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Understanding Human Emotions and Detecting Stress Levels using YOLO

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Abstract: ***The emotion recognition system can detect the emotions of a person through their facial expression. Detected emotions can fall into any of the six main data of emotions can fall into any of the six main data of emotions such as happiness, sadness, fear, surprise, disgust, and anger. It is the process of using datasets in recognizing the emotion detected by the system through image processing. Emotion detection leads to maintain a healthy environment in lives. We will use the deep learning technology to generate models with emotion based facial expression to recognized emotions. The datasets contain a large number of labelled facial images or videos with different emotions and poses, enabling researchers to train and test their models effectively. To detect the emotions we have used the YOLOV3 for implementing the existing system and YOLOV7 is used to implement the proposed system. We know that facial expression is one of the most powerful, natural and universal signals for human to convey their emotions states and intentions. Numerous studies have been conducted on automatic facial expression analysis because of its practical important in sociable robotics, medical treatment, driver fatigue surveillance, and many other human-computer interaction systems. In the field of computer vision and machine learning various facial expression recognition (FER) systems have been explored to encode expression information from facial representation. As early as the 21th Ekman and Frisen defined six basic emotions based on cross-culture study, which indicated that humans perceive certain basic emotions in the same way regardless of culture. These prototypical facial expressions are anger, disgust, fear, happiness, sadness, and surprise. Recently advanced research on neuroscience and psychology argued that the model of six basic emotions are culture-specific and not universal.***

Keywords: Yolov3, CNN, Facial Expressions, Yolov3

I. INTRODUCTION

Emotion detection is one of the many facial recognitions technologies the have developed and grown through the years .Using advanced image this dispensation , this software functions like a human brain that makes it capable of recognizing emotions too. We use image processing from deep learning to train the algorithm by different dataset which is YOLO. The inputs that can be given to the system to analyse videos, images. Also, it is crucial and important for detection of human feelings at a specific moment without actually asking them. Human emotions paly a more important role in the day-to-day life of an individual to enhance their mental efficiency. YOLO(You Only Look Once)is a popular object detection algorithm that was introduced by Joseph Redmon, Santosh Divvala in 2016.It is an end-to-end neural networks that can detect objects in real-time from images and videos.

The YOLO algorithm is based on the concept of dividing the input image into a grid cells and predicting the bounding boxes and class probabilities for each cell. It uses a single neural networks to simultaneously predict multiple bounding boxes and class probabilities for each box. The YOLO algorithm has several advantages over other object detection algorithms, such as its speed, simplicity, and high accuracy. It can process images in real-time with high accuracy and can detect multiple objects in a single image. The YOLO algorithm helps in recognizing different emotions of person like happy, sad, anger, surprise, fear etc. Firstly we capture / upload the images or videos of human helping in detecting the emotions and we classify the different types of emotions using YOLO algorithm, based on the emotion we classify whether someone is feeling happy, sad, anger, fear etc. We display some funny jokes, motivational quotations if someone is feeling sad for long time to make them feel comfortable in a environment.

II. LITERATURE SURVEY

In the literature, there are also more sophisticated approaches focusing on predicting emotions. In recent years, various deep learning techniques have been applied to software emotion projection, including Neural Networks, Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN). These techniques can analyse different types of emotions, change history, and other characteristics to predict to predict the emotions of human beings. By using DL models, can identify emotions early in the initial process and take corrective action.

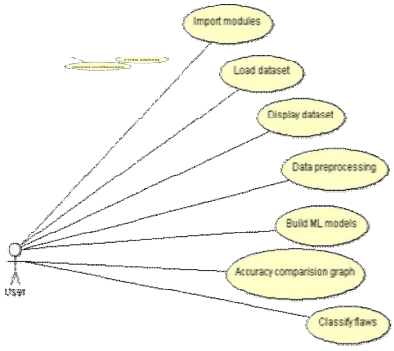
1) *Emotion Recognition Using Deep Convolutional Networks:* The universality of facial expression and the body language is a key feature of humans interaction. Charles Darwin already published on globally common facial expression in the 19th , which play an important role in non verbal communication. In 1971, Ekman Frisen declared facial behaviours to correlated uniformly with specific emotions. Apparently humans but also animals, produce specific muscle movements that belong to a certain mental state.
2) *Deep Facial Expression Recognition:* A Survey Image classification system generally consists of feature extraction followed by classification stage. Shan Li and Weighong provided an extension overview of the analytical features extractors and neural networks approaches for recognition of facial expression. It may be concluded that both approaches work approximately equally well by the time of writing, at the beginning of the twenty-first century. However, given the current availability of training data and computational power, the expectation is that the performance.
3) *The Expression of the Emotions in Man and Animals:* The author Charles Darwin was a british scientist who is known around the world for his 1859 work "On the Origin of Spices by Means of Natural Selection". In his work drawin set out his theories about the principles governing the evolution of plant and animal species, introducing concepts such as natural selection ans survival of fittest. Darwin collected as much evidences as possible of the similarities between and animals. Originally this material was intended to form a chapter .He sought to prove that the inner feelings of humans and animals manifested themselves outwardly in similar ways, with similar expressions. For Example when concerting hard, humans and animals both pucker their lips, and when angry, the eye muscles contract and teeth are bared.
4) *Recognizing Action Units for Facial Expression Analysis:* Most automated expression analysis systems attempt to recognize a small set of prototypic expression, such as happiness, anger, surprise, and fear. Such prototypic expressions, however, occur rather frequently. Human emotions and intentions are more often communicated by changes in one or few discrete facial features. In this paper, we developed an Automated Face Analysis(AFA) system to analyse facial expressions and transient facial features in a nearly frontal-view face image sequence. The AFA system recognizes fine grained changes in facial expression into action units.

III. METHODOLOGY

The process typically involves the following steps:

1) *Data Collection:* We capture the images or videos of humans to capture the emotions which helps in predicting the results.
2) *Feature extraction:* Extracting features from the data that are relevant to predicting emotions. These falls under six categories like sad, anger, neutral, disgust, happy, surprise.
3) *Model Training:* Using deep learning algorithms to train models on the extracted features. The models are trained to recognize patterns and and helps in detecting which emotions it falls under.
4) *Model Evaluation:* Evaluating the performance of the trained models on new data to see how accurately they can predict emotions.
5) *Emotion Projection:* Using the trained models to predict the emotions. However, supervised machine learning approach for emotion projection helps in classifying the different types of emotions.

Supervised machine learning approach for software flaw projection is motivated by the desire to improve software quality, reduce software maintenance costs, and enhance the reliability of software systems. By projecting software flaws before they occur, developers can take proactive steps to prevent or mitigate their impact, leading to improved software quality and customer satisfaction. Additionally, software maintenance costs can be reduced as it is typically more expensive to fix flaws after they have been discovered than to prevent them from occurring in the first place. Machine learning algorithms can help to automate the flaw projection process, enabling developers to identify potential issues more quickly and accurately than traditional.



Majority of the time the data collected for running deep learning algorithms is not available readymade. Hence, the data requires pre-processing which will help to get the right predictions. The fore most step in best model building is data pre-processing followed by Data Collection, Data Merging, Null Value Treatment, Outlier Treatment, Garbage Value Removal and creating the analytically ready data set for the Effective Data Analysis. In our work, the above pre-processing steps are incorporated to create the analytical data set.

Data pre-processing is an important step for the creation of a deep learning model. Initially, data may not be clean or in the required format for the model which can cause misleading outcomes. In pre-processing of data, we transform data into our required format. It is used to deal with noises, duplicates, and missing values of the dataset. Data pre- processing has the activities like importing datasets, splitting datasets, attribute.

The format of data in a proper manner. It provides you pre-processed dataset.

The way how this data is pre-processed is discussed below. Main Steps involved in Data Preprocessing are Feature Sampling and Encoding. Since the raw data are incomplete for making them complete form pre-processing should be done.

A. Steps involved in Data Pre-processing

Data Cleaning
Data Normalization
Feature Selection
Handling Categorical Data
Labelling the data
Splitting the data
Training the data

B. Training the Model

The training part, the algorithm as mentioned above will be implemented. it helps in finding a better set of output. The training is done on basis of the dataset input to the system. The efficiency of the system can be improved every instance as many times the model is trained, the number of iterations etc. You will need a dataset of test that is labelled with corresponding emotions you can either create your own dataset or use an existing one .some popular datasets for emotion detection include Emolnt,SemEval-2019 Task 3,and affect in tweets. Once you have your dataset, you will need to preprocess the test.

C. Testing the Model

Testing will be conducted so as to determine whether the model that is trained is providing the desired output. As the data is entered for testing, the .csv file will be retrieved to crosscheck and then compare and the results of the newly entered data will be generated. On basis of how the model is trained with the help of the dataset, the user will input values of his choice to the attributes specified and the results will be generated as the whether there image is detected.

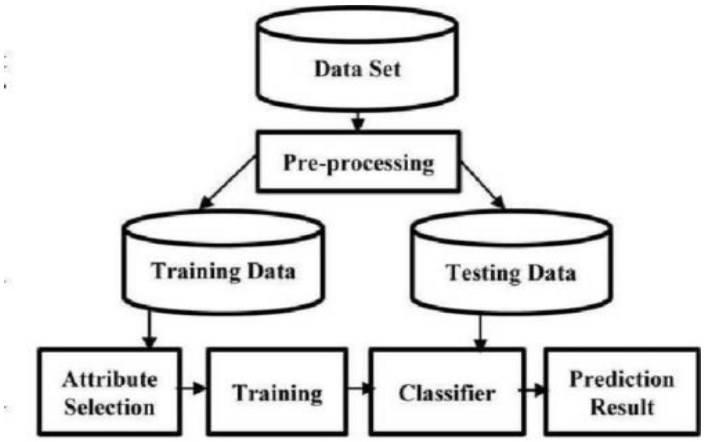


Figure 3.2 : Dataflow diagram

IV. TESTING & RESULTS

A summary of the performance comparisons of the implemented models based on testing accuracy and testing loss is represented in Table. The performance metrics that are considered in our proposed work are as follows. Performance Comparison of Different Deep Learning Architectures will give the accuracy and loss occurred while the model is trained.

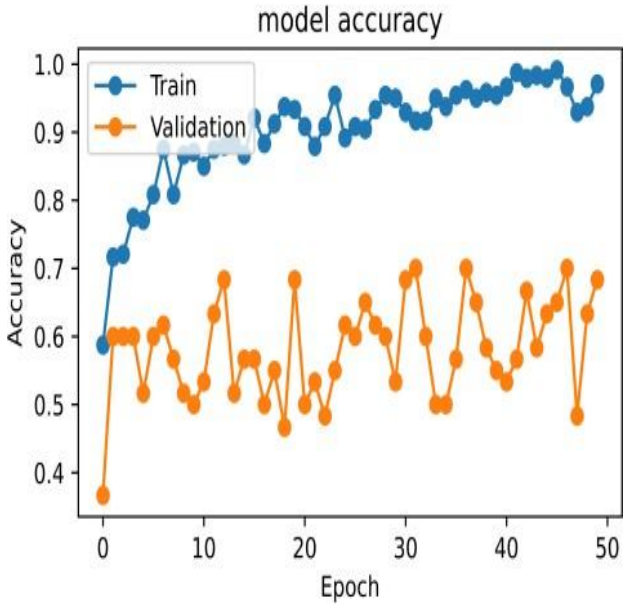


Fig: Model Validation as a variation of epochs

The screenshot of the proposed system is as shown in the figure. The front end for the system was designed using Streamlet package.

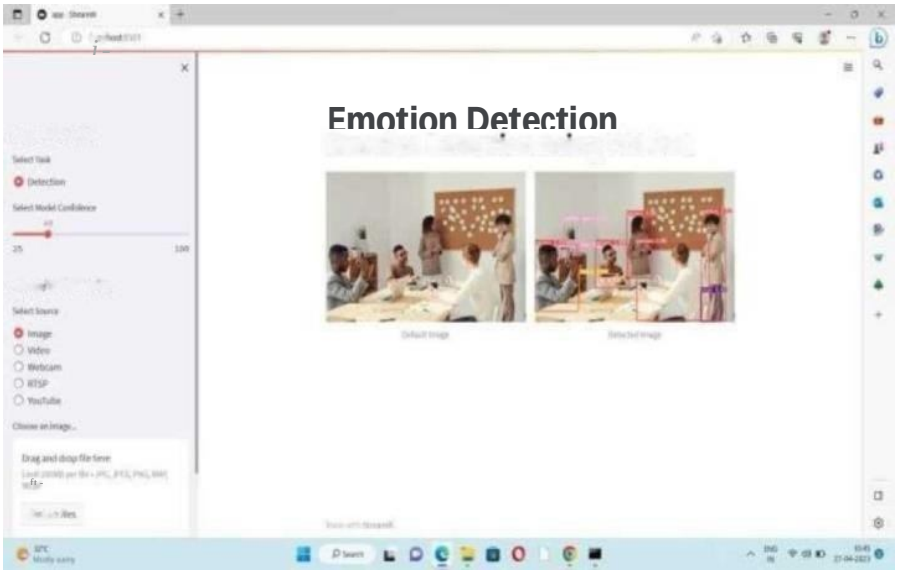
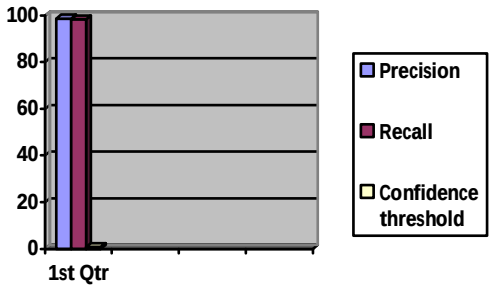


Fig: Screen shot of the proposed system

The system achieved the following parameters during the training pahse are as follows

Parameter	Value
Precision	98.63
Recall	98.3
Confidence threshold	0.85



The proposed model was tested by applying various types of 100 data samples. For this data the testing accuracy was found to be around 98 %

V. CONCLUSIONS

Deep learning can essentially do everything that machine learning does, but not the other way around. For instance, machine learning is useful when the data set is small and well accurate, which means that the data is carefully pre processed. Data Processing require human intervention. also means that when the dataset is large and Complex, machine becoming algorithms will fail to extract information Deep learning, on the other hand is extremely Powerful when the dataset is large. it can learn any Complex Pattern from data and can draw accurate Conclusion on its own. In fact, deep learning is So Powerful that is Can even Process unstructured data. data is not adequately arranged like text Corpus, Social media activity, etc.

Emotion detection is significant for machine learning and artificial intelligence. The innovation in emotion detection involves machines to understand how people feel, which is the first step for them to fulfil our needs. Deep learning based on emotion detection gives performance better than traditional methods image processing.

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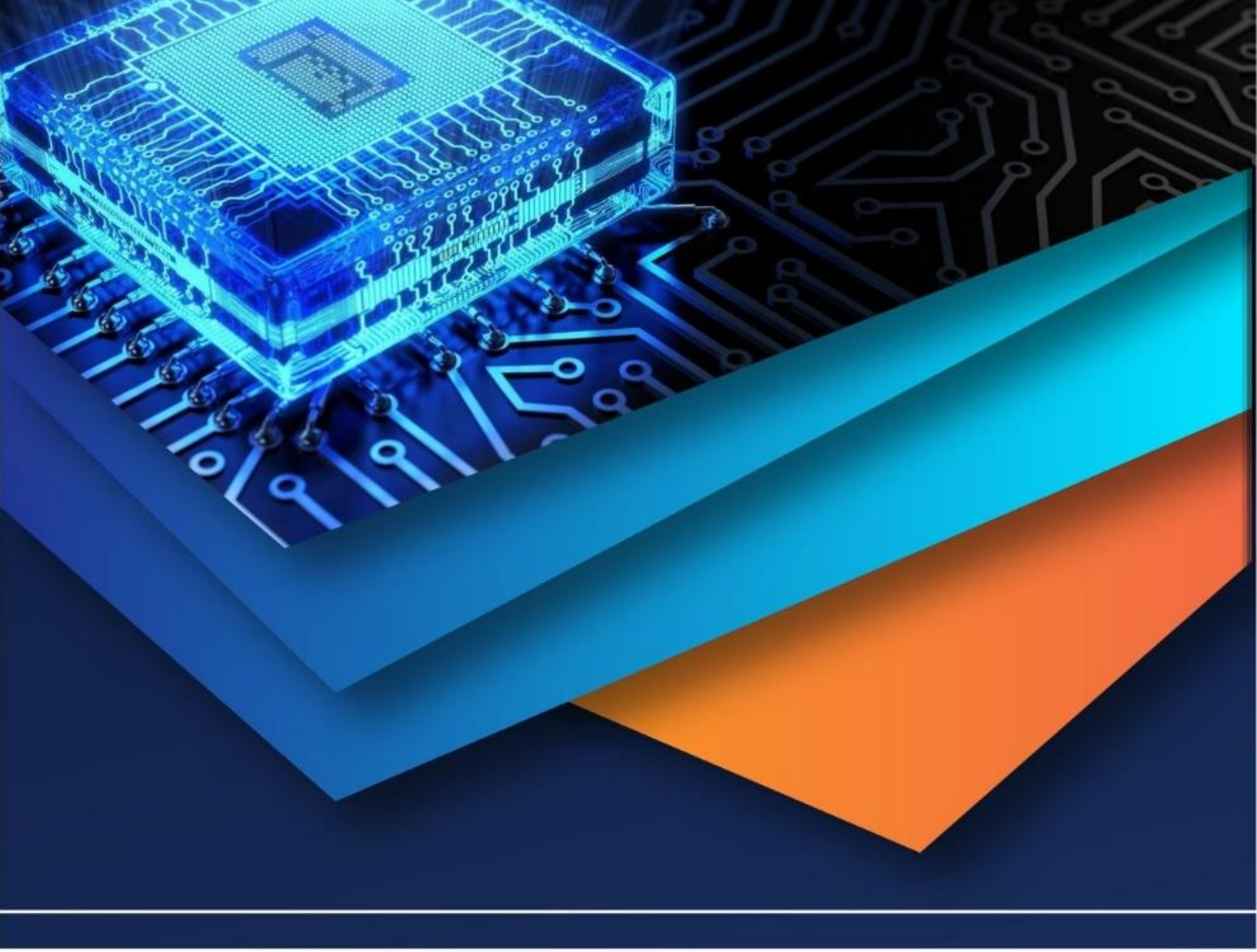

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