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EMOTION DETECTION BASED ON FACIAL EXPRESSION

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Abstract: The use of social media platforms, where photographs are important, is growing daily. Nowadays people post certain pictures on websites to share their feelings and sentiments on nearly any occasion. They are the easiest way through which people express their emotions. Images play a crucial role in today's generation where it has become a major part of everyone's lives. In this project, we are mining the possibilities to predict various emotions (happiness, surprise, sadness, fear, anger and neutral) depicted by an image and further we are able to classify the emotion into either of the three classes that is Positive, Negative and Neutral. These sort of predictions can be useful in applications for automatic tag predictions of the visual data available on social media platforms and understanding sentiments of the people and their emotions.

Keywords—sentiment, emotions, prediction, mining

I.INTRODUCTION

Images have become an integral part of the people in today's time. Every minute detail to a huge number of details can be shared in the form of images. Analysing these contents from social media platform or image-sharing websites can give an idea about the general sentiment of people and the emotions they share. Sentiment analysis, often known as opinion mining, is a natural language processing(NLP)[1] method for identifying the positivity, negativity, or neutrality of data. Predicting the sentiment polarity of an input image using two (positive, negative) or three polarity levels is the main goal of our project (positive, neutral, negative). To automatically assign emotional tags to images, it would be helpful to comprehend the emotion that each one conveys. As sentiments are the key influencing factor for almost all human behaviours and activities, systems for analysing sentiments are being used in wide areas such as advertisements recommender, blog recommendation, movie recommendation, virtual marketing. Analysing sentiment of textual contents has evolved to be one of the most active areas of research in Natural Language Processing. However, there hasn't been much research done on computer vision that focuses on analysing the sentiment of visual contents. It is advantageous to comprehend the many feelings and sentiments an image might convey and to automatically forecast emotional tags on them because images play such a significant part in today's culture. We intend to forecast the emotions of an image that fits into the categories of happiness, surprise, sadness, fear, anger and neutral as part of this project and to further categorize those feelings as Positive, Negative and Neutral.

II. LITERATURE SURVEY

[1] In this project, they looked into how Convolutional Neural Networks (CNN) could be used to forecast the different emotions (such as happy, surprise, sadness, fear, rage, and neutral) that an image might convey. Applications for automatic tag predictions of the visual data available on social media platforms and for comprehending human moods and emotions made use of these kinds of predictions. For training purposes, they used the VGG16 model, ResNet model, and a customized CNN framework with 7 layers, which was subsequently able to predict the emotion and sentiment represented by the photos. Using the CNN architecture, the prediction was more accurate. The trained model was utilized to predict the emotion on a live image by loading a specific image or capturing it using a GUI.

[2] The MATLAB 2018 programme, which offers sophisticated programming for scientific studies, and the digital image processing features were employed in this study. The Gauss filter was used to reduce image noise, while the Canny method was used for edge detection [2]. Errors were removed by use geometric ratios. The study's findings showed that sentiment identification techniques used on photos with comparable facial expressions produced false sentiment classifications. However, it has been noted that using MATLAB programming and functions for face recognition has typically led to successful outcomes.

[3] The focus of this research is on some of the notable deep learning models, including Deep Neural Network (DNN), Convolutional Neural Network (CNN), Region-based CNN (R-CNN), and Fast R-CNN, as well as the suitability of their applications in image sentiment analysis and their drawbacks. The research also addresses the difficulties and prospects for this developing subject.

[4] Various deep learning methods, including DNN, CNN, R-CNN, and Fast R CNN, are discussed in this study for image sentiment analysis. According to this study, CNN is much more accurate and efficient than DNN, R-CNN, and Fast R-CNN when it comes to picture sentiment analysis. [4] Finding out human moods like happy, sad, etc. is its main goal. The emotional state of a person as well as various human emotions in various situations are generated by this report. The acquired dataset was trained in order to construct a prediction model that will forecast various emotions in accordance with the training. Using a video file or live feed, the trained model can be used to identify emotions in accordance with the training it underwent. They begin by using OpenCV and several HAAR Cascades, which are often trained classifiers, to detect faces. Following implementation, they can currently extract two sentiment features from human faces, "Happy" and "Sad," with the potential to extract additional features in the future.

[7]This project presents Facial Expression recognition system “Sentiment Analysis” which uses Viola-jones algorithm to detect face from an image and local binary pattern for expression recognition. For classification of expressions, Support vector machine is used. A facial expression project can detect a person’s facial expression and display weather the person is smiling, sad or shocked. This product framework is intended to first identify and read a person’s face. The system then computes various facial parameters of the persons face. After identifying and registering these parameters, the system classifies the expressions for human sadness, smile and human expressions. Based on these statistics the system concludes the person’s emotional state.

[8]This paper mainly focuses on live classes. A sentimental-based facial expression detection model is used to find the attentiveness of the students. For this at first multiple frames from the video are taken at a regular interval and these frames are given as input. Two main classifiers are used in this project, VGG16 based Convolutional Neural Network for sentimental analysis and Haar Cascade Classifier for Face detection. This model predicts the mood of the student like sad, bored, drowsy, and others.

III.METHODOLOGY

The specifics of our emotion detection and the sentiment polarity of the displayed image are described in this section. First, the dataset is pre-processed, then it is shrunk and transformed into an array. The CNN model was subsequently employed for training purposes, allowing us to anticipate the mood and sentiment shown by the photos. The trained model will then be used to predict the emotion represented by the image under the categories of happiness, surprise, sorrow, fear, anger, and neutral using a specific image that has been loaded or a live Webcam. This section contains comprehensive information.

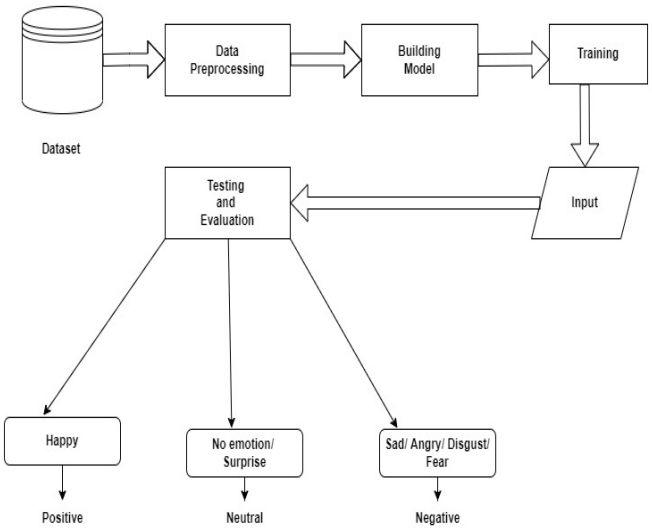

Fig 1: Workflow Diagram

3.1 Dataset Collection

Data is important and crucial part for sentiment prediction to be carried out. A large amount of data is a must to generate a better accuracy. The data for our model is collected from Kaggle for training purpose. The emotions include: Angry(0), Disgust(1), Fear(2), Happy(3), Sad(4), Surprise(5), Neutral(6).

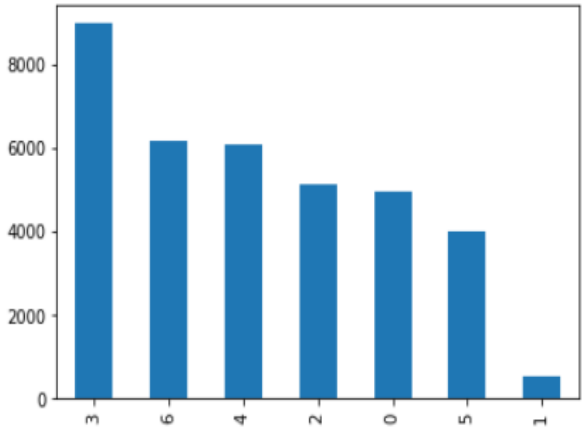

Fig 2: Collection of data

3.2 Data Preprocessing

The images in the dataset with variable sizes are converted into one fixed custom size for better accuracy and faster results. All the images in the dataset are also rescaled as per requirements so that the model can work in an efficient way without any disturbance. We also converted image to array values to make training easier and performed augmentation to expand our dataset and train it with images with all angles.

3.3 CNN Model

After preprocessing, we trained the model using VGG16, ResNet50 and custom CNN model. The accuracy between these three is taken into consideration and the better performing model was used for the prediction of emotion of the static image as well as for predicting emotion using webcam. The custom CNN mode consisting of 23 layers gave the accuracy of 95.80% which was higher the that of VGG16 which gave accuracy of 87.07% and ResNet-50 whose accuracy was 66.32%.

3.4 Testing

Since custom CNN model which we built gave better accuracy, we used the same model for our testing and further implementation process. For live face detection Haar Cascade was used. Haar Cascades are real-time face detectors which are used to detect objects in images or videos. It is machine learning based approach where a lot of positive or negative images are used for training the classifier. Positive images are those images which we want classifier to identify whereas negative images are those which we don't want to be detected. Haar cascades can be used to detect any objects, we just need to have XML file for it. Integration of our python backend code with the user interface is done using Flask.

IV.WORKING

Since custom CNN model which we built gave better accuracy we used the same model for our testing and further implementation process.

Fig 3 : User Interface

The User Interface allows the users to check or test the results in two ways : First, by taking image as the input from the device and second, live by directly using web camera.

Fig 4 shows the result obtained, that is, emotion depicted with its sentiment when a particular image is taken as the input from the device. Emotion depicted live using web camera can be seen in Fig 5.

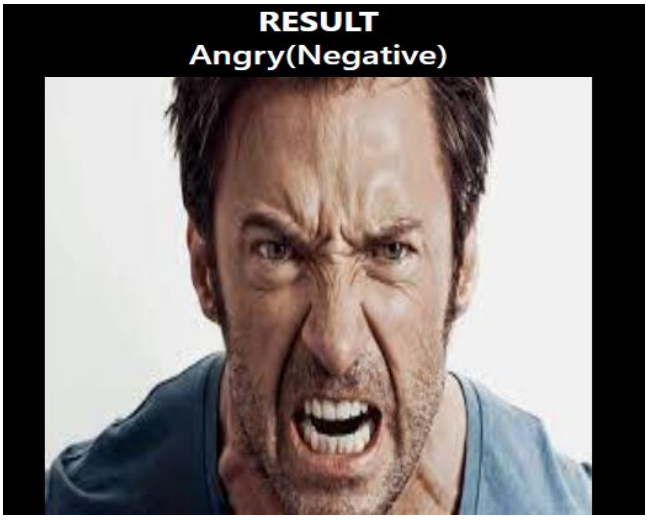

Fig 4: Emotion with its sentiment depicted by taking input image

FIG 5 : EMOTION WITH ITS SENTIMENT DEPICTED USING WEB CAMERA

V. CONCLUSION

In this project, we tried to predict the emotion to get its sentiment. We considered two pre-trained models and we also built one custom model and compared their accuracies for further use. We conclude by saying that custom model which we built gave better results and was used for testing and depicting emotion. Also, testing of emotion live using web camera gives more accurate results especially with emotions such as happy, angry, neutral and sad.

VI. FUTURE SCOPE

Possible Future Scope can be predicting of emotion with its sentiment based on the sound of a person while talking or through the anxiety or nervousness of the person's face in the image or even through video live stream. With everyone's face being covered these days due to pandemic, another possibility could be predicting emotion of a person while person is wearing a mask.

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