Human Sentiment Analysis using Machine Learning & Image Processing

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Abstract— Facial expressions reveal a great deal about a person's feelings. One of the most difficult aspects of interpersonal relationships is effectively reading facial emotions. Automatic emotion identification based on facial expression recognition has become a hot topic in domains including computer science, medicine, and psychology. For improved outcomes, HCI research communities employ an automated face expression recognition system. For the recognition of expressions in both static photos and real-time films, many feature extraction algorithms have been developed. Love, happiness, rage, fear, and sadness are all examples of human emotions. These photographs are quite diverse from one another, but they all show the same human emotion. In this study, we look into the prospect of utilising machine learning to predict an image's emotion. These kind of predictions can be employed in applications such as automatic tag predictions for social media photographs. Websites, as well as a buyer purchasing a product from a store or through a social media platform, can be useful for determining product quality..

Keywords:- Human Sentiment, Emotion, CNN, ten emotions, , RAFT.

I. Introduction

In the last year, emotion detection has been a popular research area. Emotion identification from text has been the subject of recent research. Advertisement and commercial reasons, as well as medical patient behaviour analysis, are among their uses. When used in a social network framework, it may be a valuable tool for learning how people, social circles, communities, and cities feel about current events and other topics. Emotion recognition via photographs is a burgeoning subject of study. Detecting changes in facial expressions in accordance with an individual's internal emotion state and goals is called emotion from photographs. Six emotions were detected from the human face, which is an important location for detecting emotions. Happy, Surprise, Anger, Sadness, Fear, and Neutral are the emotions. Humans have long used emotions to communicate themselves through their facial expressions. Despite the fact that nothing is spoken vocally, there is much to learn about the words and cues we send and receive through nonverbal communication. Although individuals can easily distinguish the facial expressions of people they know, reliable expression identification by machines remains a challenge. In terms of feature extraction and face detection approaches utilised for expression categorization, there have been numerous advancements in recent years. An image is fed into our algorithm, which we then use to forecast mood. The method of Image Processing can be used to obtain an enhanced image and to extract a large amount of relevant information from it.. It is a very efficient method of converting an image to its digital form and then executing various operations on it. Techniques like as CNN and RAFT have been shown to be highly accurate in determining emotions from images.

II. Literature survey*:*

[1] Kai-Biao He, Jing Wen, and Bin Fang introduced the Adaboost Algorithm for face detection, which is based on MB-LBP characteristics and skin colour segmentation.

Face detection is based on the Adaboost algorithm in this paper, and instead of Haar-features, extracted MB-LBP characteristics are used to train the Adaboost classifier. Skin colour is also integrated with Adaboost to lower the probability of false alarms. To begin, a skin Gaussian model in Cg-Cr colour space is created, and some constraints are applied to obtain the candidates' faces.

[2] Enrique Correa, Arnoud Jonker, Michael Ozo, and Rob Stolk presented their Convolutional Neural Network-based emotion recognition article. A few hundred high-resolution photographs to tens of thousands of lesser images are used in this procedure. The size of the training dataset from FERC needs be raised from 9000 to 20000 photos in order to improve the accuracy of the emotions recognised. The findings are compared to those obtained using other approaches such as SVM and LVQ. It has a 90 percent joyful, 80 percent neutral, and 77 percent surprised accuracy.

[3]Kartika Candra Kirana, Slamet Wibawanto, and Heru Wahyu Herwanto proposed using the Viola Jones Algorithm to detect emotions. Though the Viola Jones method is widely used for face detection, it is employed here for both face detection and emotion recognition. These procedures classify emotions using Russel's Circumplex, which is more efficient in classifying emotions. This method has three stages: first, an image from a video is taken, then undesirable rectangular sections are removed, and last, the emotion in the image is detected. The prediction had a 74 percent accuracy rate.

[4]Anjali, Prachi Chaudhary have provided comparison of various facial emotions recognition system like JAFFE, RAFD where RAFD accuracy scored 99.33%

[5]Dhwani Mehta, Mohammad Faridul Haque Siddiqui and Ahmad Y. Javaid have provided comparison of various facial

[6]Khaled merit & Abdelmalik have explained an additional way of processing and detecting facial expression, Discrete Wavelet Transform(DWT) for reducing processing time. In this emotios recognition system CNN scored highest 97.6%.

[7]Dipika Raval have provided a technique for facial expression detection using Principal Components Analysis (PCA) and Facial Action Coding System (FACS)for facial muscles detection.

[8]G.Kalaivani ,S.Sathyapriya ,Dr.D.Anitha have worked on different types of facial movements related only to mouth region is mentioned and briefly explained.

[9] Nicu Sebe, Michael S. Lew, Ira Cohen, Ashutosh Garg, and Thomas S. Huang focused on recognising emotions via a Cauchy nave based classifier. As an approach, use the Cauchy distribution as a model. for detecting emotions through facial expressions in sequences of video The Gaussian vs. Cauchy Taking a guess was used to conduct the experiments. select a random example from the training set and do an analysis initial categorization The Cauchy distribution was shown to be superior. The testing set was then classified using this information. Experiments that are dependent on the person and experiments that are independent of the person Experiments were carried out that proved unequivocally that showing the Cauchy-based classifier was much more effective better outcomes

III. Methodology:

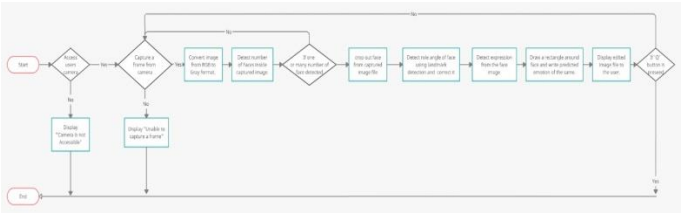


FIGURE 1. Flowchart of facial expression recognition basic structure

A CNN, or Convolutional Neural Network, is a type of neural network idea that is mostly used for frame-by-frame image analysis. A CNN has a convolutional layer with activation-function, fully linked layers and pooling, receptive fields, and weights. It then does the operation based on those functions.

The acquisition and processing of photos, as well as the detection of faces and extraction of expression data, are all part of the Emotion Recognition System. The System is broken down into three parts. The first step is to identify the face region from the acquired image, which is then pre-processed to remove any environmental or other variations/errors. The final phase involves extracting the person's expressions, which are subsequently categorised. The classifier produces an output of the expression that the user or application can recognise.

Facial recognition is the process of extracting the face region from the background. Input photos with varying lighting conditions and complicated backgrounds can make identifying expressions difficult. It entails segmenting and extracting facial traits from an uncontrollable environment.

Detecting the existence of a human face in an image is a difficult undertaking because to the many different variants of the face. This variety is caused by the varying sizes, angles, and positions that a human face could have inside the photograph. Different imaging settings such as illumination and occlusions impact facial appearances, as do emotions that can be deduced from the human face. Face detection techniques have been categorised into four categories over the last few decades: knowledge-based, feature invariant, template-based, and appearance-based.

In face expression recognition, the image pre-processing stage is crucial. Noise and undesired effects can contaminate raw photos. Facial expression recognition may fail if the test image has different lighting conditions than the training set photos. [1] The photograph is pre-processed to reduce the effects of environmental and illumination variations on the image. The goal of the image pre-processing stage is to create photos with normalised intensities, so that changes in lighting and the environment have no effect. Feature extraction is the process of extracting features from an input image and converting them into a set of features. Feature extraction aids in the reduction of large amounts of data to tiny amounts of data, increasing computational efficiency..[1] The characteristics of the human face are represented by a set of points. Face parts such as the corners of the mouth and the brows are recognised using pixel intensities. In the Facial Expression Recognition system, there are two primary categories of feature extraction methods: Features that are based on geometry and features that are based on appearance.

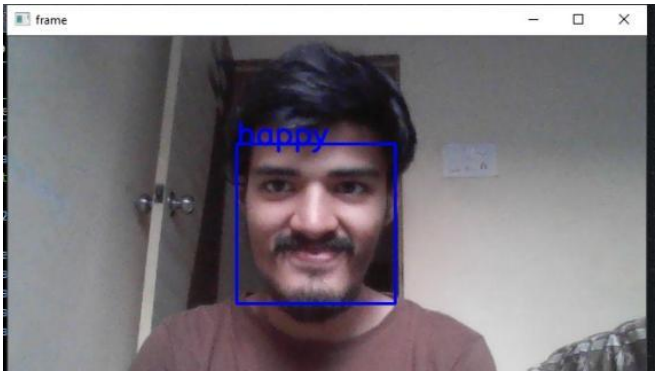
Geometric feature vectors are created by taking into account geometric relationships such as angles and locations between various facial features such as the nose, eyes, and ears. The movement of the facial points determines the facial expression. The accuracy of face component detection is critical to the method's efficacy. [1] The most important part of this procedure is determining and tracking the exact place in the face region..

Appearance-based features concentrate on face features such as bulges and wrinkles around the lips and eyes. To extract a feature vector, this approach applies image filters to the entire image. Appearance-based algorithms come in a variety of shapes and sizes. [1] Local binary Patterns (LBP), Local Directional Patterns (LDP), Local Directional Ternary Patterns (LDTP), and Gabor Wavelets are only a few examples.

Classification- The features extracted from previous block tries to classify the features based on the similarities between the feature data as Classification is done by supervised learning. The classifier has to be trained first and then the input test data is given to recognize the expression of the image in trained model with the provided image.

IV. Output

Accuracy of this project is about 55% - 60%. Picture as Input can be taken on real time basis, we can upload the picture in the project as well. For the real time ,user will be asked to allow the camera permission.



V. Applications And Future Scope:-

Emotion detection is an essential aspect of computer vision, and it may be used to execute a wide range of jobs and processes if one understands the complexities and limitless possibilities afforded by the field of emotion detection

A. App and product development:-

Emotion detection has the potential to help optimise a variety of software engineering processes, including testing the simplicity with which a product may be utilised.

B. Improved learning practices:-

Evidence reveals that while some emotional states

promote better learning habits, others try to repress them. The distinction between the two groups with differing emotional states is not easily discernible.

C. Improvised web development:-

Because of the massive size at which the internet is growing, service providers are interested in gathering massive amounts of data from customers. As a result, all information and adverts are tailored to the user's profile. As a result, including extensive details about various human emotions can result in considerably more precise behavioural models of various sorts of users. [2].

D. Immersive gaming :-

Video games account for a sizable portion of the entertainment sector. As a result, video game producers centre their research on various forms of human emotions that are regularly encountered in order to make these games much more intense and intrusive. To entice more players, video games are designed in such a way that they organically blend human emotions into game play. [2].

VI. Conclusion

Artificial Intelligence may be used to handle exciting challenges such as emotion detection, which is extremely difficult even when employing a large number of photographs, yet we humans, like our programme, make mistakes when evaluating someone's emotion. In technical papers and reports, the best accuracy was about 83 percent. After training the CNN with a large image collection, we can create an optimal model for classifying a person's emotions based on his facial expressions. CNN allows us to extract certain sophisticated information from the face, making it extremely useful for picture categorization based on expressions in an image format.

The automatic face expression recognition systems and numerous research obstacles are discussed in this work.

Face recognition, feature extraction, and categorization are the main components of these systems. For a higher recognition rate, a variety of strategies can be applied. Techniques with a higher recognition rate perform better. These methods offer a realistic answer to the challenge of facial expression recognition and can be used in a limited setting. Emotion identification through facial expression is a global problem that poses challenges due to the unknown physical and psychological features of emotions that are tied to each person's unique qualities. As a result, research in this sector will continue for many years to come because numerous issues must be resolved in order to develop an ideal user interface and improved user experience.

VII. References

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