author: J.Anil, L.Padma Suresh

In this paper some of the tailor made face expression Recognition algorithm are presented. This paper also gives a brief insight into a feature extraction method of these face expression recognition.

### 5) Literature survey on facial expression recognition Techniques

Author: G.Rajeswari, P.IthayaRani

In this paper, various technique and databases used in the discussed for facial expression recognition. Many researchers are interested to do research in facial expression. Because by the Quote "One person could be judge by their reaction not by actions" like that. Persons mood can be easily identified by their emotions rather than their words.

In the existing system, classification is done through simple image processing to classify images only.

- Existing work includes the application of feature extraction of facial expressions with the combination of neural networks for the recognition of different facial emotions (happy, sad, angry, fear, surprised, neutral, etc..).

- Humans are capable of producing thousands of facial actions during communication that varies in complexity, intensity, and meaning. The existing system is capable of analyzing the limitations of the existing system of Emotion recognition using brain activity.

## III. PROPOSED SYSTEM

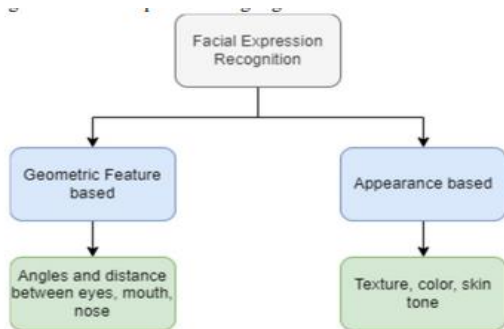
Human emotion detection is an important part of human-computer interaction. Emotions influence

how people connect with one another and with technology. Understanding and recognizing emotions may lead to more individualized and productive interactions in customer service, education, mental health, and marketing, among other fields. Facial expression recognition is one of the most used ways for identifying human emotions. Facial expression recognition uses computer vision to identify changes in facial expressions that might indicate various emotions such as pleasure, sorrow, or rage. It entails examining the motions of numerous facial muscles, such as the lips, brows, and eyes, to detect an individual's emotional state. With the advancement of artificial intelligence and machine learning, facial expression detection has become increasingly accurate and dependable over time. This technology has gotten a lot of attention in recent years because of its potential to transform areas including healthcare, security, and entertainment. We will go through facial expression recognition in depth in this paper, covering how it works, its uses, and its possible influence on society.

Facial expression recognition is mainly achieved by two methods –

- 1) Geometric feature based method
- 2) Appearance based approach

The types of facial expression recognition can be explained using Fig 1.



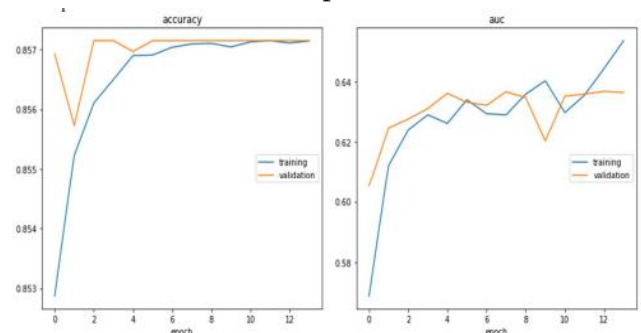
**Fig 1 : System Architecture**

The geometric feature-based method and the appearance-based approach are the two basic approaches to facial emotion recognition. The geometric feature-based technique entails detecting

certain spots on the face, such as the corners of the eyes, nose, and mouth, then calculating the distances and angles between these points to infer the person's emotions. The appearance-based technique, on the other hand, entails examining the texture and color of a person's face to identify their feelings.

#### IV. RESULTS

The system achieved a testing and validation accuracy of 85.72% during training for 10 epochs which is about 25% increase over the conventional CNN accuracy. The system also demonstrated a minimal training loss of about 1.75 and a validation loss of about 1.81 which is considerably lower than the conventional CNN models. The training accuracy and the validation accuracy are expected to further increase with the use of a more versatile and colored datasets and a sufficiently large training system, and increase in the number of epochs.



**Fig 2 Accuracy and auc after 10 epochs**

#### V. CONCLUSION AND FUTURE WORK

In conclusion, a new world of opportunities for emotion recognition in computer vision has emerged with the creation of facial emotion detection models. These models are able to precisely identify and categorize human emotions based on facial expressions by utilizing machine learning algorithms and deep neural networks. These models have numerous uses, including in marketing, psychology, and human-computer interface. There are still issues that must be resolved, such as the requirement for

extensive and varied datasets and the possibility of bias in the training data. Despite these difficulties, face emotion detection models have made substantial progress, which is very encouraging for the development of emotion identification technology in the future. Real-time video frame emotion recognition has a wide range of potential applications in the future, as well as several avenues for more study and improvement.

Future research may focus on a variety of proposed system related topics, such as:

- 1) Cross-modal emotion detection, which involves integrating data from many modalities, such as audio, text, and physiological signals, in order to increase the system's resilience and accuracy.
- 2) Emotion Identification In The Wild: Adapting the system to real-world variability, including a range of linguistic, cultural, and demographic differences.
- 3) Real-Time Emotion-Aware Affective Systems: Developing and testing a system that can recognize emotions in real-time for usage in real-world contexts including tailored recommendations, computer-human interaction, and mental health monitoring.

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