

Monitoring Panic Situations in Students and Alerting Using Artificial Intelligence

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The role of artificial intelligence (AI) in human monitoring and recognition has been upgraded with different solutions to address difficulties in various industries. This sensing-based technology can have a considerable impact on students' life by helping parents and teachers understand and realize students' panic situations. Several students are losing lives owing to unbearable panic attacks and the tough decisions they make during their panic phase. In the current education system, students face panic due to fear of exams, failure in exams, bullying, and so forth. If this situation is recognized and communicated early, it can help elders prevent the dangerous decisions taken by students. AI can play a major role in monitoring day-to-day activities by identifying their panic attacks and alerting the responsible persons. This is achieved by sensing and monitoring facial expressions and human behavioral patterns. The AI system also influences their mind by enabling professional counselors to provide counseling on their mobile phones to soothe their minds and avoid harsh thoughts. As the AI system is made to be controlled within a private network to enhance privacy, the choice of alerting personal and counselor options can be availed by their parents. This AI-technology-based system not only saves students from panic but also promotes a positive personality. According to several studies, students across the globe are victims of panic situations. Hence, using this expression sensing system the right way can save thousands of lives across the globe.

1. Introduction

The education system helps an individual in building potential knowledge to explore their career options and learn new things. Schools and colleges provide different activities for students to engage and participate; students are in a society where they face competition daily and race to succeed. These competitions are gradually creating a stressful environment for students. This is due to different growth potentials and learning curves, which vary for every individual. Students face negative consequences during competition with fellow classmates causing imposter syndrome.⁽¹⁾ These various academic pressures and conditions affect their emotions internally. Every student has their own social and personal life, which is way different from the competitive school world. The competition among students has its pros and cons as explained in an article on

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raising kids.⁽²⁾ Students need assistance and support to help them understand the competitive world better. The lack of awareness about such an environment can cause high levels of stress and difficulty in expressing themselves.

Stress and mental burden are parts of an educational career with challenging goals. These parts of students' life are constantly affecting their mental ability, making it difficult for them to cope with reality. Some of them have made wrong choices during their panic and pressure situations, resulting in the end of their lives. Surveys also demonstrate a high number of students who mentally break down with depression as well as commit suicide.⁽³⁾ The few factors that cause major peer pressure and panic among youngsters are fear of exams, failure in tests and examinations, bullying, competition, and so forth. It is important to sense these factors, which, however, cannot be detected by teachers or parents. Because they fail to detect such situations in students, help is unavailable at the time of need.

A normal way of conveying something without speaking is generally through facial expressions. Many people do not express themselves when confronted with a tragic situation and when they are in public places. Several people might have no intentions of expressing any feelings or emotions during such instances. Human beings tend to have facial expressions that show automatically without any extra action required.⁽⁴⁾ Identifying and understanding students' expressions using different features such as forehead lines that change depending on the facial expressions help in understanding different reactions. This method of classifying and understanding the detailed features of the face is a way of realizing human feelings. Every human facial expression contains much information; it depicts different moods and feelings of people. The face is a clear identity of each one and carries information about a person; it also provides information about mental state, mood, and feelings. Facial expressions are considered a means to understand an individual as a primary source of information; these act as a key to understanding emotions and feelings. The results from expression identification determine the feature extraction that is actually based on facial recognition and age classification.⁽⁵⁾ These features concentrate on the eyes, nose, and mouth as they can enhance feelings based on texture and shape. The features are extracted from facial movements and are classified into different categories for better identification.

In our study, we have classified three different stages for identification: preprocessing, feature extraction, and classification. Existing solutions have limitations as the muscle movement of each local area is classified into various sections, such as raising the eyebrows, moving or wrinkling the brow, rolling the eyeballs in different directions, and curling the lip.⁽⁶⁾

Our research focus is to identify different expressions of each student for better panic prediction. When students are monitored to identify their state of mind, we differentiate situations when they are found to be in panic using their facial expression in combination with the feature extraction method to synchronize their expressions. To identify their feelings from the fine differences and facial movements or expressions in real time, we require a preset data with routine or normal facial expressions and movements. We use the ability of artificial intelligence (AI), where our algorithm plays a major role in sensing and monitoring day-to-day activities and recognizing students' panic situations. Their parent or guardian will be notified with an alert message for further action when these situations are recognized. Student data and

privacy will be given utmost priority. Our system is designed in such a way that it can be used on a local server. Accessing and controlling the data within a private network help enhance privacy, with the choice of selecting who receives the notification. The goal is to deploy a secure system that not only monitors students in real time but also provides the right support to save students from panic and promotes a positive personality. Hence, using this monitoring system the right way can save thousands of lives across the globe.

2. Literature Review

Normally, humans hide their emotions when they are in public. People tend to reserve emotions and try to control or hide their emotions, even when dealing with problems head on. However, it is challenging for someone to control their face, eye, and mouth movements when feeling certain emotions, because this usually happens reflexively. The psychologist Paul Ekman found that there are six universal basic emotions: anger, disgust, fear, happiness, sadness, and surprise.⁽⁷⁾

A complex situation is when students face panic and depression, and the caretakers are not aware of the complexities involved and their occurrence. Hence, no help is provided to students who are struggling to lead a normal panic-free life. If this happens to students who are in school, we aim to recognize and send out alerts to the caretakers through their surveillance systems. Studies indicate that students typically experience increased levels of stress while attending college.⁽⁸⁾ Students have to prepare themselves to not only recognize and manage opportunities but also maintain relationships and deal with other people. A lot of factors cause stress, such as exposure to audio–visual media, peer pressure, the high expectation of parents, bullying, physical abuse, the lack of self-esteem, and other reasons for distress.⁽⁹⁾ The buildup of stress and pressure creates a panic room in their mind, making them uncomfortable. These situations often have a negative impact and they decide to end their lives. From 2009 to 2018, suicide rates among youths aged 14–18 years increased by 61.7% from 6.0 to 9.7 per 100000 population.⁽¹⁰⁾ Therefore, the school and parents need to understand the emotions that students experience and provide the necessary care and support.

Several studies have been conducted to make it easier for teachers and parents to know the emotions of students using various technologies, one of which is by trying to read the reflexes of motion and learning behavior.⁽¹¹⁾ In this study, the correlations among the frequency of behavioral tasks and emotional state variables are evaluated. The process involves methods of recognizing emotion through facial behavior. This demonstrated that emotion recognition based on facial expression is an effective method used in identifying different emotions.⁽¹²⁾ In this study, we learn different emotions, which consist of three stages, namely, feature extraction, subset feature extraction, and emotion classification using the Haar cascade method to detect an input image and face as the basic requirement for the feature extraction of eyes and mouth. Both were successful in the detection of all five different facial expressions.

It was found that the development of technology is insufficient. Some improvements are needed to achieve higher precision and accuracy of facial expressions. Another study utilized several datasets that contain the facial expressions of children linked to their emotional state to

evaluate eight different emotions and compare them with the adult dataset. They identified limitations associated with the automated recognition of emotion in children and provided suggestions.⁽¹³⁾ Further developments include an effective approach to analyzing the facial expressions of students who are in institutes and following a routine lifestyle. This different approach helps us understand different stress levels in students. Several researchers also identified that there are connections between emotions and cognition if applied during an online class during a lecture.^(14,15)

These studies demonstrated that there are multiple things to be focused on during this sensing and detection of facial expressions to improve its accuracy and achieve our desired results. Hence, we are proposing our AI model, which helps in monitoring panic situations in students and alerting the persons in-charge. The system is designed to be secure as it functions on a private network, and authorized sharing of information is given importance. Our technology obtains data from the external sensing of facial expressions and human behavioral patterns to provide accurate results.

The proposed model not only ensures monitoring and alerting but also provides easy content sharing based on the situation. The system also provides counseling content that can be processed in a student's gadget to foster positive thoughts. This content obtained through professionals can soothe young minds and avoid harsh decisions when left alone. As the system is controlled within a private network to enhance privacy, the choice of alerting the person and counselor can be determined by their parents. This not only prevents students and young minds from making improper decisions during panic and depression, but also lets parents and teachers know about their condition. This promotes a positive personality and provides access to help at the right time.

3. Methodology

The method of monitoring and alerting the respective persons in-charge plays a vital role in creating awareness of students' situations where elders can help. This help cannot directly solve most of the issues immediately. To ensure that the alerting process is protected with an effective response and the issues faced are resolved, we provide supervised content to remove harmful thoughts. The follow-up process to identify different stages of students' mindsets and provide content based on their situation plays a major role in consoling and calming their mind. The different stages of identification are followed by providing them personalized content to view on their gadgets. These contents will be monitored and reviewed by professionals who understand mental health. These contents will be provided to students who are identified to be under panic and stress and will be approved and clearly supervised by professionals from mental health departments, who are also experienced in treating such people to avoid stress and help them remain calm. These additional steps can help the students overcome such a difficult phase and problematic mindsets. The harmful thoughts during panic and stress can be dangerous to one's own life; hence, helping students overcome them through personalized content can be very important. There are several cardiovascular fears that constantly create anxiety-filled moments and affect the lives of people who suffer from panic.⁽¹⁶⁾

We are using convolutional neural network (CNN) with feature extraction to simplify the input image and extract important parts for the identification of stress and panic. Facial expression is observed when local regions such as the forehead, eye, eyebrow, mouth, and nose change with differences in feelings. These differences are extracted from input images and processed through different layers where different convolution layers will be applied to the image. The images are further classified through monitoring of features and processing the input image. The flow of image processing is shown in Fig. 1. The final layer will help in characterizing panic and fear as an expression in the face along with facial expressions and human behavioral patterns. The algorithm will process the image and determine the needed expression detection method.

The process flow uses the input image to section the features in different situations and acts as a method to analyze, monitor, alert, and update. When we say analyze, the students in the classroom or through an online learning platform will be analyzed and identified. This process of analyzing in the future can be used for several processes, such as attendance, invigilation, and so forth. Currently, we are using this analysis for panic monitoring and sensing in students. The first major consideration flow is explained in Fig. 2. Classroom monitoring happens through the closed circuit television (CCTV) setup present inside the classroom, where the students' facial expressions and human behavioral patterns are captured and processed through our AI algorithm. The data collected through this process are transferred to a local server where processing and identification are performed.

The results of data processing will be transferred to the devices of parents and teachers as an alert message when panic or stress is observed in any of the listed students. As recent trends, normal schools and classrooms are constantly upgraded owing to the social distancing norms that are required for safety. Hence, classroom CCTV sensing with monitoring is not a helpful process of monitoring students. Online learning platforms can also be put to subjective panic

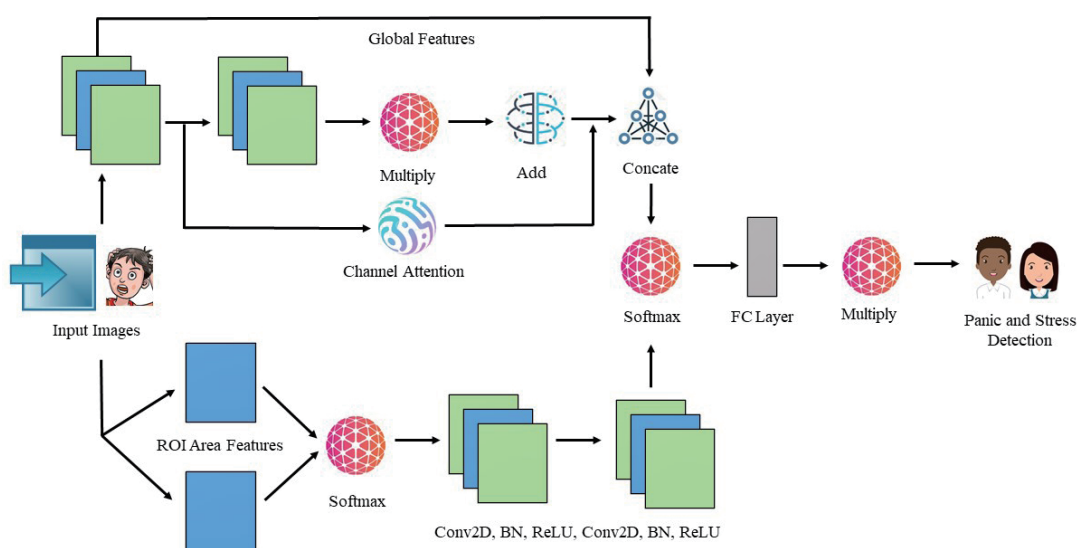


Fig. 1. (Color online) Different layers to process the input image.

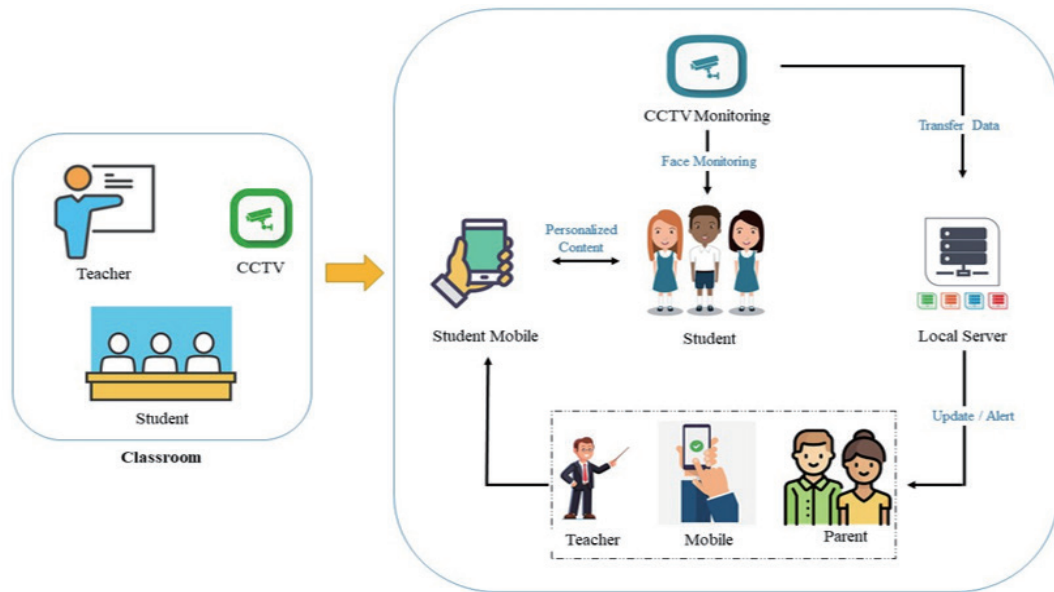


Fig. 2. (Color online) Workflow process.

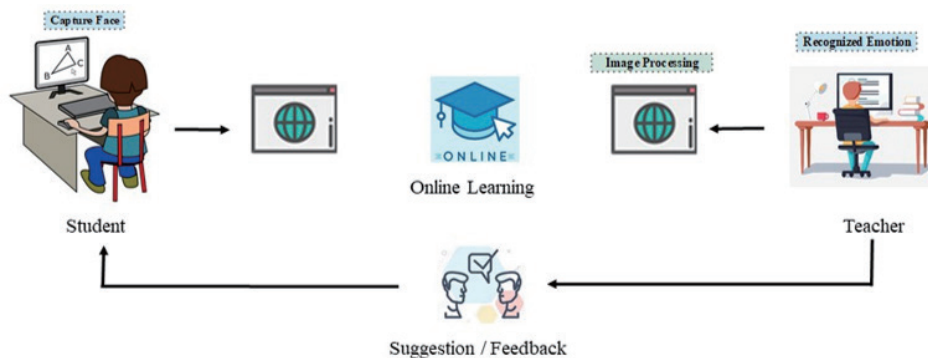


Fig. 3. (Color online) Monitoring process for online classes.

and stress monitoring through their own respective cameras. The data are again stored under a supervised local server for privacy and security. The secure flow after this data collection remains similar to the data monitoring process in classrooms. The data obtained are processed through the AI algorithm where the required identification takes place using the difference in facial expressions and their altered behavioral patterns. These recognized differences and situations are sent as an alert to parents and teachers for further follow-up action. The flow of online monitoring is shown in Fig. 3.

The above analysis, both offline and online, is performed to ensure the safety of young children and to make sure their parents and guardians are aware when their children require extra attention, care, and support. This is also performed to provide a safe place and happy surroundings to ensure a positive mindset. This support at the right time will avoid the dangerous steps taken by students during peer pressure situations. These damaging situations not only spoil

their time but also create a very bad impact on their future personality. This peer pressure and uncomfortable situation can adversely impact their future. By keeping all the harmful effects from their subjective situation and in consideration of all these issues, our generated model will capture the differences in their expression, feelings, and human behavioral patterns and produce a clear identification when there is an alarming situation.

4. Results

Our study has three different stages, including different aspects of analyzing and sensing the stress and panic in young school children. A traditional classroom always has a group of students who sit and study together; hence, a single teacher cannot provide complete attention on one student. This is a scenario in most of the offline classrooms. When some students in such classrooms experience panic situations due to several reasons explained earlier, the cameras used with our monitoring and alerting system can ensure that the situation is communicated in time. In cases of online classes, the most common mode of teaching these days, monitoring and alerting panic situations are performed through the online medium. These classes with no one-on-one interactions are making it more difficult to understand students and their feelings.

The mode of teaching can either be online or offline. There are still students left unattended, who are being monitored and addressed using our system. Our system follows facial movements and expressions, which are basically classified on the basis of an analysis that is shown in Fig. 4. The dots connect to features of a person's face; here, the expressions change the features with movements. In Fig. 4, the black dots depict the face outline and the green dots denote the features of the face such as the forehead, eyebrows, eye, and lip. The movements of these features create a different emotion or feeling, which is also denoted in the above figure. Muscle movement

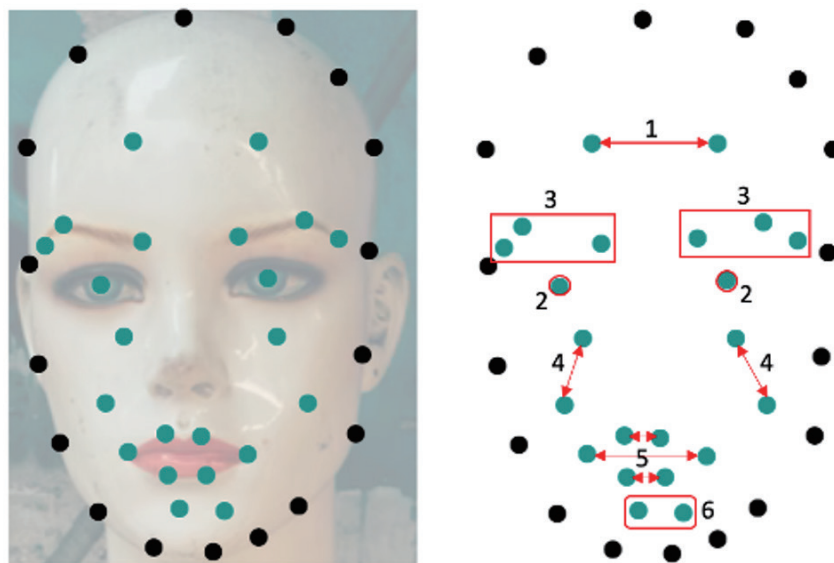


Fig. 4. (Color online) Expression analysis.

denotes different expressions, and the difference between two points from the same feature also adds to differentiating different emotions. This process differentiates normal expression from a varied expression that is observed during monitoring, and then the model utilizes feature movements and classifies them further. These add up to improve the identification accuracy, and the difference in expression is monitored and processed using our pre-set AI model with feature fusion. This model recognizes facial expressions and human behavioral patterns. All model strategies embrace the learning rate attenuation strategy. The accuracy can be further optimized with the addition of tone, frequency, and the difference in the rhythm of a person. The local areas of one's face are closely examined with different equations for each part of the face for their peer pressure situation identification. The calculation additionally includes human behavioral patterns where the hand and body actions play a major role in identifying the needed action.

The eye area is identified with the original positioning subtracted with the changed position; this helps in identifying the movement. The movement of the eye is later characterized into different emotions to identify the needed expression. The eyebrows also tend to have a different shape with a different expression; hence, we determine the origin to the moved location to identify the panic or stress. These are the major factors initially noticed to obtain the expression and feelings. The eye and eyebrow are also combined with the nose and mouth. These local features of one's face combined with body movements are the different factors used while identifying the peer pressure and panic attacks in students. These features extracted from the obtained dataset will be tested and positive results will be forwarded to the parents and teachers in-charge for further action and to provide support and care. The personalized content is also approved as a next step on student devices through professionals, which aids in the positive mindset to remove negative vibes and distractions in students' minds.

Hence, we have worked on classifying students' facial expressions and human behavioral patterns for identifying panic and stress in students with the features throughout the face and added behavioral patterns for higher accuracy in results. The previous research studies have differentiated the identification based on few definite features where the limitation to be accurate is high. The result obtained with limited feature classification can provide a false alarm and can result in unwanted or neglected situations.

Our system supports secure access control to authorized persons to ensure data privacy with additional support from professionals to provide content to motivate and enhance the presence of mind, increasing positivity in one's panic mind. There is an alert and notification sent to authorized members to provide help at the right time. These features together lead to the best way of monitoring and accessing data, ensuring easy and convenient monitoring. The previous works and research do not combine such differentiated applications.

The mode of sensing facial data is also an advantageous option as our system can use data from both online and offline classes and help parents and teachers give the right attention to students. The combination of different levels of identification for better results, different modes of monitoring feasibility, higher protection for data and supportive information, counseled content to promote positive minds, and mainly communicating the alarming situation to concerned people makes our system unique and better for usage in real time.

5. Conclusions

The desired students' monitoring and sensing are achieved successfully using CNN with an accuracy of 94%. The panic situations in students are identified, and an alert to the concerned member is sent when a student is observed to be in stress or panic. Our result combines different levels of identification, monitoring, and communication with high security and privacy. The classified facial features and behavioral patterns of students are monitored to identify alarming situations; this system can be deployed in both online and offline mediums of education.

The provision and availability to access counseled content can promote sharing positivity when students are left alone. The panic attacks and depression in students are difficult to detect as young minds tend not to share their emotions verbally with parents and teachers. This creates a boundary that makes teachers and parents unaware of the need to provide the right help at the most important time. Hence, to avoid harsh decisions and save lives of students and to provide a secure and comfortable environment to students, this solution helps in addressing the issue instantly.

This solution is aimed in creating a safe place and ensure support to students in need. In the future, this solution can be automated, making the flow simpler with the help of sensors to identify the different stages of panic. The different stages of panic can be sensed, monitored, and identified, which can help in managing panic situations accordingly with appropriate actions, and parents or teachers can provide support through a hidden layer, allowing students to slowly figure their own way out of panic. During complex and advanced panic situations, immediate action can be taken. This advancement can make a student believe in oneself and be self-reliant.

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