

Machine Learning Based Student Emotion Recognition Using CNN Algorithm

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Abstract- Human motion detection has attracted significant studies interest with inside the subject of pc vision, in particular for study room environments. However, maximum applicable research has centered on one precise conduct of college students. Therefore, this undertaking proposes a pupil conduct popularity device primarily based totally on individual feelings detection. A system that could apprehend the feelings of a human higher can expect and reply to the human conduct higher, which in flip can substantially enhance the performance of the assignment that is supposed to be done. A system mastering-primarily based totally convolution neural community set of rules might be used on this undertaking to teach facial emotion pix database and use switch mastering approach to pre-teach facial the version with facial photo database, will its personal weights and basis. A skilled version will seize the stay streaming of college students via way of means of the usage of a high-decision virtual video digital digicam that faces toward the college students, shooting their lives feelings thru facial expression, and classifying the feelings as happy, neutral, angry, wonder and unhappy that could provide us an perception into the study room and the pupil emotion info may be stored with inside the MYSQL database. This experimental technique may be used for video conferences ,online classes, etc. This proposition can enhance the accuracy of emotion popularity and centers quicker mastering. We have offered the studies methodologies and the completed outcomes on pupil feelings in a study room environment and feature proposed an stepped forward CNN version primarily based totally on switch mastering that could suggestively enhance the feelings class accuracy.

Keywords- Human motion detection, pc vision, pupil conduct popularity device, feelings detection.

I. INTRODUCTION

The face is the most communicative and expressive a part of human being. Facial expression popularity identifies emotion from face picture, it's far a manifestation of the hobby and persona of a human. Facial expression popularity has added an awful lot interest withinside the beyond years because of its effect in scientific practice, sociable robotics and schooling. Currently, a instructor use exams, questionnaires and observations an reassets of remarks

however those classical techniques regularly include low efficiency. Using facial features of students, the instructor can alter their method and their commands substances to assist foster studying of students. The cause of this task is to find emotion popularity in schooling via way of means of knowing an automated device that examine scholar's facial expressions primarily based totally on Convolutional Neural Network(CNN).It consist of a multistage picture processing to extract function representations.Our device is able to find face detection, normalization and emotion popularity that must be this sort of five feelings: neutral, angry, happy,surprise and sad. Many researches are inquisitive about enhancing the studying surroundings with Face Emotion Recognition(FER). In this device which is ready to research scholar's facial expressions for you to examine study room coaching effect. The device consists of 5 phases: information acquisition, face detection. Face popularity, facial features popularity and post-processing. The procedures makes use of(CNN) for classifications for an evaluation of scholar's emotion who taking part in lively face-to-face study room instruction. Webcams can be connected to our software that can be established in classrooms to acquire stay recordings then we are saving that information. The CNN set of rules will be expecting the scholar feelings after which scholar facial features information with inside the study room may be stored with inside the MYSQL database. The goal of this task is to increase Automatic scholar Facial Emotion Recognition System that could take human facial pics containing a few expression as enter and understand and classify it into exceptional expression elegance such as: happy, angry, sad, wonder and neutral. The reason of this task is to find emotion popularity in schooling via way of means of knowing an automated device that examine scholar's facial expressions primarily based totally on Convolutional Neural Network(CNN), and saved the scholar face feelings information in database. This System can assist the instructor to understand scholar's comprehension closer to his presentation.

II. LITERATURE SURVEY

[1] **D.A. Pitaloka, et.al,(2017)**Deep learning is a part of machine learning approaches which can be adapted to emotion recognition and facial expression analysis.

However, deep learning depends on data size which may effect on its performance.

[2] **M.H. Siddiqi et.al.,(2018)**SVM is one of the techniques used in machine learning to analyze data used for classification and regression analysis. SVM used different kernel function to map data in input space into high-dimensional feature spaces.

[3] **Minanee,S et.la.,(2019)**Worked for a facial emotion recognition system using deep neural networks. Their approach based on a convolutional neural networks where attention is focused on the rich feature ofthe face parts to reduce the network layers, to be less than 10 layers, instead of using deeper networks. They apply a visualization technique to highlight the most salient regions of face image to improve the classsifer’s outcome.

[4] **D.Yanget.la(2019)**Proposed a model that recognizes emotion in virtual learning environment based on facial emotion recognition with Haar Cascades method to identify mouth and eyes on JAFF database in order to detect emotions.

[5] **Chu,H.C et.la(2017)**Emotions are an inevitable part of interpersonal communication. They can be expressed in many different forms, which may or may not be observed with naked eye. Therefore, with the right tools, any indications preceding or following them can be subject to detection and recognition.

[6] **Mariana-Juliana,et.la(2018)**There has been an increase in the need to detect a person’s emotions in the past few years and increasing interest in human emotion recognition in various fields including, but not limited to, human-computer interfaces animation medicine security diagnostics for Austim Spectrum Disorders(ASD) in children and urban sound perception.

[7] **Michael R I, et la(2018)**The recognition of facial expressions is the core of the system. When the trained model file is obtained, in addition to using test set data to test the network training results, the more important thing is to use the corresponding code to complete the call to the model, so as to test whether the model can achieve the expected good results in the expression picture data under the real environment. The implementation of the whole system in software will be completed around the network training and expression recognition,using PyQT5,OpenCV,Keras and other libraries to complete the design of the application layer interface.

III. PROPOSED METHODOLOGY

First, the system detects the face from input image captured from the video input, and these detected faces are cropped and normalized to a size of 48x48. Then, these face

images are utilized as input to our project to give the better result.

The output is the facial expression recognition results(happy, neutral, angry, surprise and sad).The predicated face expression is mapped by using contour mapping. A Convolutional Neural Network(CNN) is a deep neural network that can identify visual patterns from input image with minimal pre-processing compared to other image classification algorithms.

The student facial expression can be monitored and predicted based on the CNN algorithm and the student facial expression data in the class room can be saved in the MYSQL database for future.

Trained the large dataset for better accuracy and result is based on our input. Based on those features it performs convolution layers.

The performance of the CNN on real time application is analyzed.Also,we have deployed a visualization method to highlight the salient regions of face images which are the most crucial parts of in detecting different facial expressions.

ADVANTAGES:

- In this proposed system student facial emotions are detected by using CNN algorithm , by using this algorithm have great accuracy and better output result.
- The detected student face emotion data’s can be stored in the MYSQL database for reference. This backend database system is very helpful to teacher to recognize student’s attention in the classroom.

ARCHITECTURE DESIGN:

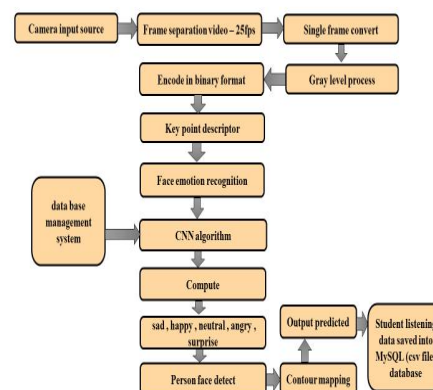


Fig no[1] Architecture Design for proposed system

IV. SYSTEM MODULES

There are six modules used in this system

- Input video module
- Image Pre-processing module
- Database module
- Face emotion module
- Contour mapping module
- Reference module

1. Input video module:

The input of the student faces from the classroom video can be captured from the camera, then the video can be converted into frames 25fps. The multiple frames can be converted into single frame format.

2. Image Pre-processing module:

In this preprocessing module, the single frame color image can be converted into grey scale image by using gray scale conversion process. Then the grey scale image can be encoded with binary format.

3. Database module:

The human face expression images are collected from the camera and the face expressions of the human images can be trained and that pre-trained images can be stored in the database.

4. Face emotion module:

This module detects the student face emotions by using convolutional neural network algorithm. This algorithm computes the student face emotions like sad, happy, angry, neutral and surprise by comparing with the pre-trained database system.

5. Contour mapping module:

The student face emotion computed by using CNN algorithm after that the detection of face expression contour mapping process will be mapping that face expression of the student.

6. Reference module:

The detected student face emotions data can be stored in the MYSQL database for analysis the student comprehension towards his presentation in this classroom.

V. CONVOLUTIONAL NEURAL NETWORK

When programming a CNN, the input is a tensor with shape. Then after passing through a convolution layer, the image becomes abstracted to a feature map, with shape.

A Convolution layer within a neural network should have the following attributes:

- Convolution kernels defined by a width and height (hyper-parameters).
- The number of input and output channels.
- The depth of the convolution filter (the input channels) must be equal to the number channels (depth) of the input feature map.

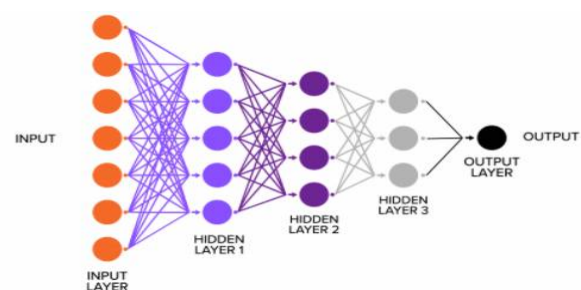


Fig no[2] Convolutional Neural Network

1. Input Layer:

In this layer only we are giving input to our model. The number of neurons is same as the total number of neurons in this layer is equal to total number of features in our data.

2. Hidden Layer:

The input from input layer is then fed into the hidden layer. Depending upon our model and data size there can be many hidden layers. The output from each layer is computed by matrix multiplication of output of the previous layer with learnable weights of that layer and then by addition of learnable biases followed by activation function which makes the network nonlinear community.

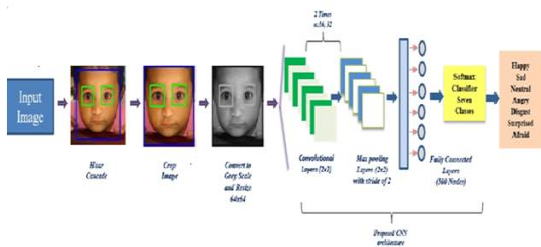
3. Output Layer :

The output from the hidden layer is then fed into sigmoid which convert the output of each of class into probability score of each class.

The data is then fed into model and output from each layer is obtained this step is called feed forward, we then

calculate the error using an error function, some common error function are cross entropy, square loss error and many other.

After that, we back propagation into the model by calculating the derivatives. This step is called back propagation which is used to minimize the loss.



Segmentation Process:

Segmentation partition an photograph into awesome areas containing every pixel with comparable attributes. Image segmentation is a method to decide the length of the border and form. It separates the item from its heritage primarily based totally on different capabilities extracted from the photograph .

After doing away with the noise and hair from the lesion area , the lesion wishes to be separated from the skin, and consequently the evaluation for analysis is carried out basically the use of the essential area . There are lots of segmentation strategies feasible for this study.

Thresholding:

An image processing method that creates a bitonal image based on setting a threshold value on the pixel intensity of the original image.This approach determines the brink after which the pixels are divided into organizations primarily based totally on that criterion . It covered bi-stage and multi thresholding. Thresholding approach consists of histogram and adaptive thresholding

Color-primarily based totally segmentation:

Algorithms segmentation primarily based totally on colour discrimination. Include precept factor transform/round coordination transform.

Discontinuity-primarily based totally segmentation:

Detection of lesion edges the use of lively contours/radial seek techniques/0 crossing of Laplacian of gaussian (LOG). It covers Active contours ,Radial

seek&LoG3.2.4Region-primarily based totally segmentation it's far a technique of splitting the photograph into smaller additives then merging sub photograph that are adjoining and comparable in a few sense.

Gray Scale Conversion:

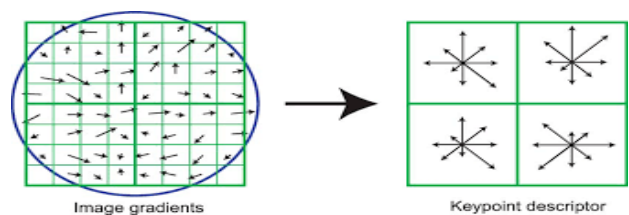
Grayscale is a variety of grey sun sunglasses from white to black, as utilized in a monochrome show or printout. Grayscale pics are maximum generally utilized in a monochrome show or printout. Grayscale photograph are maximum generally utilized in photograph processing due to the fact smaller facts allows developer to do greater complicated operation in a shorter time .

In virtual pics, grayscale way that the fee of every pixel represents best the depth facts of the light. Such pics usually show best the darkest black to the brightest white. In different words , the photograph includes best black, white, and grey colors, wherein grey has more than one levels.

Key Point Descriptor:

A SIFT descriptor of a neighborhood region (Key Point) is a three-D spatial histogram of the photograph gradients. The gradient at every pixel is seemed as a pattern of a 3-dimensional primary function vector, shaped via way of means of the pixel region and the gradient orientation.

Binary photograph descriptors encode course look the use of a compact binary string. The hamming distance on this area is designed to comply with a favored photograph similarity degree usually sought to be invariant to scene illumination and viewpoint changes.



Data Base Management System:

The DBMS manages incoming data, organizes it, and provides ways for the data to be modified or extracted by users or other programs. Some DBMS examples include MySQL, PostgreSQL, Microsoft Access, SQL Server, FileMaker, Oracle, dBase, Clipper, and FoxPro.

We are going to start the live camera and capturing the emotions of the students like happy, sad, surprise, fear and

angry in the form of feedback. All the information after capturing, it will store in the Database System. If we need we can open and view it.

VI. CONCLUSION

In this project, we supplied a convolution Neural Network version for students' facial features reputation. The proposed version consists of four convolution layers, 4 max pooling and a couple of absolutely related layers. The device acknowledges faces from students' enter pix the usage of system mastering method and classifiers them into 5 facial expressions: surprise, sad, happy, anger and neutral. The proposed version performed an accuracy fee of 99% on database. Our facial features reputation device can assist the instructor to understand students' comprehension closer to his presentation.

VII. FUTURE ENHANCEMENT

Face expression reputation device have progressed plenty during the last decade. Our device may be utilized in virtual cameras in which in photo may be captured handiest whilst the character smiles. In safety structures that can pick out a character, in any form of expression he gives himself. Doctors can use the device to recognize the depth of ache or infection of a deaf patient. Our device may be used to stumble on and song a user's kingdom of mind, and in mini-marts, buying middle to view the comments of the clients to beautify the enterprise etc.

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