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Emotion Recognition to Find Attention Level of Student During Class

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Abstract: ***Nowadays, Machine is playing a similar role as a human being in every field of decision making, recommending something, diagnosing patients or recognising someone. That Day is not far where the machine will start commanding humans. A lot of research has been done, and some are going in the field of making a machine to visualise and detect and recognise person or objects. This technique is called Computer vision, which gives power to the machine to visualise and recognise that this person is this. With the same technology in this research, I have developed a system for recognition & expression reading with the help of deep learning to recognise the students and find their attention level using the facial expression.***
IndexTerms: Machine Learning, Deep Learning, Computer Vision, Emotion Recognition.

I. INTRODUCTION

Machine learning is something like training a kid to recognise a person and asking him who the person is? Or showing him some fruits and asking him to bring that fruit from a basket. This is machine learning in which we train a machine by giving soma data and making a decision, prediction based on that data. Today's world is moving toward AI and Machine learning with its different applications like computer vision, pattern recognition, prediction, etc. To implement such an application like Face recognition and emotion recognition, which is also a field of computer vision which gives the ability to computer or machine to find and recognise a person with its different parameters of faces. In this research, we are going to take real-time images from the video which is installed inside classroom and that same camera with recognise the student's face and mark its presence in the classroom and later it will recognize the expression of their faces, which will help us to find the attention level of each student during class hours.

II. PROBLEM STATEMENT

When the teacher writes something on boards, then most students distract from their topic, this causes massive loss of a student to concentrate on the discussed topic [1]. To overcome this loss and disturbance occurred in class, a live video surveillance camera will be responsible for finding the attention level of students and sees the face of the distracting person in the class.

III. AFFECTIVE COMPUTING

Affective computing or effective is similar to emotion recognition. It is a system in which it acts like human expression and read human feeling; these types of system are used in decision making[2,3].

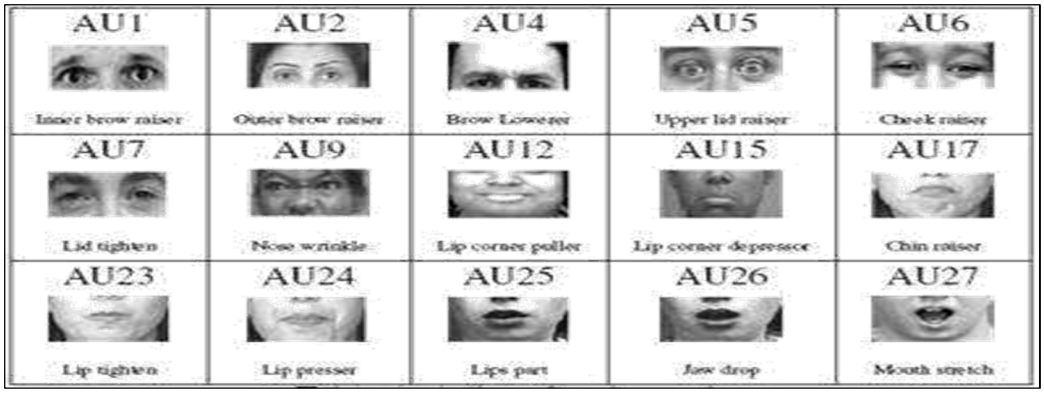

Figure 1: Expression by Eye and lip

Affective computing is the power of emotion analytics or artificial intelligence applied towards emotions. This is a technology that knows how you feel, can now read human emotion in real time by video surveillance and by combining sensor technology and using big data and machine learning. Emotion analytics engines will engage consumers more effectively.

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IV. PROPOSED METHOD

As discussed in the above section that in this paper, we are going to focus on the second part, i.e. Face detection and emotion recognition. For emotion we have used Fisher Face for train the model, create it and store it in a .xml model file. While reading the expression of face, it uses for prediction for emotion. For capturing photos from the webcam as well as processing on it and implementation of fisher face methodology, we have used opencv and EEl are used to connect javascript with python in our project[4]. The reason for choosing this was the frontend of HTML with CSS gives us too many facilities for our project. In JavaScript, we have provided all the possible ways of producing final emotion status.

A. Implimentation Work

Implementation work required good programming skill and excellent knowledge in computer vision and machine learning. In this research, I have used python programing language and few line code of javascript.
Firstly have installed python version 3.7 and open cv2 and then completed all required dependencies for this research like numpy, panda, matplotlib, etc. The tool used here is Anaconda navigator for jupyter notebook.

B. Data and Sources of Data

To train our model, firstly, i have used four different types of images (Happy, Sad, Anger, Neutral) and made four separate XML file for training and testing model. I have collected approx 100 images of different faces with different expressions. For that we need to create few .xml files such as A Haar Cascade.xml file, Haar cascade is mainly a classifier which is used to detect or identify particular objects from the source and haarcascade_frontalface_default.xml is a haar cascade designed by OpenCV to detect the frontal face. The Haar Cascade is trained by applying to the positive image over a set of negative images. The training of the model is generally done using dataset and on various stages. Better results are obtained by using high-quality images and increasing the number of stages for which the classifier is trained.

Name	Date modified	Type	Size
__pycache__	6/8/2019 4:18 PM	File folder	
dataset	2/8/2019 3:00 AM	File folder	
images	6/8/2019 4:20 PM	File folder	
WD	2/8/2019 3:00 AM	File folder	
.gitattributes	2/8/2019 3:00 AM	GITATTRIBUTES File	1 KB
capture	2/8/2019 3:00 AM	Python File	4 KB
haarcascade_frontalface_default	2/8/2019 3:00 AM	XML Document	1,226 KB
hard_update	2/8/2019 3:00 AM	Python File	1 KB
light	2/8/2019 3:00 AM	Python File	1 KB
model	2/8/2019 3:00 AM	XML Document	12,961 KB
model1	2/8/2019 3:00 AM	XML Document	12,962 KB
model2	2/8/2019 3:00 AM	XML Document	12,954 KB
README	5/24/2019 8:59 PM	MD File	3 KB
test	6/8/2019 4:26 PM	JPG File	56 KB
Update_Model	2/8/2019 3:00 AM	Python File	1 KB

Figure 2: All Files Combined for Project

After completing the coding part. We need to combine all the files in a single folder. Here dataset contains all the images of different faces and different emotions like Happy, neutral, sad, angry. Images folder contain the current images of a person while running the code. Capture is the main python file which needs to run for application execution, haar cascade already defined above. Model is the .xml while which are used to train and test out model and test image is the primary image which captures at the time of execution. Update Model is another python file which is created to update our model.
For execution, we need to create an environment file. Environment file contains all dependencies and all python library which are required to run this project.

```
name: geekshubchannels:- !!python/unicode
'defaults'dependencies:-
python=3.5-
pip==19.1.1-
 numpy==1.12.0-
jupyter==1.0-
matplotlib==2.0.0-
scikit-learn==0.18.1-
scipy==0.19.0-
 pandas==0.19.2-
pillow==4.0.0-
seaborn==0.7.1-
h5py==2.7.0-
pip:919.1.1-
tensorflow==1.1.0  -
keras==2.0.4
opencv-4.1.0-
```

Figure 3:Environment.yml file

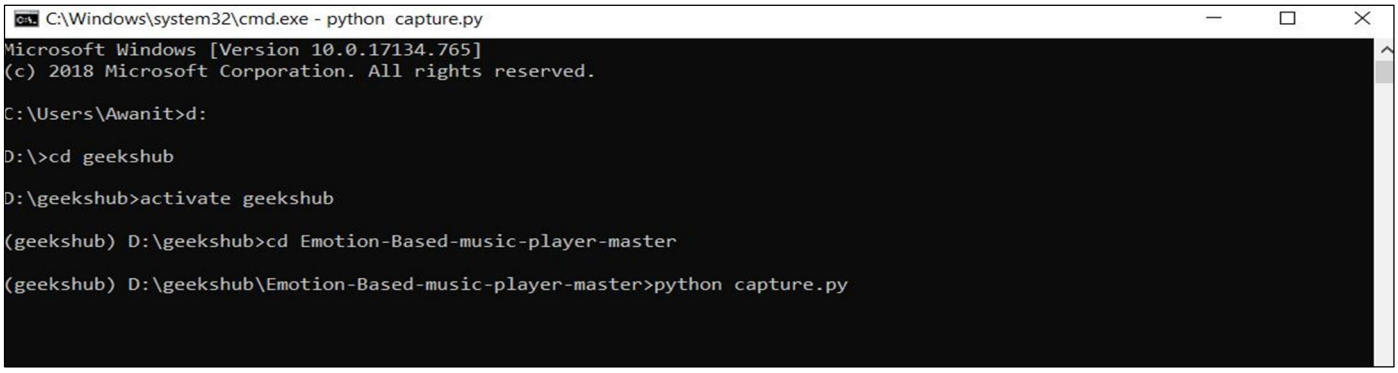

Figure 4: Activate Environment and Execution of Python File.

To activate the Environment file, we need to open command prompt then open the specific directory where the .yml file is kept. As shown in figure 4 activate geekshub (Name of Environment file) then we have opened the project folder under that we executed our main file capture.py

Figure 5: Angry Emotion

Figure 6: Happy

Figure 7: Neutral

Figure 8: Sad

C. Theoretical Framework

With any Machine Learning problem, our prediction is only as right as our data. Affective computing has a data problematic, but it runs deeper than just lacking labelled training data. Building an algorithm means we need to know our inputs and outputs. Two core tactics inform how solutions can be designed for emotion recognition are:

1) *Categorical:* All emotions fall into set classes. There are a finite set of human's emotions. Scientists developed the system, called FACS (Facial Action Coding System), and have continually been updating it since then. The emotions are Neutral, happy, sad, surprise, fear, anger, etc.
2) *Dimensional*: Emotions exist on a range, and can't be well-defined concretely. The model of affect defines two dimensions, pleasure and arousal (PAD), while the PAD emotional state model uses three.

Neural Nets for Emotion Recognition

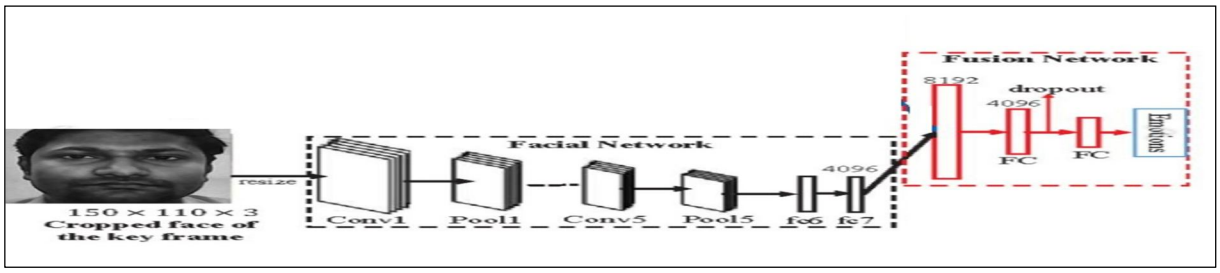

Figure 9: Recognition of Emotion

A Neural Network, a subsection of Deep Learning, is a type of algorithm that has to develop wildly popular over the past few years, It is something related to biological terms like neuron and something like human brains. In addition to its uncanny ability to achieve higher than the formerly state-of-the-art accuracy for many classification tasks, Neural Nets have a critical benefit that's immensely helpful in emotion recognition: they do feature engineering automatically.

In a Neural Network, we input the data we want to use, and the data gets passed through different " hidden layers" of the network. Each layer modifies the input values to try and morph it into something useful and predictive in the model. For our purposes, that means that we can input our data as is and tweak the model to output what we need[5,6].

Convolutional Neural Networks (CNN's) – very effective for the use of images as inputs. These networks further feature engineer the input images and can help achieve greater accuracy in emotion recognition. One of the cutting edge algorithms in Affective Computing was developed by two professors from The Open University of Israel and uses CNN's.

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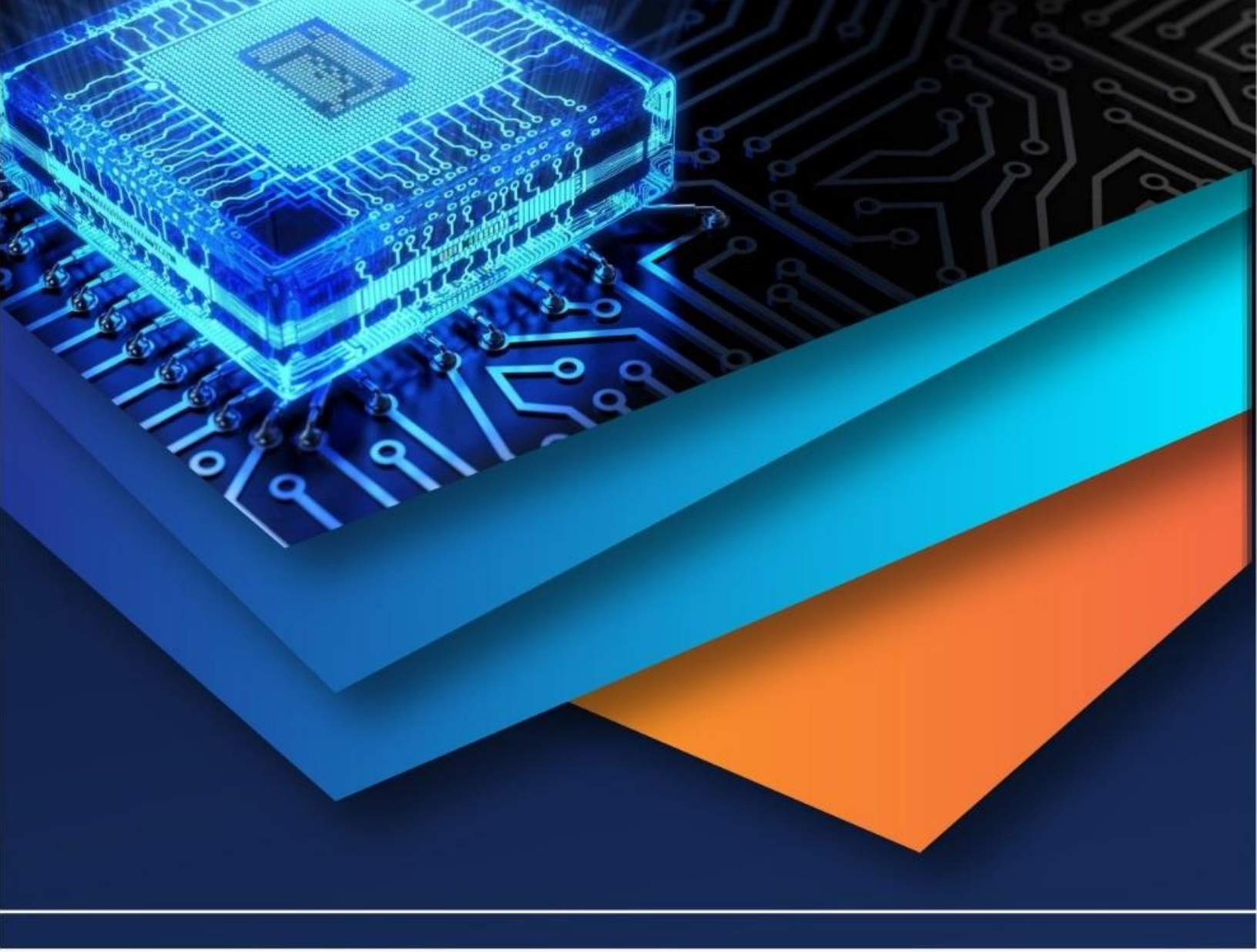

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