

FACIAL EMOTION DETECTION USING MACHINE LEARNING

Bharat
School of Computing Science and
Engineering
Galgotias University
Greater Noida, India
bharatdevgn24x7@gmail.com

Ravi Shukla
School of Computing Science and
Engineering
Galgotias University
Greater Noida, India
ravishuklawwe@gmail.com

Santosh Kumar
Associate Professor
School of Computing Science and Engineering
Galgotias University
Greater Noida, India
sant7783@hotmail.com

Abstract— The employment of machines to accomplish various activities is expanding throughout society. Giving robots perception allows them to undertake a wide range of jobs, including those that are extremely difficult, such as geriatric care. Machine perception necessitates that machines comprehend their surroundings and the purpose of their interlocutor. Recognising facial expressions might aid in this situation. Deep learning techniques were utilised to build this work using photos expressing the following facial emotions: happy, sorrow, rage, surprise, disgust, and fear. Human emotions are mental states of sentiments that arise spontaneously rather than via conscious effort and are accompanied by physiological changes in facial muscles that result in facial expressions. Nonverbal communication methods such as facial expressions, eye movement, and gestures are widely employed in various applications of human-computer interaction, with facial emotion being one of the most commonly used since it transmits people's emotional states and sentiments. Emotion recognition is a difficult process since there is no clear differentiation between the emotions on the face, and there is also a great deal of complexity and unpredictability. Because certain essential extracted characteristics are employed for modelling the face in the machine learning method, it will not attain a high accuracy rate for emotion identification because the features are hand-engineered and rely on past information. Automatic emotion identification based on facial expression is an intriguing study subject that has been discussed and implemented in a variety of fields.

1. INTRODUCTION

Facial expressions are changes in the face caused by a person's

- Internal motional states,
- Intentions, and
- Social communications.

One of the most popular machine vision applications in recent years is facial expression identification. It enables the machine to perceive human emotions, increasing its efficacy in executing numerous jobs. It is a software tool that is socially intelligent. Security, entertainment, and human machine interaction all make extensive use of facial expression detection systems. There are several phases involved in a face emotion recognition system.



2. RELATED WORK

Several fields, including machine learning, natural language processing, neurology, and others, have made contributions to the subject of emotion detection research. In prior investigations, they combed through face expressions, voice characteristics, and textual data as universal markers of emotions. Emotions can be divided into static categories such as happiness, sorrow, disgust, rage, fear, and surprise. Later works benefit from merging visual, audio, and textual data. The merging of this data produces the most accurate outcome. This sort of fusion can take three forms: early, late, or hybrid. Other ethos includes emotional aspects and cooperation between emotional processes and other intellectual operations..

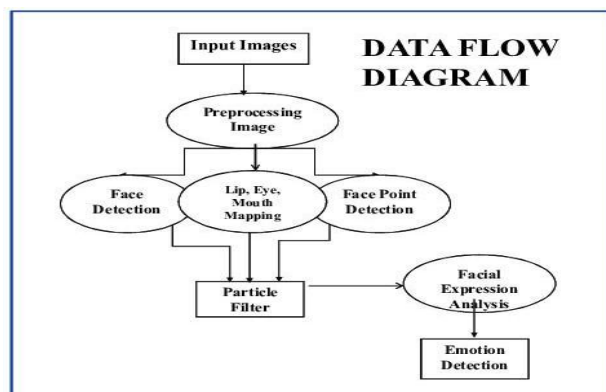
- A. Emotion Recognition Using Facial Feature Recognition This paper investigates emotion identification using machine learning and the support vector machine (SVM). Some ideas are used to the detection, extraction, and assessment of picture face expressions. They are as follows:

- i) Viola-Jones cascade object detectors and Harris corner key-points to extract faces and facial features from images.
- ii) Histogram of oriented gradients (HOG) feature extraction.
- iii) Support vector machines (SVM) to train a multi-class predictor for classifying the seven fundamental human facial expressions such as: (Anger, Contempt, Disgust, Fear, Happiness, Sadness, Surprise).

B. Point-based SVM Emotion Recognition in Real Time This paper uses machine learning to recognise emotions using a cascade of a multi-class support vector machine (SVM) and a binary SVM. The movement of 19 feature points is used to derive emotions in this method. These feature points may be seen in several areas of the face, including the lips, eyes, brows, and nose. It mostly operates on non-changeable igid points on the nose. It is divided into two sections: facial recognition and action unit (AU). Computers can quickly recognise facial expressions and determine a person's motivation in areas such as entertainment, social media, content analysis, criminal justice, and healthcare.

3. PROPOSED METHODOLOGY

This system can recognise a user's live emotions by comparing the input to a training dataset of known emotions to discover a match. Different emotion types are recognised by combining data from facial expressions, bodily movement and gestures, and voice. Algorithm involve the use of different supervised machine learning algorithms in which a large set of annotated data is fed into the algorithms for the system to learn and predict the appropriate emotion, which is said to contribute to the emergence of the so-called emotional or emotive Internet.



3. BACKGROUND INFORMATION

A. Emotion Recognition Facial Recognition

Recognising Emotions Facial Recognition technology is concerned with methods and procedures for identifying emotions from facial expressions. Various technical advancements in the fields of Machine Learning and Artificial Intelligence have simplified emotion identification. It is predicted that expressions will be the future method of communication with computers. The need for automated emotion identification from facial expressions is increasing dramatically. Research work in this area mainly concentrates on identifying human emotions from videos or from acoustic information. Most of the research work recognizes and matches faces but they have not used convolutional neural networks to infuse emotions from images. Emotion Recognition deals with the investigation of identifying emotions, techniques and methods used for identifying. Emotions can be identified from facial expressions, speech signals etc. Massive approaches, such as machine learning, neural networks, artificial intelligence, and emotional intelligence, have been developed to infer emotions. Emotion Recognition is gaining relevance in study, which is essential for solving various difficulties. The basic need of Emotion Recognition from Facial Expressions is a demanding issue in emotional Intelligence when photographs are sent into the systems.

B. Facial Emotion Recognition

Facial Emotion Recognition is a scientific field that attempts to determine emotions from human facial expressions. According to the polls, advances in emotion recognition simplify complicated systems. FER offers a wide range of applications, which will be explained more below. Emotion recognition is a difficult process since emotions fluctuate depending on the surroundings, appearance, culture, and face expression, resulting in unclear data. The face Emotion Recognition Survey [2] is extremely useful in researching face emotion recognition.

C. Deep Learning

Deep Learning [3] is a machine learning approach that models data to perform a specific goal. Deep learning in neural networks offers a wide range of applications, including image identification, classification, decision making, pattern recognition, and so on [4]. Other deep learning approaches, such as multimodal deep learning, are used for feature selection, image identification, and other purposes.

D. Applications of Facial Emotion Recognition

In BPOs, Emotion Recognition is utilised to detect callers based on their emotions. Emotion Recognition is used as an identifier for conversational analysis[7] in order to detect dissatisfied customers, consumer satisfaction, and so on. FER is employed in vehicle board systems based on information about the driver's mindset that may be offered to the system to begin his/her and the customer's safety.

4. FUTURE SCOPE

Because human facial expression recognition is a simple procedure, it may be used to assess a subject's mood or emotional condition. As a result, considerable untapped potential exists in this sector. The basic concept of a machine understanding human emotional states may be applied in a variety of contexts, some of which we have discussed below..

- The capacity to identify and track a user's state of mind has the potential to allow a computing system to deliver relevant information when a user needs aid - not only when the user wants help, for example, by gauging the mood of the person entering the room.
- Assist those involved in emotion-related research in improving the processing of emotion data.
- Surveillance and security applications. Based on the macro elements collected from video camera footage, computer models, for example, acquired up to 71% accurate categorization of innocent or guilty individuals.
- In this sense, lying detection among criminal suspects during interrogation is another helpful feature for which this approach may be used as a foundation. It has been demonstrated that facial clues may frequently reveal a falsehood to the trained eye.

- One application to the Health Sector is patient monitoring in hospitals to assess the efficacy of prescription medications. Furthermore, diagnosis of disorders that modify face characteristics and psychoanalysis of patient mental state are options..

Also worth noting is the benefit of interpreting emotions from visual signals, as our system does, over studying audio data of human speech. Not only does the likelihood of noise impacting and distorting the input for our system decrease, but there are also less ways to conceal or misunderstand visual information as compared to aural data, as mentioned by Busso et al. As a result, facial expressions would be an important component of a multimodal system for emotion analysis..

5.FEASIBILITY

As illustrated in the literature review, facial expression detection has been used in the past (references 1–5).

- The present real-world issue will be solved, segments in problem generation will be created, and genuine fundamental objects will be used.
- Languages such as PYTHON will be utilised. The code was hosted on GitHub.
- Before and after the product launch, the project is beneficial. Credit card fraud is decreasing.
- It can extract rules and forecast future activities based on the existing condition.

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