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HUMAN SENTIMENT RECOGNITION USING DEEP LEARNING

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ABSTRACT

In this article we focus on 'Human Sentiments' that has played a major role in the human evolution. These sentiments can be recognized by factors such as body movement, gestures, speech, and facial expressions. Over the past few decades as the technologies has grown followed by the advancement in artificial intelligence and machine learning techniques it has now became possible for us to make research on the human sentiments using vast number of datasets and applying them to these methods. This field has attracted many researchers to study and find an efficient and accurate technique using which sentiments of a human can be recognized using their facial expressions. The application of these can be used in a wide range of fields like human-machine interaction, criminal detection, taking review from the customers, etc. Some researchers have mapped techniques which can be used to do so. The aim of this research paper is to develop a model using Deep Learning algorithm which can detect human sentiments by training it on a large labelled dataset of different sentiments.

Keywords: Human Sentiment Recognition (HSR), Facial Expression, Deep Learning, Emotion, CNN.

I. INTRODUCTION

The facial emotion recognition mainly consists of two phases – facial changes according to emotions (psychological) and use of AI based models. The emotions are conveyed by two ways i.e. Verbal (consciously) and nonverbal (unconsciously). These emotions can be conveyed by three main signs which include changes in facial expression, change in tone of voice and physiological changes. Out of these facial emotions are those which can be easily detected and are also some of the first signs that appears first and can be used to detect a person's emotion.

Many scientists have worked in these emotion recognition techniques and have also developed some methods on it. Ali I. Siam, Naglaa F. Soliman [1] have used mesh angular encoding to extract facial emotion and has detected ten emotions. At those times it was not possible to implement such methods on persons with different facial structures, different ages, different skin tones, facial hair growth, etc. But now as the technological advancement has grown and many algorithms can be applied to diverse real-life situations and cases using AI and ML algorithms it became easy for us to recognize facial emotions using a proper algorithm.

In this paper, we enhance the accuracy of sentiment recognition using a model which uses a dataset having numerous images of different human facial expressions and an algorithm to determine the facial emotions.

II. METHODOLOGY

2.1 Dataset

The Facial Emotion Recognition dataset (FER-2013) is a dataset taken from Kaggle, introduced on the International Conference on Machine Learning (ICML) in 2013 brought with useful resource of Pierre-Luc carrier and Aaron Courvill. FER2013 is a properly-studied dataset utilized in ICML competitions and numerous research. Among all strategies for FER, profound deep learning models, in particular Convolutional Neural Networks (CNNs) have regarded notable ability due to their effective computerized feature extraction and computational performance. FER-2013 is a grayscale picture containing about 30,000 facial RGB pictures of various expressions with dimensions restricted to 48×48 pixels, and the primary labels of it could be divided into 7 kinds: 0=angry, 1=disgust, 2=fear, 3=happy, 4=sad, 5=surprise, 6=neutral.

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Fig 1: Images from dataset

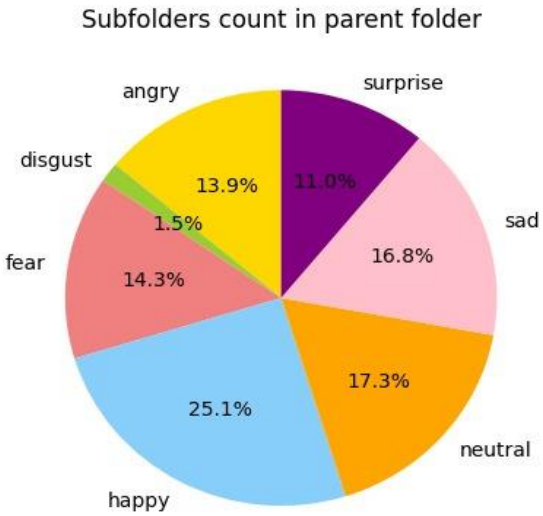

Fig 2: Content of dataset

2.2 Data pre-processing

Data pre-processing is a crucial step in human emotion recognition because it helps prepare the raw data for analysis and model training. Some pre-processing steps may vary depending on the data to be processed (e.g., facial expressions, audio, physiological signals, or text).

Face Detection and Alignment: Detect and align faces in images or videos to ensure consistent placement of emotional cues.

Grayscale conversion: Convert colour images to grayscale, which can simplify processing and reduce the effects of light variations.

Normalize: Normalize pixel values to a selected range (e.g., 0-1 or -1-1).

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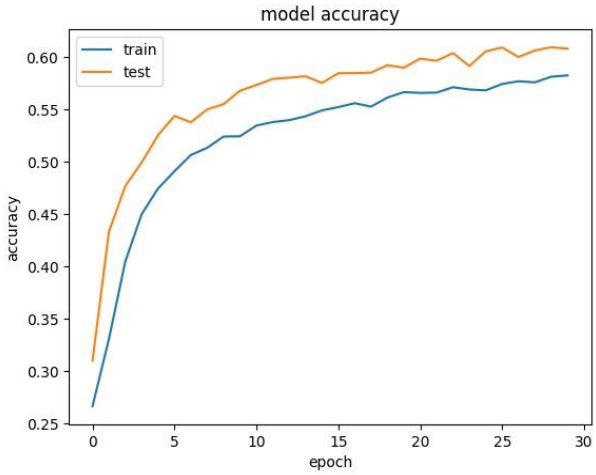

Fig 3: Accuracy of model

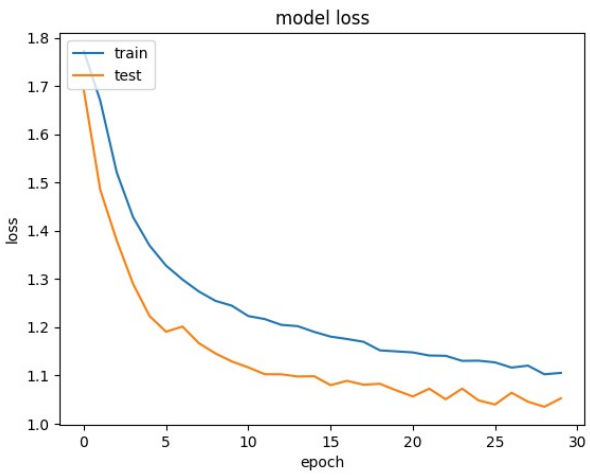

Fig 4: Loss of model

III. MODELING AND ANALYSIS

CNN Architecture

The CNN architecture is composed of various layers – input layer, hidden layers and output layer. The input layer will take picture of a facial expression as an input from the dataset. The input taken from the input layer is then feed into the hidden layers. The convolutional layer will extract features from the input images by considering them as a cuboid having 3 dimensions. It applies a set of filters/kernels to the image. Kernels can also be seen as a small neural network running on a small patch of the image. Kernels are matrices having dimensions of 2x2, 3x3 or 5x5 pixels. These kernels slide over the image of a facial expression and computes the dot product of the patch of the image pixels taken by them. Now this dot product is given to the pooling layer, lowering the chances of overfitting of the model. The main purpose of the pooling layer is to reduce the extent of the previously generated end result making the computation fast. It will also reduce the memory. The resulting feature matrices are the flattened in one dimensional vector by taking the input from the pooling layer. Now they are passed to the fully connected layers which will compute the final classification task. The output from the fully connected layers is taken to the output layer. A logistic function is used for classification tasks which converts the output of each class into the probability score of each class.

IV. RESULTS AND DISCUSSION

In this study, we use the FER 2013 dataset for Facial Expression Recognition (FER), which contains many facial images labelled with seven different emotions: angry, hate, fear, happy, sad and indifferent. Our goal is to develop a deep learning model to clarify these assumptions.

V. CONCLUSION

The paper 'Human Sentiment Recognition' (HSR) has shown higher rate of accuracy and it can be used in daily life. The model is very promising in the field of psychology and generates reviews based on facial emotion. In HSR we have used deep learning, CNN which consists of collecting data, data processing, and feature extraction and finally generating the results based on facial sentiments. The model successfully analysed the face and generated result (happy, sad, anger, fear, disgust, surprise, and neutral). HSR has the potential to advance many applications, from personalization of experiences to mental health assessments and generating honest reviews. By solving challenges and ethical issues, we can use the power of HSR to improve people and society as a whole. We are limited to only a few emotions and this research will lead and encourage the upcoming generation to dig deep into this topic and make future development.

VI. FUTURE WORK

In the model, seven basic emotions are defined: Anger, Disaffection, Fear, Happiness, Neutrality, Sadness and Surprise. Future work can look at categorisation of emotion into a number of categories, including shame, anger, dominance, envy, hope, optimism, love and guilt.

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