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Attentiveness Predictor

Dr. Asif Ali[a], Aadarsh Laad[b], Aditya Chouhan[c], Al-akmarShafin[d], Atik Raiwale, Gourav Parwal[f]

[a,b,c,d,e,f]Department of Information Technology, Acropolis Institute of Technology and Research Indore, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, Madhya Pradesh, India.

Abstract: As the world is suffering from COVID 19 pandemic, it has drastically impacted each sector. The educational institutes have been shifted to the online platforms. Attending lectures in the physical classroom is an easy method of learning as well as for teaching but due to pandemic effects the study has shifted to online platforms resulting in a virtual gap between teacher and student. While teaching physically one can observe the learner's attentiveness and understanding but online lectures make it impossible to observe every single student's activity so with the help of image processing and computer vision, a model has been developed to report the teacher about the emotion and attentiveness of the learners. This application is based on image processing and analysis of the screenshots captured during the lecture.

Keywords: Efficacy, precise theory.

I. INTRODUCTION

As the holy grail of computer vision research is to tell a story from a single image or a sequence of images, face detection and recognition has been studied for more than four decades. Significant efforts have been paid to develop representation schemes and algorithms aiming at recognizing.

Attentiveness detection becomes a necessity while teaching online because the teacher must know about the attentiveness of the student for better learning.

A system is made in such a way that it detects a student's face and iris position and evaluates them. Thus, after processing it generates a report for the class, evaluating their attentiveness.

This application uses Haar Cascade Algorithm for face detection. In order to determine whether the learner is present (attending lecture) or not, analysis of learner's emotion and iris position is perfomed in the application using CV (Computer Vision), TensorFlow and various Python modules (Keras, Pandas, Numpy, MatPlotLib and others).

II. RELATED WORK

1. This model is proposed a novel technique called facial emotion recognition using convolutional neural networks (FERC) is done. The FERC is based on a two-part convolutional neural network (CNN): The first-part removes the background from the picture, and the second part concentrates on the facial feature vector extraction. In the FERC model, an expressional vector (EV) is used to find the five different types of regular facial expression. Supervisory data were obtained from the stored database of 10,000 images (154 persons). The two-level CNN works in series, and the last layer of perceptron adjusts the weights and exponent values with each iteration. FERC differs from generally followed strategies with single-level CNN, hence improving the accuracy.[1]

2. This model implements empirical evaluation of facial representation based on statistical local features, Local Binary Patterns, for person-independent facial expression recognition is done. Different machine learning methods are systematically examined on several databases. Extensive experiments illustrate that LBP features are effective and efficient for facial expression recognition. This model further formulated Boosted-LBP to extract the most discriminant LBP features, and the best recognition performance is obtained by using Support Vector Machine classifiers with Boosted-LBP features. Moreover, investigation of LBP features for low-resolution facial expression recognition, which is a critical problem but seldom addressed in the existing work. Also it is observed in the experiments that LBP features perform stably and robustly over a useful range of low resolutions of face images, and yield promising performance in compressed low-resolution video sequences captured in real-world environments.[2]

3. This model proposed a part-based hierarchical bidirectional recurrent neural network (PHRNN) to analyze the facial expression information of temporal sequences is done. PHRNN models facial morphological variations and dynamical evolution of expressions, which is effective to extract "temporal features" based on facial landmarks (geometry information) from consecutive frames. Meanwhile, in order to complement the still appearance information, a multi-signal convolutional neural network (MSCNN) is proposed to extract "spatial features" from still frames. This model uses both recognition and verification signals as supervision to calculate different loss functions, which are helpful to increase the variations of different expressions and reduce the differences among identical expressions. This deep evolutional spatial-temporal network (composed of PHRNN and MSCNN) extracts the partial-whole, geometry-appearance, and dynamic-still information, effectively boosting the performance of facial expression recognition.[3]

III. ILLUSTRATIONS

The Application build is implemented using computer vision, TensorFlow and deep learning. The model includes the image processing extracting features for facial detection and implemented CNN model for emotion prediction. Also, the contouring is being used to predict if the user is watching attentively or not. And the user interface is being developed using the Django framework.
Implementation Process:

1.The image is provided as an input.
2.Using Haar-Cascade file face detection takes place.
3.Now the respective face is passed to the function to detect the emotion.
4.The extracted image is reshaped and converted to gray-scale and passed to the model (developed using CNN) to predict the emotion.
5.After the emotion detection, again the control returns to the main function where we detect the eyes and iris position.
6.Using the detected face coordinates, a rectangle is being made on the eyes.
7.After that, using the contouring method we detect the iris inside the detected face.
8.Now the difference between the center of the rectangle and the contouring coordinates is taken and compared with the tolerance factor (constant) resulting in determination of the attentiveness.
9.After all this, finally the output will be shown in the form of numbers and dashboard to the user.

Fer.h5 (Emotion Prediction Model) :
Data set – Dataset is being used to train the model for emotion prediction. Dataset consists of approximately 30,000 images having different emotions. The model is being trained using CNN and its layers.

CNN layers
Convolution Layer: - This is the very first layer to extract the features of the input images. In this layer dot product is performed between the input image with the respective image and the output (feature map) is transferred to the next layer for further processing.

Pooling Layer: - This layer is the middle layer between the convolution and FC layer and it is applied to reduce the computational cost by decreasing the size of the received feature map.

Fully Connected Layer: - This layer starts the process of classification and using different parameters they connect the neurons between the layer.

Dropout layer: - This layer is being used to avoid overfitting. Overfitting occurs when a model perfectly works with the training data but behaves abruptly when new data set is provided. So, using this layer we drop some neurons to reduce the size of the model.

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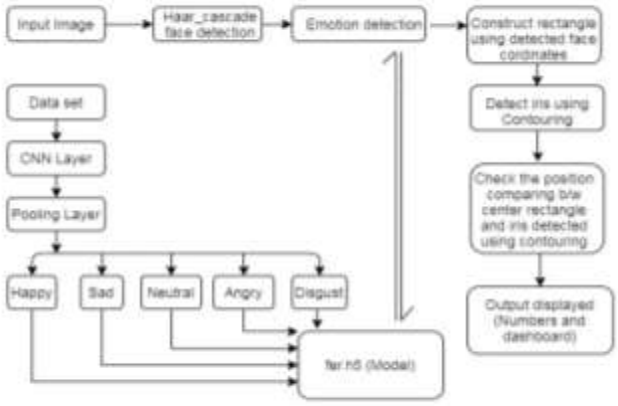

Fig. 1 Flow Diagram

IV. CONCLUSION

The aim of the project that was to automatically detect faces, emotions and iris detection when an image is provided as an input and generates a report which can assist the teachers about the attentiveness of the students is successfully and accurately done by this project with the use of concepts like Deep learning, Convolutional Neural Networks, OpenCV, TensorFlow and Django.

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AUTHOR'S BIOGRAPHIES

Dr. Asif Ali: Senior Associate Professor (IT), Acropolis Institute of Technology and Research, Indore.

Aditya Chauhan: B.tech (IT), Acropolis Institute of Technology and Research, Indore.

Al AkmarShafin: B.tech (IT), Acropolis Institute of Technology and Research, Indore.

AtikRaiwal: B.tech (IT), Acropolis Institute of Technology and Research, Indore.

GouravParwal: B.tech (IT), Acropolis Institute of Technology and Research, Indore.