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Detecting Emotions of Student and Assessing the Performance by using Deep Learning

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ABSTRACT

In the present-day scenario, Assessment of educational skills independently is prominently required which can be done by the techniques of Deep Learning. The main objective of the project is to evaluate the performance of the student while coding using his facial expressions. This model initially captures the facial expressions of the student using a camera which is our data set. These inputs are fed into the deep learning classification algorithms to assess the behaviour of the student and then those outputs are fed into the machine learning algorithms to assess his performance. This project supports external evaluation in many of the educational institutions. This model summarizes the successful patterns of a student by avoiding the pitfalls of average student patterns to develop an innovative analysis tool and promotes to develop the best education.

Key words: Deep learning, Image processing, emotions, CNN, KNN.

1. INTRODUCTION

Ongoing studies in the field of software industry and development have shown that emotions result in determining the productivity of programmers. In the field of Effective computing, many techniques and tools to recognize the emotions of students were proposed. However, those have not been verified yet and stood effective to monitor the behaviour of students. Inculcating such techniques in the educational institutions might reduce the evaluation complexity and this can help students in staying productive as well as to capture the emotions like frustration which reduces their performance. Therefore, these tools are essential to get into the picture to evaluate and assess the behaviour of students while coding. The objective of this paper is to analyze the behaviour of a student based on the emotions collected while they were solving coding questions. Assess the performance of the students based on their behaviour. Provide a classification of students who are successful and not successful in getting the output. Angry is a negative emotion in which the students express the difficulty in solving the problem. When the model is trained with these images, if the student is angry, the model automatically predicts it. Disgust is a negative emotion in which the students express the difficulty in solving the problem. When the model is trained with these images, if the student is in disgust, the model automatically predicts it. Fear is a negative emotion in which the students express the difficulty in solving the problem. When the model is trained with these images, if the student is feeling afraid, the model automatically predicts it. Happy is a positive emotion in which the students express comfort in solving the problem. When the model is trained with these images, if the student is happy, the model automatically predicts it. Neutral is a neutral emotion in which the students express the no feeling in solving the problem. When the model is trained with these images, if the student is in a neutral state, the model automatically predicts it. Sad is a negative emotion in which the students express the difficulty in solving the problem. When the model is trained with these images, if the student is feeling sad, the model automatically predicts it. The surprise is a positive emotion in which the students express the enthusiasm in solving the problem. When the model is trained with these images, if the student is feeling surprised, the model automatically predicts. In figure 1 sample dataset of angry emotions was displayed.

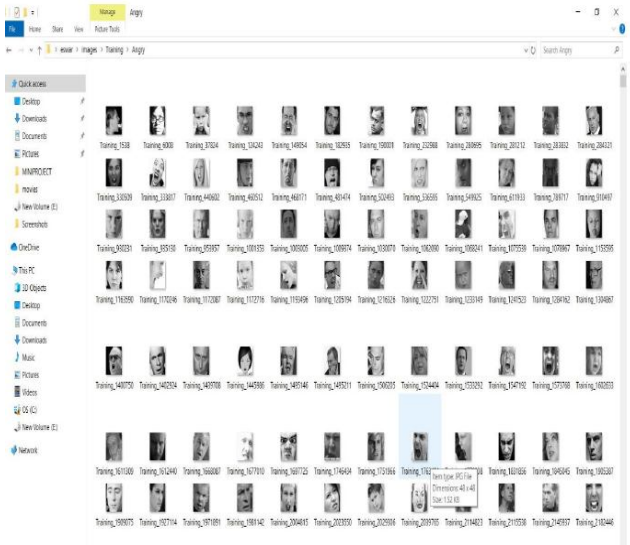


Figure 1: Sample data set of angry images

2. LITERATURE SURVEY

Emotion Recognition is an important field to work on as it enhances the interaction between humans and machines. Recognition of facial expression is not an easy task, as every individual displays emotion in various forms and complexity of human emotions makes this a more tedious task further as two individuals may not display similar emotion in same situations and even an image of the same person in one expression can vary in angle, brightness, background and position. Previous works have captured emotion using unimodal mechanism such as only facial expressions or only vocal input Through the recent, advancements in the field multimodal emotion recognition the accuracy rate of detecting an emotion using a machine has increased. Moreover, using deep learning technique with neural network have extended the success ratio of machine in respect to emotion recognition [5]. Deep learning technique has been executed using different kinds of input of human behaviour such as audio-visual inputs, facial expressions, body gestures. Yet many aspects are available in this area to work on and improve the accuracy in detection of human behaviour [6]. Based on our objectives requirement CNN stood out to be the most appropriate method to execute. Prior models of CNN were load oriented i.e. huge amount of database was required to train system to obtain a fully connected network, but this proved to be a drawback as it took a lot of time to process, recent advancements in processors have given us faster and highly refined CPU that are capable of huge calculations and this shifted CNN to a more computational oriented side and thus now the idea of full connected network is eliminated using more CNN and Relu layers. Graph theory plays an important role in solving many engineering applications. [7], [8].

3. PROPOSED METHODOLOGY

In the proposed model utilize deep-learning tools for analyzing the behaviour of student while solving coding questions and assess the performance of the student using machine learning algorithms The dataset is organized into 3 folders (train, test, validation) and contains subfolders for each image category. There are thousands of images of students while programming (JPEG) and 7 categories like happy, sad, fear, angry, disgust, surprise, neutral. A web-camera which is situated at the student's computer will record the video of the student while he/she is solving the coding problem, where some frames from the video are taken to analyze the behaviour of the student. The frames are divided into 6 categories which will be provided as input for training the model. After training, a video will be given to the model to predict the behaviour of the student. After the behaviour is predicted it is stored in a comma-separated value file which acts as an emerging data set for determining the performance of the student i.e., whether he got the output or not.In figure 2a and figure 2b shows the block diagram of the testing and training respectively.

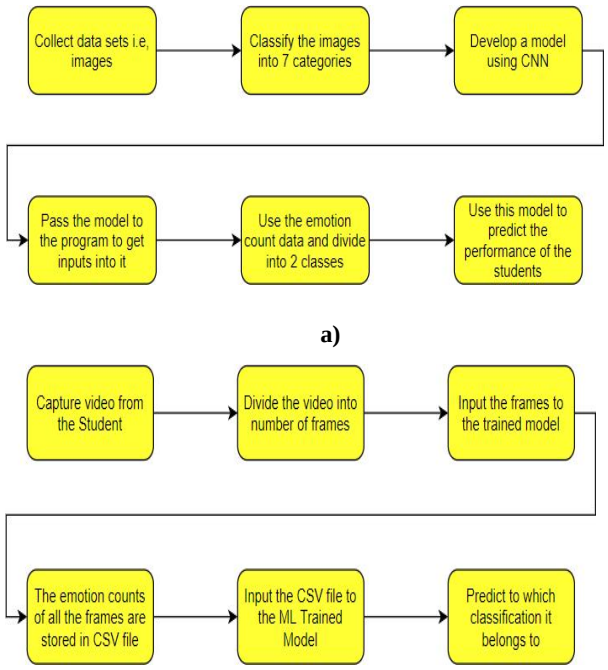


Figure 2: Testing and Training Block Diagram

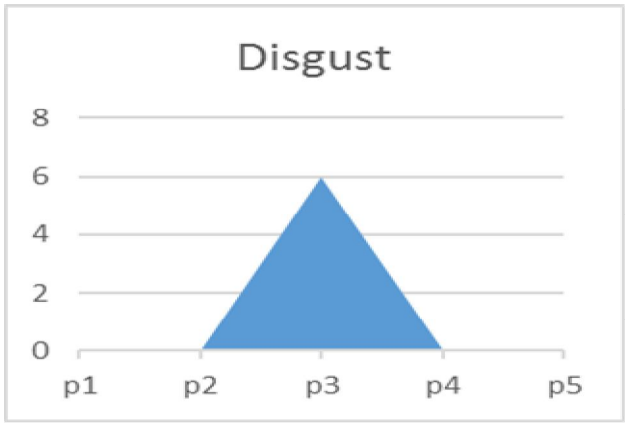
Algorithm for detecting emotions
Input: Student Exam video **Output:** Analysis of Student emotion. ***1****.Begin* ***2****.We consider standard input dataset with video as input file* ***3****.Input dataset of emotions which are formatted in .cvs file* ***4****.Video capturing and applying the CNN to frames is obtained from it* ***5****.Comparison of feature maps with all the frames obtained using matrix mapping* ***6****.Apply the rectification and filters* ***7****.Repute process five again until the final iteration of convolutional is obtained* ***8****.Apply KNN algorithm for classification of the obtained unit values* ***9****.Analyse the obtained emotion count for the student's ability and performance* ***10****.End*

The purpose of the paper is to reduce the evaluation complexity and support the external evaluation and exist as an effective tool in the present-day educational institutions. In the existing system, there are various manual methods to analyze the student emotions while solving coding problems. Face-to-Face interaction with each student, where the mentor comes and check how the student is actually feeling for solving the coding question. The Existing system can also produce feedback forms to the students to know the emotion towards the exam. However, these didn't prove to be successful. Drawbacks of existing system is chances of malpractices, external evaluation, complexity of work, time consuming [9], [10]. To overcome the drawbacks of the existing system, the proposed system has been evolved. Using Computer vision and Image-Based Deep Learning techniques the project is able to create an analysis tool for analyzing emotions exhibited by students while solving coding problems, which is helpful in analyzing the behavior and assessing the performance of the student. Deep learning classification techniques can be used to classify the student's emotions into different categories. Based on these emotions, the project can predict the student's success using machine learning classification algorithms. Advantages of proposed system are easy to analyze, less time consuming and easy to control, external evaluation can be reduced, easy to identify the below average performing students and can prevent malpractices.

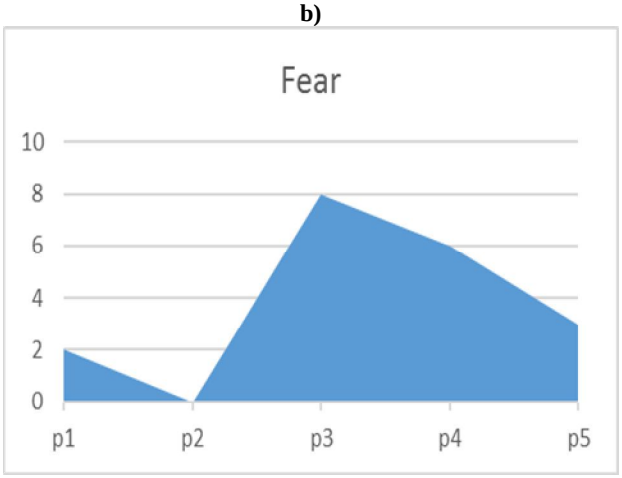
4. RESULTS AND DISCUSSION

In figure 3 five individual students p1, p2, p3, p4, p5 are asked to attend online exam for identifying the emotions about exam. Figure 3a gives information about anger, Figure 3b gives information about disgust, Figure 3c gives information about fear, Figure 3d gives information about happy, Figure 3e gives information about sad, Figure 3f gives information about surprise and Figure 3g gives information about neutral. p1 is anger, p3 is disgust, p3 is having more fear when compared to others. p2 is happy will writing exam, again p1 is sad, p4 was surprised, finally p1 is surprised.

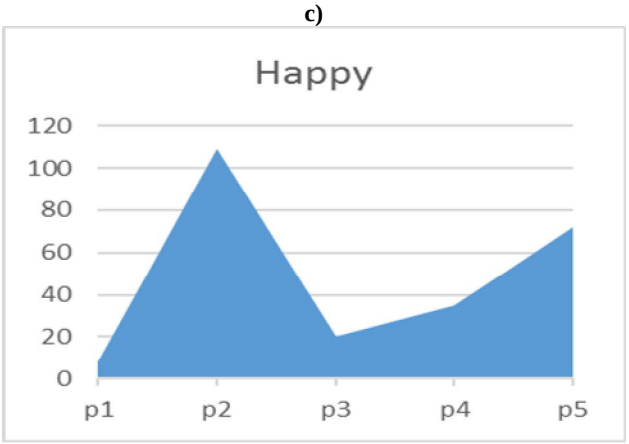
a)



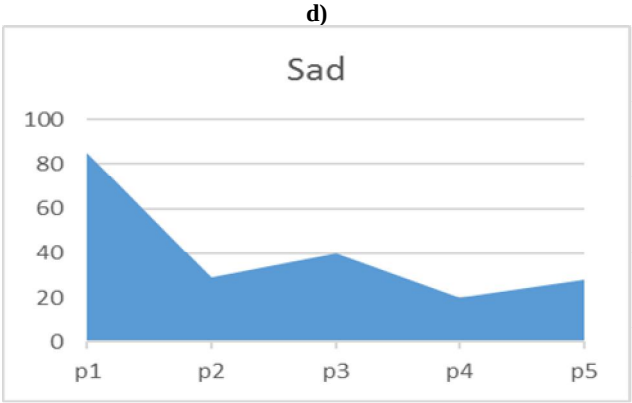
b)



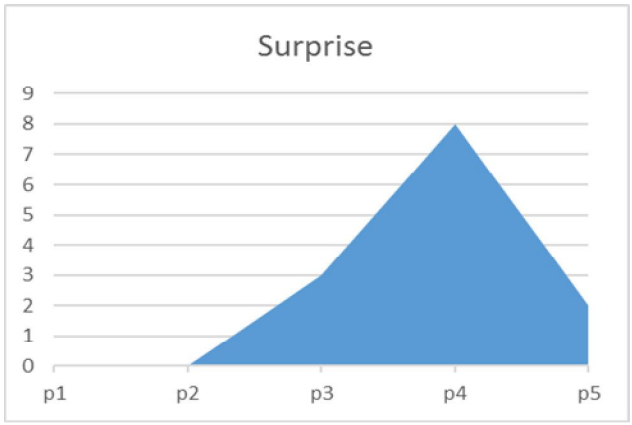
c)



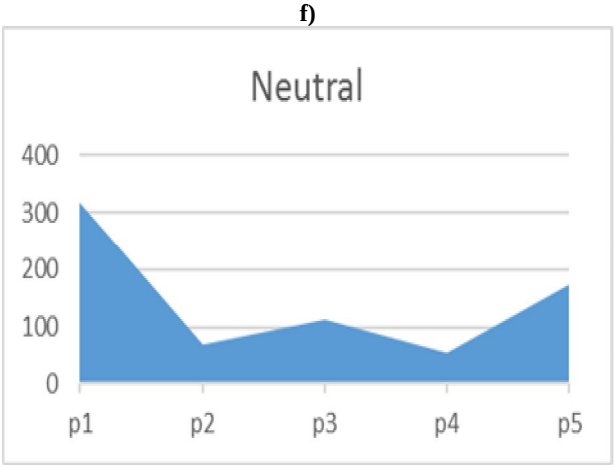
d)



e)



f)



g)

Figure 3 : Individual comparison of emotions in five students

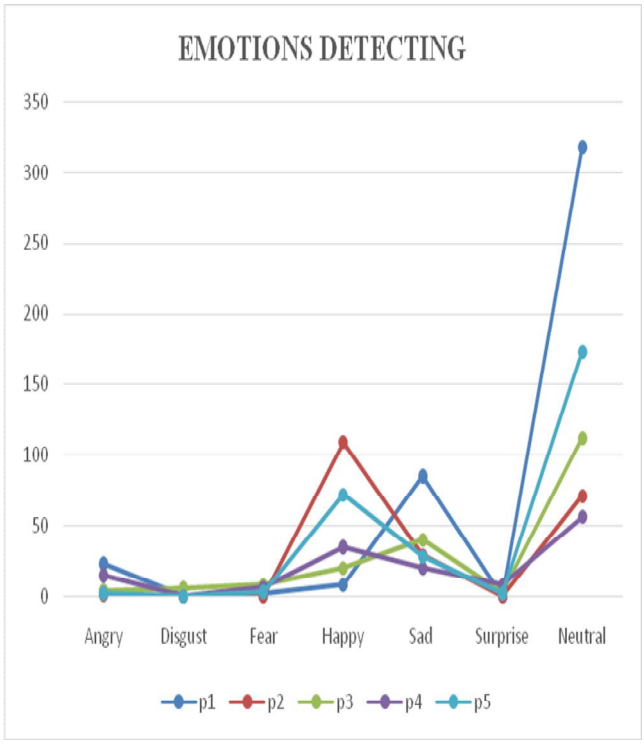


Figure 4 : Consolidate comparison of emotions in five students

In figure 4 graph displays the general trend these five individual students p1, p2, p3, p4, p5 displays while attending a test and we can notice that their response to the test was neutral overall i.e. neither were they challenged or were they happy while giving the examination that is the exam pattern was predictable and similar to previous exam patterns. Hence it should be changed/ improved.

5. CONCLUSION

Assessing the performance of a student by emotions using deep learning techniques is trained successfully using python with an accuracy of 67% against the custom data set. This can further be applied to various real-time image classification problems in engineering colleges for predicting the behaviour of students while solving coding problems. In the case of tools for recognizing emotions on the basis of facial expressions, attention should be paid to the appearance of the object. Other objects may also be captured in the video, so for that purpose, hair cascading came into play. This framework has the potential to be a practical tool for evaluating and positioning the culture of engineering education in the context of solving coding problems. Once the model gets trained successfully, a lot of human work in classifying images based on scans can be reduced to a minimum. This model summarizes the successful patterns of a student by avoiding the pitfalls of average student patterns to develop an innovative analysis tool and promotes as the best education tool.

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