Emotion Recognition in E-Learning System using Deep learning

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ABSTRACT

Technological advancements in e-learning systems provide students with new options to strengthen their academic progress and expand access to education. In intelligent e-learning systems, facial expression recognition is becoming increasingly crucial. Supporting students' emotional needs during learning tasks, on the other hand, is difficult and necessitates an understanding of their feelings.

The main objective of this study is to improve the effectiveness of e-learning by recognizing and recording students' sentiments by providing quick feedback. In this study students' emotions, which include enthusiasm, happiness, bewilderment, grief, decision, and wonder. Similarly, the movement of the head, eye, and full-face is considered in this study. To become aware of the learner's involvement and hobby in attending e-learning sessions, various tactics such as attention stage size and synthetic neural community are employed.

With the rise of distance learning in general, and e-learning, having a system capable of determining student engagement is critical, and one of the most difficult challenges for teachers, researchers, and policymakers. In this paper, we present a system for detecting students' levels of engagement. It was designed to work in real-time and datasets, and it only uses information provided by the web camera.

From the perspective of virtual environment, this paper provides a framework that combines the face expression recognition (FER) algorithm with virtual learning platforms. The cameras on the devices collect images of students' faces, which the FER algorithm analyses and classifying into eight different sorts of emotions. An online course has 12 students enrolled. At a meeting, the proposed method was put to the test, and the results showed that it works effectively in a range of situations. This framework can also be applied to other circumstances that are comparable to online meetings or any virtual environment

Keywords: Emotion Recognition, E-learning, Convolutional Neural Network (CNN), Deep Learning

INTRODUCTION

As a result of COVID-19 pandemic, almost all universities, schools, businesses, and academic institutions around the world have been forced to engage in online learning. Any organization that uses the internet for teaching and training could benefit from this system(Jianhua Zhang, 2020).

Emotion is a crucial factor in determining a participant or student's attention during any online activity or class. The quickest approach to identifying emotion is to interpret the emotional symptoms through facial expressions is one of the easiest methods (Hammoumi et al., 2018). It is the easiest method to observe the students' level of engagement during physical classes but due to COVID-19, all academic activities go online. Almost every academic institute are using various online platforms like Zoom, Google classroom, WebEx, Microsoft team, etc. for conducting their online activities and classes. (Coman et al., 2020)

One of the most difficult aspects of online learning is determining the students' degree of participation in the class and their interest in the topic. And it is very difficult to analyze the students' degree of engagement and mood in E-learning, and instructors must know the students' or participants' level of focus on various topics because if the lecture ends with student boredom, the instructor's efforts are wasted (Ahmed et al., 2013). As a result, according to the study, the instructor must be aware of the students' feelings. As a result, understanding the nature of emotions, their eliciting situations, and emotional experiences within the academic environment is crucial (Landowska et al., 2017; Murphy, 2020)

OBJECTIVES

The objective of this study is to improve the e-learning environment by harnessing student emotion and delivering real-time feedback, as well as to try to interest students in-class lectures. We created the Emotional Recognition in E-Learning (EREL) system, which is a web-based system and a mobile app that detects, and analyses faces and displays their emotions in real-time, saving photographs in a database so that instructors may assess students' involvement levels.

METHODOLOGY

Emotional Recognition in E-Learning (EREL) is a Web-based system and a mobile app that detects and analyses human faces in real-time and displays their emotions. In intelligent e-learning systems, facial expression recognition is becoming increasingly crucial. We used Flask, HTML, CSS, and a deep learning technology called convolutional neural networks to build the system (CNN). Facial expressions are key identifiers for human sentiments since they are linked to emotions. A person's facial expression is a nonverbal manner of expressing emotion most of the time (approximately 55 percent of the time), and it can be utilized as concrete proof to assess whether they are telling the truth. Analyzing data and developing training and validation Batches run on the Karolinska Directed Emotional Faces (KDEF) dataset. A convolutional neural network (CNN) is a form of artificial neural network that is specifically intended to process pixel input and is used in image recognition and processing. We built a CNN with four convolutional layers, including Batch Normalization, Activation, and Max Pooling, as well as Dropout Layers, Flatten Layers, two fully connected dense layers, and a Dense Layer with SoftMax Activation Function. After 15 epochs of training, the model is evaluated, and the model Weights are saved in.h5 Values. A python script is also written, which when run, produces a Graphical Visualization of the Emotions present in the image. Finally, as illustrated in Figure 1, we create a file that inherits from all our defined Classes and deploys our application using Flask.

RESULTS

We took pictures that included the facial expressions of all participants at the same time in a realistic online meeting to evaluate the framework's applicability in a real-world situation; there were 12 participants in this meeting, and the captured time was selected after the discussion. There was a total of 12 faces captured, 11 of which were successfully recognized faces with sufficient feature points. The distinction is explained as follows: multiple expression features may be present on a face at the same time; the expression presented on this face will be labeled according to the most likely expression determined by these features, but the overall expression of an image containing multiple faces is determined by the sum of various expression features contained in each face. In certain “happy” faces, the likelihood of happiness is substantially greater than neutral, but in some “neutral” faces, the probability of happiness is just slightly lower than neutral. Overall, the results of this experiment may give favorable evidence for the model's performance when applied to a real-world environment as shown in Figure **2** and Figure **3**.

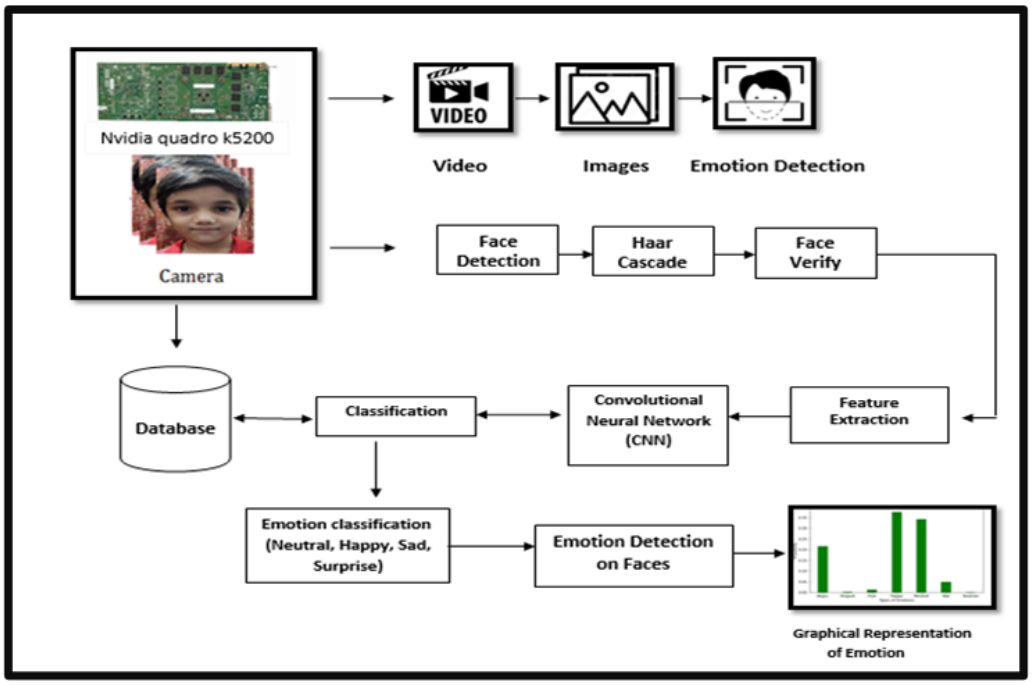

Figure 1. E-learning System Framework.

Figure 2. Emotion Detection system Testing.

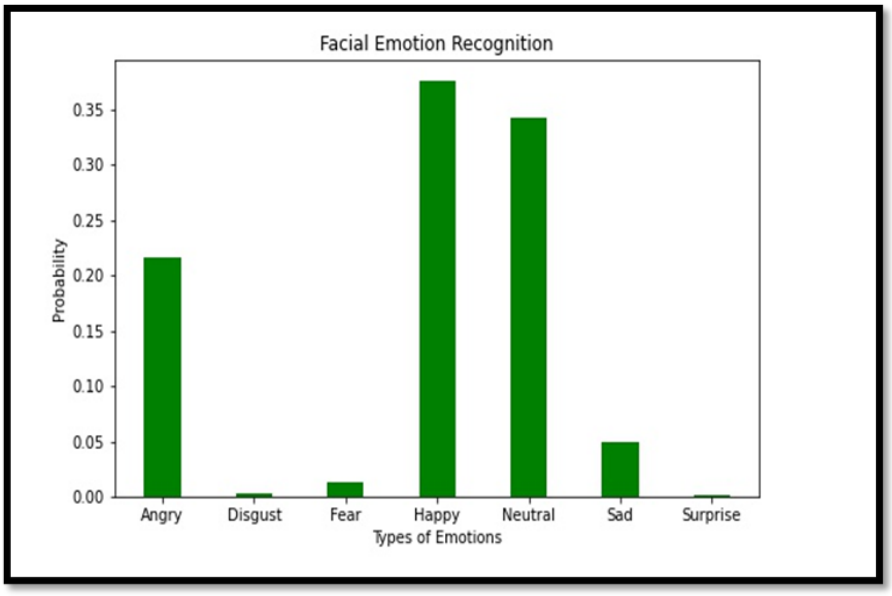

Figure 3. Probability of Emotions.

CONCLUSION

In this study, we have used a CNN-based system for facial expression identification, which passed the test and was able to detect faces and classify emotions with an accuracy of 89% percent on test data and 85% percent on the KDEF dataset. To test our suggested approach, we experimented with 12 participants. The results reveal that emotions were recognized and that the algorithm produced cutting-edge results. This study intends to improve current e-learning methods by identifying student emotion recognition during a pandemic and integrating emotion detection into adaptive learning activities. The classification accuracy using CNN yields promising results in identifying four (5) types of face emotions: happy, normal, surprised, angry, and sad. Other development will be improved in the future to improve online e-learning, particularly during the COVID-19 pandemic we will enhance our web and app we will develop a video calling application for e-learning which will detect emotion directly in that app and alert instructor and We will add further algorithms to make the e-learning situation better.

REFERENCES

1. Ahmed, F. D., Tang, A. Y. C., & Ahmad, M. S. (2013). Recognizing Student Emotions Using an Agent-Based Emotion Engine. International Journal of Asian Social Science, 3(9), 1897–1905.
2. Coman, C., Țîru, L. G., Meseșan-Schmitz, L., Stanciu, C., & Bularca, M. C. (2020). Online teaching and learning in higher education during the coronavirus pandemic: Students' perspective. Sustainability (Switzerland), 12(24), 1–22. https://doi.org/10.3390/su122410367
3. Hammoumi, O. El, Benmarrakchi, F., Ouherrou, N., Kafi, J. El, & Hore, A. El. (2018). Emotion Recognition in E-learning Systems.
4. Jianhua Zhang. (2020). Emotion recognition using multi-modal data and machine learning techniques: A tutorial and review. Information Fusion, 59, 103–126.
5. Landowska, A., Brodny, G., & Wrobel, M. R. (2017). Limitations of emotion recognition from facial expressions in e-learning context. CSEDU 2017 - Proceedings of the 9th International Conference on Computer Supported Education, 2(Csedu), 383–389. https://doi.org/10.5220/0006357903830389
6. Murphy, M. P. A. (2020). COVID-19 and emergency eLearning: Consequences of the securitization of higher education for post-pandemic pedagogy. Contemporary Security Policy, 41(3), 492–505. https://doi.org/10.1080/13523260.2020.1761749