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Enhancing Child Learning Engagement through Facial Expression Recognition and Online Activities

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ABSTRACT: The prominent goal of this project is to create a model or an application that improves the way of learning of the children with few learning activities along with recognizing their emotion while this learning process. The aim is to identify an image that is extracted with one of the following facial Expression Recognition (angry, disgust, fear, happy, sad, surprise or neutral), If we get a positive expression i.e happy or surprise we can say that the child is able to understand the learning activity and he is interested in those learning activities. Facial expression recognition has remained a complex and interesting problem in computer vision. Deep learning is a form of machine learning that uses Deep Neural Networks to classify human face images into different emotions. This problem can be solved with deep learning algorithms, which are also robust in uncontrolled environment. To further the progress in online education, it is critical to ensure that kids receive the same level of concentration and learning quality in online teaching as they do in traditional way. So, by using online learning activities and facial expression recognition model, which is based on convolutional neural network architecture, we can keep kids focused for longer hours and make them involved as same in traditional way.

I. INTRODUCTION

The fundamental task is to get students to engage in learning activities that are likely to result in achieving [the intended learning] outcomes. It is helpful to remember that what the students does is more important that what does the teacher does. It is equally important that each activity is meaningful and ensures student development and advancement through the unit. Activities should build on previous activities and avoid being repetitive, they should enable students to engage with and develop their skills, knowledge, and understandings in different ways. These learning activities engage students in active, constructive, intentional, authentic, and cooperative ways. Facial emotion recognition is the process of detecting human emotions from facial expressions. The human brain recognizes emotions automatically, and software has now been developed that can recognize emotions as well. This technology is becoming more accurate all the time and will eventually be able to read emotions as well as our brains do Facial expressions reveal a person's emotional state (emotion, reflection), cognitive function, physiological (fatigue, pain), personality, and psychopathology. The nature of facial expression information is contained in the deformation of key permanent facial features, which is characterized by a visible change. Emotion recognition is the process of associating an emotion with a name

II. PROBLEM STATEMENT

Due to the closure of offline classes because of covid-19 pandemic everything must became online including education system. These online classes are helpful for higher education students as they have basic knowledge and they can utilize the resources efficiently, but for kids who are aged from 6-10 don't have any idea how to utilize resources and they can't even focus continuously for longer hours. So, we thought of introducing learning activities.

Learning activities, as the name suggests, are activities designed or deployed by the teacher to bring about or create the conditions for learning. The difference between a Learning by Design approach to employing various learning activities and other approaches to teaching relates to the pedagogical character or focal intent of the activities selected.

The goal is to Create a machine learning model which identifies the emotion of the child while they perform their learning activities. From the input video which is recorded while the kid is performing learning activity, frames are

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extracted for every fraction of second and the expression of each frame is detected. Based on the expression of the child the teacher will come to know that whether the kid is able to understand.

III. LITERATURE REVIEW

Andrey V. Savchenko, Lyudmila V. Savchenko and Ilya Makarov TRANSACTIONS ON AFFECTIVE COMPUTING, DECEMBER Year: 2021,. Classifying emotions and engagement in online learning based on a single facial expression recognition neural network . In this paper , student engagement levels from disengaged to engaged , individual emotions and group level effect is observed and also can be used for real time video processing even on a mobile device of each kid separately without sending facial video to the remote server .

Amal Alrehaili , Abdullah Alsaeed and Wael Yafooz.9th International Conference on Technologies and Optimization and (ICRITO) Amity Noida, India. Reliability, Infocom (Trends Future Directions) University, Year: Sep 3-4,2021 Sentiment analysis on youtube videos for kids . This paper investigates existing methods and techniques that concentrate on youtube video sentiment analysis . The methods classify them based on machine learning and deep learning approaches

Vladimir Georgiev Alexandra Nikolova TEM journal. Volume 9, Issue 4, Pages 1692-1696,ISSN 2217-8309,DOI: 10.18421 /TEM94-49 Year:November-2020, Tools for creating and presenting online learning resources for preschool kids . A set of interactive components for creating and visualizing lessons for kids , which can be integrated in existing and new E-learning platforms and mobile applications . The article describes the challenges of using management systems , points out the needs of specific audience , finally reveals the functionality of a module for realizing learning resources for kids

Olisah Kingsley S Mohamed Ismail Z International Journal of Information System and Engineering Vol. 3 (No.1) Year: April,2020, Research paper speaks about the importance and impact of information and communications technology on teaching and learning in pre schools and also discusses about the advantages and disadvantages of E-learning platform. Improving the system with regards to the future technology and innovations . We have to keep the system up to date.

IV. METHODOLOGY

4.2.1 User based & Content based Features:

Firstly, we must provide learning activity to the child, after that automatically video is captured while the child is performing learning activity. From the video that is captured, we need to convert the whole video into image frames From the frames that are extracted, the system will identify whether face is detected or not. If the system detects face, then from the face features are extracted, based on the features that are extracted Emotion is detected. The detected emotion is displayed on the output screen. Skin colour can be considered as a good feature for detecting human face. Since colour allows fast processing and is highly robust to geometric variations of face pattern, skin colour has proven to be a useful and robust cue for face detection, localization, and tracking. Image content filtering, content aware video compression and image colour balancing applications can also benefit from automatic detection of skin in the images.

In the YCbCr colour space, Y component represents the luminance information; Cr component represents the red chrominance information; Cb component represents the blue chrominance information. One advantage of using these colour spaces is that most video media are already encoded using these colour spaces. Transforming from RGB into any of these spaces is a straightforward linear transformation as given below:

faces are detected by the components of their skin color separately on basis RGB colors. After the face is detected by color threshold then a rectangular box or alignment can be framed to faces to segregate them out of whole image.

Frames: are grey scale converted images.

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Face acquisition:

images are converted to grey scale images that is entirely to a grey shade. Further here histogram equalization (HE) and Discrete wavelet transform (DWT) are done to reduce darkness or brightness problems. This is done to remove noises from images.

All these colour spaces separate the illumination channel (Y) from two orthogonal chrominance channels (UV, 1Q, CbCr). Therefore, unlike RGB, the location of the skin colour in the chrominance channels will not be affected by changing the intensity of the illumination. In the chrominance channels the skin colour is typically located as a compact cluster with an elliptical shape. This facilitates building skin detectors that are invariant to illumination intensity and that use simple classifiers. Figure 2 shows the histograms of different colour models for two different images. Histogram of an image represents the relative frequency of occurrence of the various grey levels in an image. From the results obtained, it is found that the grey scale distribution for Cb & Cr lies within a certain range of pixel values for any type of skin. This is because the Cb & Cr values are independent of illumination of light. Due to this property of YCbCr colour space, it is preferred for skin colour detection. Since RGB components are subject to the lighting conditions, the face detection may fail if the lighting condition changes. Among many colour spaces, this work uses YCbCr components since it is one of existing Matlab functions thus would save the computation time.

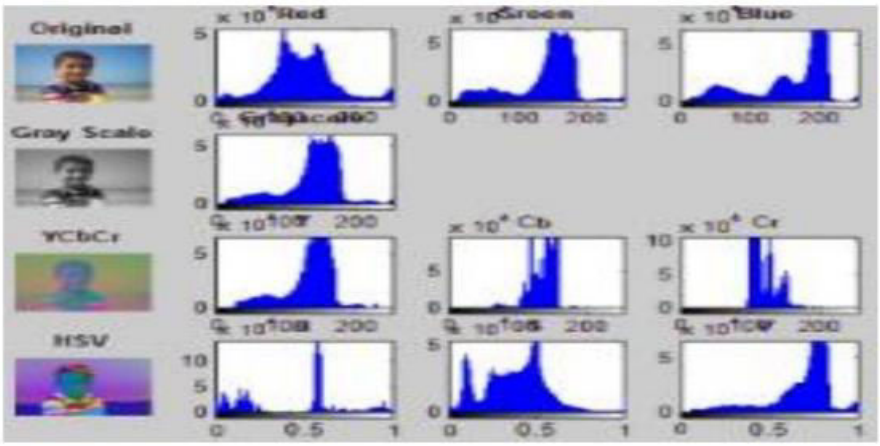
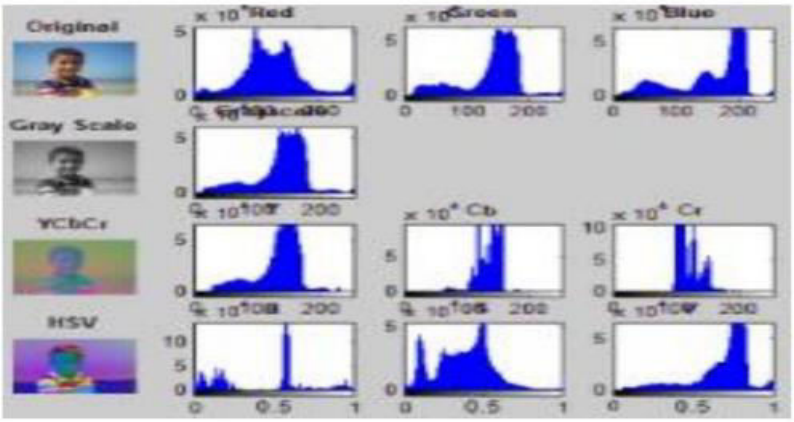


Fig 5.2.1.2 Histogram



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IMPLEMENTATION

Implementation involves the following steps:

1.Data Gathering 2.Data Cleaning

3.Implement learning activity 4.Define data generators

5.Create the model 6.Train the model

7.Detect emotion.

Data Gathering:

Gathering data is the most important step in solving any supervised machine learning problems. Your text classifier can only be as good as the dataset it is built from.If you don't have a specific problem you want to solve and are just interested in exploring text classification in general, there are plenty of open-source datasets available. On the other hand, if you are tackling a specific problem, you will need to collect the necessary data

Data Cleaning:

Data Cleaning is one of the important parts of machine learning. It plays a significant part in building a model. The success or failure of a project relies on proper data cleaning. Professional data scientists usually invest a very large portion of their time in this step because of the belief that "better data beats fancier algorithms" If we have well-cleaned dataset, there are chances that we can get achieve good results with simple algorithms also.

Steps Involved in Data Cleaning:

1.Removal of unwanted Observations. 2.Fixing structural errors.

3.Managing unwanted outliers. 4.Handling missing data.

Define data generators: A data generator is a specialized software tool that generates false or mock data for use in testing applications. The generated data may be either random or specifically chosen to create a desired result.

Create the model: A machine learning model is a file that has been trained to recognize certain types of patterns. You train a model over a set of data, providing it an algorithm that it can use to reason over and learn from data.

There are 7 primary steps involved in creating a machine learning model.

Defining The Problem

Data Collection

Preparing the data

Assigning appropriate models/protocols

Training the model

Evaluating and defining measure of success

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Parameter tuning

Train the model: A training model is a dataset that is used to train an ML algorithm. It consists of the sample output data and the corresponding sets of input data that have an influence on the output. The training model is used to run the input data through the algorithm to correlate the processed output against the sample output.Model training in machine learning is the process of feeding an ML algorithm with data to help identify and learn good values for all attributes involved. There are several types of machine learning models, of which the most common ones are supervised and unsupervised learning. Supervised learning is possible when the training data contains both the input and output values. Each set of data has the inputs, and the expected output is called a supervisory signal. The training is done on the deviation of the processed result from the documented result when the inputs are fed into the model. Unsupervised learning involves determining patterns in the data. Additional data is then used to fit patterns or clusters. This is also an iterative process that improves the accuracy based on the correlation to the expected patterns or clusters. There are no references output dataset in this model.

```
Epoch 1/50
448/448 [==============================] - 1030s 2s/step - loss: 1.8060 - accuracy: 0.2580
Epoch 2/50
448/448 [==============================] - 778s 2s/step - loss: 1.6374 - accuracy: 0.3610
Epoch 3/50
448/448 [==============================] - 747s 2s/step - loss: 1.5308 - accuracy: 0.4093
Epoch 4/50
448/448 [==============================] - 727s 2s/step - loss: 1.4627 - accuracy: 0.4409
Epoch 5/50
448/448 [==============================] - 745s 2s/step - loss: 1.4057 - accuracy: 0.4652
Epoch 6/50
448/448 [==============================] - 655s 1s/step - loss: 1.3551 - accuracy: 0.4853
Epoch 7/50
448/448 [==============================] - 602s 1s/step - loss: 1.3141 - accuracy: 0.5011
Epoch 8/50
448/448 [==============================] - 588s 1s/step - loss: 1.2760 - accuracy: 0.5172
Epoch 9/50
448/448 [==============================] - 579s 1s/step - loss: 1.2418 - accuracy: 0.5327
Epoch 10/50
448/448 [==============================] - 784s 2s/step - loss: 1.2071 - accuracy: 0.5464
Epoch 11/50
448/448 [==============================] - 822s 2s/step - loss: 1.1788 - accuracy: 0.5560
Epoch 12/50
448/448 [==============================] - 620s 1s/step - loss: 1.1556 - accuracy: 0.5643
Epoch 13/50
448/448 [==============================] - 632s 1s/step - loss: 1.1262 - accuracy: 0.5785
Epoch 14/50
448/448 [==============================] - 587s 1s/step - loss: 1.1058 - accuracy: 0.5874
Epoch 15/50
448/448 [==============================] - 676s 2s/step - loss: 1.0785 - accuracy: 0.5959
Epoch 16/50
448/448 [==============================] - 609s 1s/step - loss: 1.0622 - accuracy: 0.6065
Epoch 17/50
448/448 [==============================] - 500s 1s/step - loss: 1.0356 - accuracy: 0.6165
Epoch 18/50
448/448 [==============================] - 519s 1s/step - loss: 1.0136 - accuracy: 0.6231
Epoch 19/50
448/448 [==============================] - 512s 1s/step - loss: 0.9900 - accuracy: 0.6315
Epoch 20/50
448/448 [==============================] - 518s 1s/step - loss: 0.9728 - accuracy: 0.6399
Epoch 21/50
448/448 [==============================] - 524s 1s/step - loss: 0.9467 - accuracy: 0.6522
Epoch 22/50
448/448 [==============================] - 534s 1s/step - loss: 0.9247 - accuracy: 0.6596
Epoch 23/50
448/448 [==============================] - 551s 1s/step - loss: 0.9074 - accuracy: 0.6650
Epoch 24/50
448/448 [==============================] - 557s 1s/step - loss: 0.8818 - accuracy: 0.6754
Epoch 25/50
```

Fig 6.4 Training the model

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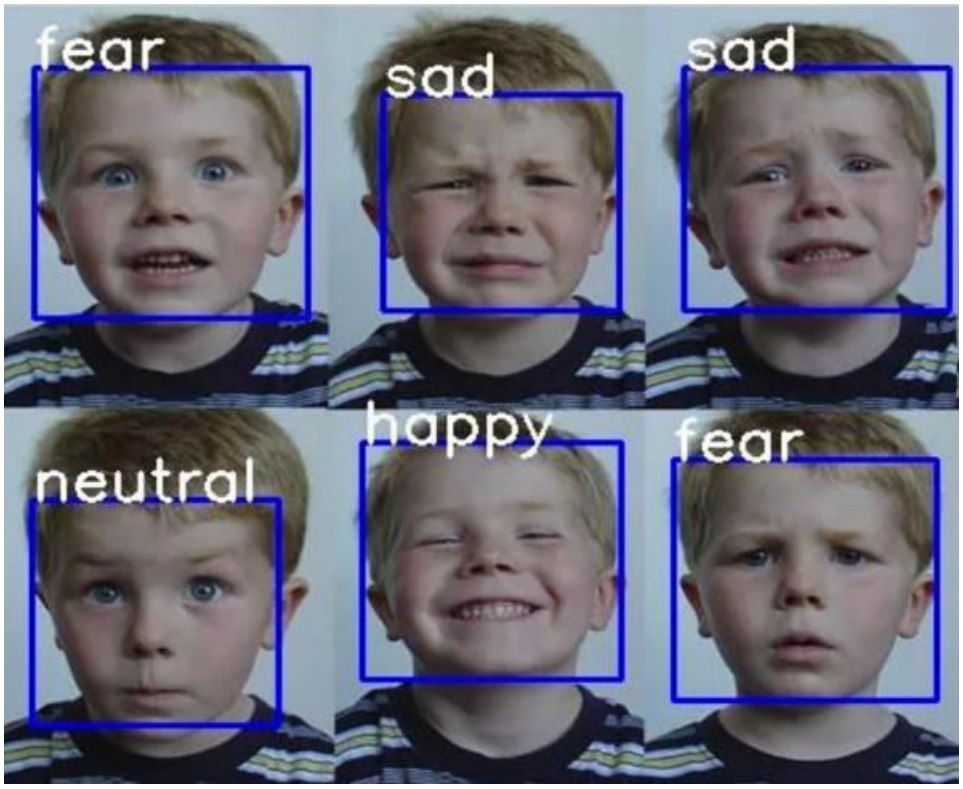
DETECT THE EMOTION :

Based on the model that we have trained , detected emotion will be displayed on the screen



TESTING:

In machine learning, model testing is referred to as the process where the performance of a fully trained model is evaluated on a testing set. The testing set consisting of a set of testing samples should be separated from both training and validation sets, but it should follow the same probability distribution as the training set. In Machine Learning testing, the programmer enters input and observes the behavior and logic of the machine. hence, the purpose of testing machine learning is to elaborate that the logic learned by machine remain consistent. The logic should not change even after calling the program multiple times.

The machine learning model is tested in terms of accuracy or confusion metrics or classification report. Our project is tested in terms of accuracy, where we get our project accuracy as 85%

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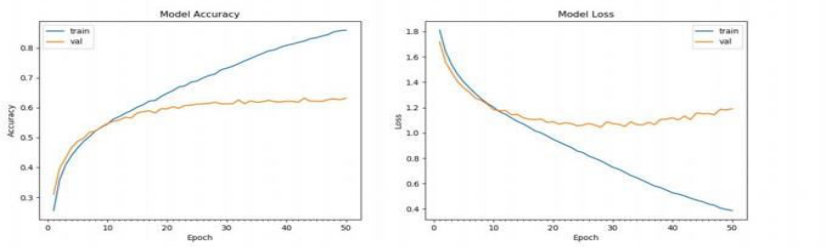

Fig 7.1 Plot of Model Loss and Model Accuracy

V. EXPERIMENTAL RESULTS AND DISCUSSION

The result of our project is detecting the emotion of the person while the learning activities are performed. Here, the learning activities and the emotion detection will be running simultaneously.

After the pandemic the offline classes have turned into online classes and the children won't concentrate in the class at all, and the teachers are hopeless about that. Our project can overcome this situation by introducing learning activities for children and emotion recognition algorithm for the teachers. The learning can be made fun for the children by using the learning activities and help- them to listen to class and concentrate, whereas the teachers can know whether the child is concentrating on the class or not by using the live video emotion recognition as the children will be turning on the video. Learning activities are designed to develop learning that supports course outcomes

Figure 3: Pie-chart on factors to consider
while purchasing a EV

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VI. CONCLUSION

This study is an approach of using webcams to monitor the faces of users in an online video and translate their facial expressions into Learner Engagement levels. These would give invaluable feedback to instructors on how to tailor their material, which in turn could help with better engagement on a higher completion rate. The CNN classifier is used for emotion detection in live videos. The accuracy can be increased by training the model with a greater number of datasets.

Online learning has greater benefits than traditional way of learning but it's too hard to make children focus on the screen for long hours, but by providing different learning activities help them to stay focused for longer hours and can learn continuously. Including e-learning activities in their learning process makes children interactive, creative and make them attentive. These learning activities helps children in building their academic and helps in conceptual thinking, experimental thinking and helps children in building their personality development.

However, there are limitations to our ability to successfully predict Learning Engagement levels in certain conditions. For example, people moving their heads significantly or having obstructions on their faces (e.g.. glasses) limited the performance of the models. The geometric validators improved the performance, however even these were not infallible. The best way to improve accuracy in such conditions is to train on a wider range of images that include various head poses and facial obstructions.

As even their emotions get recognized, it is easier for the mentor to get to know whether the child can understand or not while the children are performing different learning activities.

As children now a days loves to play games, making their learning fun with the kind of games they love would help them to learn in a great way.

VII. FUTURE WORK

In future we can add voice and can classify interests based on voice modulations.
Also we can suggest best activities amongst all the activities based on the time spent we can suggest the best possible activity.

> we can classify according to different age groups

> We can use this model for determining the attentiveness of people in various platforms like zoom, cloud meetings, etc.

REFERENCES

1. Sita Rani, Pankaj Bhambri. Meetali Chauhan, A Machine Learning Model for Kids Behavior Analysis from Facial Emotions using Principal Component Analysis. 5th Asian Conference on Artificial Intelligence Technology (ACAIT), 2021.
2. Andrey V. Savchenko, Lyudmila V. Savchenko and Ilya Makarov, IEEE TRANSACTIONS ON AFFECTIVE COMPUTING, DECEMBER 2021.
3. Amal Alrehaili, Abdullah Alsacedi and Wael Yafooz, 9th International Conference on Reliability. Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO) Amity University, Noida, India. Sep 3-4, 2021.
4. Vladimir Georgiev Alexandra Nikolova TEM Journal. Volume 9. Issue 4, Pages 1692-1696, ISSN 2217- 8309, DOI: 10.18421/TEM94-49, November 2020.
5. Olisah Kingsley S, Mohamed Ismail Z, International Journal of Information System and Engineering Vol. 3 (No.1). April, 2020 ISSN: 2289-7615 DOI:10.24924/ijise/2015.11/v3.iss 1/219.232

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