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Stress Evaluation and Prevention During Examinations Using Data Analytics

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ABSTRACT

Purpose: Stress can include fear, anxiety, inability to relax, increased pulse rate, difficulty in breathing, difficulty in getting proper sleep or insomnia, changes in diet, difficulty in concentrating or focussing, deterioration of existing health conditions (both physical and mental). Stress during examinations is a major concern for both students as well as their parents. Certain measures and precautions can be taken to detect this stress using modern day technologies and prevent students from taking mental pressure.

Design/Methodology/Approach: With the help of created as well as available datasets a model and research paper has been created using supervised machine learning algorithms eg: random forest algorithm to detect stress levels in humans using facial recognition.

Findings: In this proposed model, the user whose photo is being captured is signifying as happy. It can be termed that the stress level is comparatively low and, when the emotion is neutral the user may or may not be stressed and may signify neutral facial expressions. In case of sad and angry facial gestures it can be considered that the user is stressed. Although the accuracy of this model needs to be tested, this model cannot be concluded accurately as it may require a greater number of iterations and improvements.

Originality/Value: This research paper will help to understand the overall concept of face detection with the help of machine learning algorithms at early stages which can further help in early diagnosis.

Paper Type: View Point

KEYWORDS: Stress | Mental Health | Lifestyle | Data Analytics | Machine Learning | Face Recognition | Accuracy | Deep Learning

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Introduction:

Exams are stressful, there may be certain reasons why you as an appearing candidate may feel stressed during exams. Various symptoms that may occur during exams if you are under mental pressure could be:

- Loss of contact with friends and no enjoyment of activities.
- Feeling low in energy or depressed.
- Trouble in making decisions.
- Loss of appetite or eating too much(overeating).
- Lack of sleep and struggles to get out of bed.
- Difficulty in focussing while studying.
- Feeling lazy.
- Muscle tension or headaches.
- Butterfly feeling in hands or abdomen.
- Fast heartbeat or feeling unwell.
- Restlessness, nail biting or gnashing of teeth.
- Confusion or loss of consciousness during the test.
- Digestive issues and frequent sickness and many more.

Long term stress and continuous stress creates a negative effect on the overall health of a person. If a person experiences the above-mentioned symptoms regularly it is advisable that he/she should refer to a professional else such unchecked or neglected conditions may lead to chronic disease or conditions like high blood pressure, heart disease, obesity, and diabetes.

Fig. 1: Illustration of Stress

Source: Google images

This research paper will focus on detecting stress using technologies like data analytics, machine learning, face recognition, artificial intelligence, etc at early stages and further prevent using suitable methods so that he/she can have a healthy lifestyle.

Literature Review:

Machine learning has now reached a stage of development where its successes are limited by the conditions or clauses created by many practical applications. Recognition or detection of facial images obtained inoutdoor environments with different visualand/or disabilities is still an important problem. In other words, the current system is still very far from the human imagination capacity.

Machine learning algorithms are used to analyse data from these different measures and predict an individual's stress levels. This technology has the infinite potential to be used or implemented in a variety of ways or settings, including healthcare or the medical sector, education, and the workplace, to identify or distinguish individuals who may be at risk or in danger for stress-related health problems and provide targeted interventions to reduce their stress levels. However, it is important to use these tools ethically and ensure that individuals' privacy and autonomy are respected.

In certain professions, such as transportation, healthcare, and emergency services, stress can impact an individual's ability to make quick and accurate decisions, which can be dangerous. Detecting stress levels can help prevent accidents and improve safety.

Face recognition in stress detection:

Face recognition starts by detecting facial patterns in sometimes cluttered scenes, then goes on to normalize facial images to account for geometric and light changes and uses location and shape information of facial landmarks to the appropriate classification algorithms and post-processing to identify faces. Results using model-based planning and logistics feedback.

Face recognition is a tool that uses algorithms to identify and detectthe identity of a person based on their unique facial features. The process to identify unique facial features for stress evaluation typically involves the following steps mentioned underneath:

Face detection: The first or the foremost step is to detect and identify a face in an image or video. The image may be captured using external devices such as cameras or computer-connected webcams. Modern day devices are camera enabled, making this feature more accessible to the users. This is then interpreted using computer vision techniques such as Haar cascades or deep learning algorithms.

Feature extraction: Once a face is detected, the system extracts unique facial features and expressions from the image or video captured, for example the across distance between the two eyes of the detected face, the shape or the state of the nose, and the arch of the lips, formations on the cheeks, visibility of tongue and teeth may also signify

different interpretations. These features are further analysed and are used to make a mathematical portrayal of the face, called a faceprint or template.

Face matching: The detection model then analyses the faceprint of the person in the visual representation or the video footage to a database of faceprints of different expressions to determine if there is any match. This is done by calculating the similarity between the two faceprints.

Identity verification or identification: Depending on the application, the system may either verify the identity of the person in the image or video (i.e., confirm that the person is who they claim to be) or identify the person from a database of known individuals.

Face recognition is a technology that is being used in multiple industries and has a wide range of applications at a larger scale, including security and surveillance, access control, and digital authentication. However, there are also concerns about privacy and security, particularly when the technology is used without the consent or knowledge of individuals.

Fig. 2:Sample Images for Facial Recognition

Source: reserchgate.net

Currently, the overall ubiquitous deployment and implementation of surveillance cameras in surroundings or CCTV's (Closed circuit televisions), altogether with the rapid growth or increase of data collection or information visualization and analysis/investigation techniques, offers us the medium to visualize one's stress based on image succession/patterns caught from a monitoring video device. Compared with other sensory devices that were used previously, the latter offers the accompanying referenced benefits. Firstly, it is more advantageous for its clients, especially in places like schools, hospitals, and restricted areas(areas that may be accessed by authorised personnel only)like prisons, where no carry-on or portable devices are needed or allowed. Secondly, it has a very long standby or extremely lengthy reserve time and can undoubtedly reach many people at a very low-cost or at a justified price. Thirdly, the continuous or uninterrupted frames and sequences that the detection model captures enable us to grasp and analyse individuals' stressful conditions or states in a more natural way without interference and interruption of any artificial traits and factors.

Stress can also impact an individual's personal life, such as their relationships with others and their overall happiness. By detecting stress levels, individuals can take steps to manage their stress and improve their personal well-being.

Two-levelled Stress Detection Network:

Two- levelled Stress Detection Network (TSDNet), that first learns face and action-level representation separately, and then combines the results of intense flow competition for recognition of stressful states in humans.

Seeing that the indications of stress could be even more effortlessly recognized by checking the condition out and expressions.

especially fine lines or wrinkles around the nose, mouth and eyes, signs of stress can be detected more easily and discovered the importance of our facial expressions in stress detection (eyes, nose, and mouth).

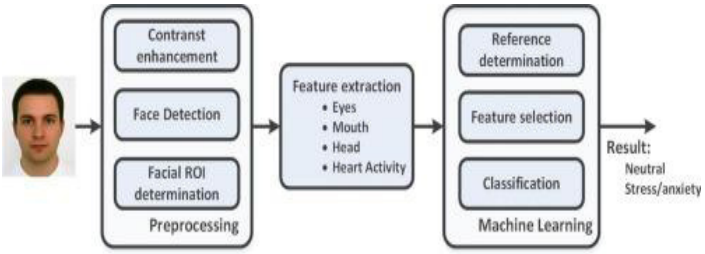

Fig. 3: Pre-processing of Image and Face Detection Mechanism

The two levels of analysis can be based on different types of data, such as physiological data and self-reported data, or on different features of the data, such as frequency and time-domain features.

In the first level of analysis, the system processes the input data to extract relevant features that are indicative of stress levels. This can involve techniques such as feature selection, feature extraction, or deep learning-based feature learning. The output of this stage is a set of feature vectors that represent the input data in a more compact and informative way.

In the second level of analysis, the system uses the extracted features to classify the input data into different stress levels. This can involve techniques such as support vector machines, neural networks, or decision trees. The output of this stage is a classification label that indicates the level of stress detected in the input data.

The two-level stress detection network can be trained using supervised learning, where labelled data is used to train the system to recognize different stress levels. The system can also be adapted to new individuals by fine-tuning the parameters of the system using a small amount of labelled data from the new individual.

Overall, a two-level stress detection network can provide a more robust and accurate method for detecting stress levels in individuals by combining different types or features of data in a multi-stage analysis.

Appropriate Measures to Prevent Stress:

- Eat an even eating regimen, get sufficient rest, and exercise consistently.
- Get up in the first part of the day and hit the hay around evening time every day simultaneously. Eat three feasts every day.
- For all intents and purposes any type of activity can go about as a pressure reliever, yet exercises, for example, strolling or running that include monotonous developments of enormous muscle gatherings can be especially pressure easing since they offer a considerable lot of similar advantages as reflection.
- Mitigating music can slow the beat and pulse, lower circulatory strain and lessen the degrees of stress chemicals and divert us from our concerns.
- Chuckling quits upsetting feelings. It assists you with a moving viewpoint, permitting you to see circumstances in a more sensible, less undermining light.
- Assisting others with canning assists with bringing us outside ourselves. It can likewise assist with diverting us from our own concerns and ponder something different.

Mindfulness: Practicing mindfulness techniques, such as paying attention to the present moment and focusing on the breath, can help reduce stress and increase feelings of calm and relaxation.

Meditation or focussing the mind on a particular object increases overall awareness and brings in mental clarity. Practicing meditation regularly can help achieve an emotionally calm and stable state of mind. It has proved to restore calmness and inner peace and prevents anxiety. Meditation does not require any external equipment and can be done for free. Positive effects of meditation are not limited to its session but lasts even after the session. It may also help in curing medical conditions.

Conclusion and Results Obtained from the Proposed Model:

The following are the sample images or screenshot captured from the output terminal which shows how different emotions can lead to different stress levels. This can also be compared with an emotion detector. Where if the emotion of the user whose photo is being captured is signifying as happy it can be termed that the stress level is comparatively low and, when the emotion is neutral the user may or may not be stressed and may signify neutral facial expressions. In case of sad and angry facial gestures it can be considered that the user is stressed. Although the accuracy of this model needs to be tested, this model cannot be concluded accurate as it may require a greater number of iterations and improvements. Also, proper testing using many test cases will also be required to ensure that this model produces accurate results.

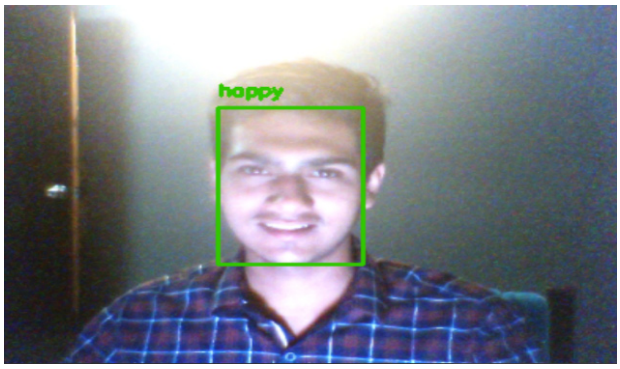

Fig. 4: Sample Image for Stress Level: Low

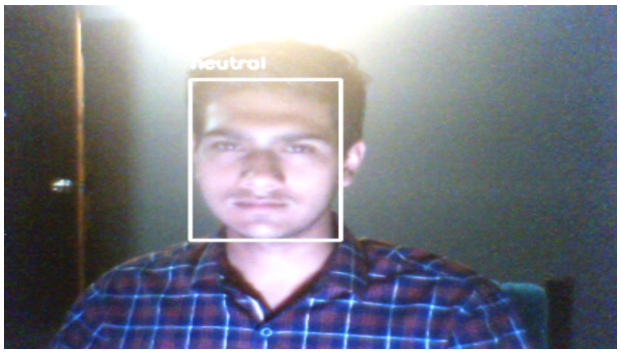

Fig. 5 : Sample Image for Stress Level: Neutral

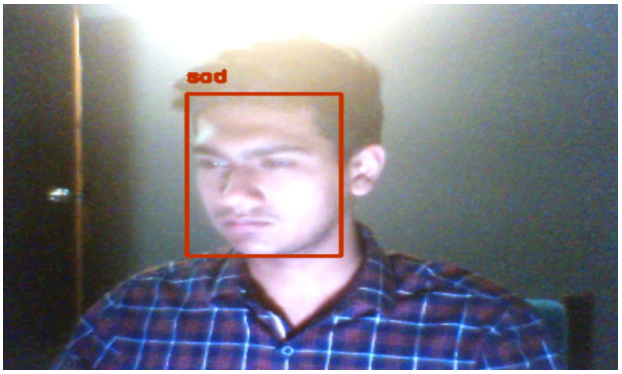

Fig. 6 : Sample Image for Stress Level: High

The following are the sample images or screenshot captured from the output terminal which shows how different emotions can lead to different stress levels. This can also be compared with an emotion detector. Where if the emotion of the user whose photo is being captured is signifying as happy it can be termed that the stress level is comparatively low and, when the emotion is neutral the user may or may not be stressed and may signify neutral facial expressions. In case of sad and angry facial gestures it can be considered that the user is stressed. Although the accuracy of this model needs to be tested, this model cannot be concluded accurate as it may require a greater number of iterations and improvements. Also, proper testing using many test cases will also be required to ensure that this model produces accurate results.

Testing a stress detection system can involve several steps, including:

- **Develop a test plan:** Before testing the stress detection system, it is important to develop a test plan that outlines the specific scenarios and test cases that will be used to evaluate the system's performance.
- **Collect data:** Data collection is an essential step in testing a stress detection system. This can involve collecting physiological data, such as heart rate, respiration rate, and skin conductance, as well as self-reported data, such as perceived stress levels.
- **Apply stressors:** Apply stressors that are known to induce stress in individuals, such as mental or physical tasks, and observe the response of the stress detection system.
- **Evaluate accuracy:** Evaluate the accuracy of the stress detection system by comparing the system's output to the actual stress levels measured during the test. This can involve calculating measures of sensitivity, specificity, and positive predictive value.
- **Test in different scenarios:** It is important to test the stress detection system in different scenarios and environments to ensure that it is robust and reliable across a range of contexts.
- **Refine the system:** Based on the results of the testing, refine the stress detection system to improve its accuracy, sensitivity, and reliability.
- **Repeat the testing:** Repeat the testing to verify that the refinements have improved the system's performance.

Overall, testing a stress detection system requires careful planning, data collection, and evaluation to ensure that the system can solve the problem more accurately, reliably, and effectively in detecting stress levels.

Limitation and Future Scope:

Researchers can invest consistent amounts of energy to work on the speed and accuracy of face detection systems to evaluate stress to empower continuous applications in different areas. This incorporates reconnaissance frameworks, biometric distinguishing proof, augmented reality, and human-PC interaction.

Further developing precision and diminishing misleading up-sides and bogus negatives, tending to difficulties like impediments, present varieties, and harsh lighting conditions. High level calculations and bigger and more different preparation datasets will add to further improved precision and quality.

Face recognition frameworks will be intended to perform well in complex situations, like swarmed conditions, low-resolution pictures or recordings, and unconstrained postures and looks. Procedures like multi-view face detection and recognition, impediment dealing with, and profound learning-based approaches will be investigated to handle these difficulties.

As face discovery turns out to be more common, there will be an expanded spotlight on protection and security concerns. Future frameworks will probably consolidate strategies to safeguard people's protection, for example, anonymization, secure information dealing with, and straightforwardness in information use. Moreover, endeavors will be made to forestall the abuse of face detection innovation, guaranteeing mindful and moral use.

Besides, progress in equipment, for example, more impressive processors and specific AI algorithms, will empower quicker and more proficient face recognition frameworks. This will add to continuous execution even on asset compelled gadgets, extending the range of stress evaluation and prevention innovation.

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The Editorial Board had used the Ouriginal – a Swedish anti-plagiarism software tool which is a fully-automatic machine learning text-recognition system made for detecting, preventing and handling plagiarism and trusted by thousands of institutions across worldwide. Ouriginal by Turnitin is an award-winning software that helps detect and prevent plagiarism regardless of language. Combining text-matching with writing-style analysis to promote academic integrity and prevent plagiarism, Ouriginal is simple, reliable and easy to use. Ouriginal was acquired by Turnitin in 2021. As part of a larger global organization GJEIS and Turnitin better equipped to anticipate the foster an environment of academic integrity for educators and students around the globe. Ouriginal is GDPR compliant with privacy by design and an uptime of 99.9% and have trust to be the partner in academic integrity (https://www.ouriginal.com/) tool to check the originality and further affixed the similarity index which is {05%} in this case (See below Annexure-I). Thus, the reviewers and editors are of view to find it suitable to publish in this Volume-15, Issue-2, Apr-Jun 2023.

Annexure 15.2.6

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Reviewers Memorandum

Reviewer's Comment 1: The title of the topic is self-explanatory and contemporary in today's time. The study utilizes data analytics techniques to evaluate stress levels and proposes preventive measures to mitigate the negative impact of stress on students' academic performance. The research presents a comprehensive and innovative approach that could have significant implications for educational institutions and student well-being.

Reviewer's Comment 2: The paper "Stress Evaluation and Prevention During Examinations Using Data Analytics" tackles an important and relevant issue concerning students' mental health during exam periods. The authors' incorporation of data analytics techniques using machine learning algorithms provides a novel approach to understanding and mitigating stress levels among students. One notable strength of the paper lies in its emphasis on preventive measures to address stress during examinations.

Reviewer's Comment 3: The Paper proposed a model for stress detection based on Face recognition. Different photos are being captured to predict whether the person is happy or sad and to signify the stress level. This research paper will help to understand the overall concept of face detection with the help of machine learning algorithms. Though the accuracy of the model needs to be further verified which opens the scope for future research.

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Conflict of Interest: Author of a Paper had no conflict neither financially nor academically.

Editorial Excerpt

The article has 5% of plagiarism which is the accepted percentage as per the norms and standards of the journal for publication. As per the editorial board's observations and blind reviewers' remarks the paper had some minor revisions which were communicated on a timely basis to the authors (Rajbala, Garvit and Laxmi), and accordingly, all the corrections had been incorporated as and when directed and required to do so. The comments related to this manuscript are noticeably related to the theme "**Stress Evaluation and Prevention During Examinations Using Data Analytics**" both subject-wise and research-wise. The paper begins by introducing the problem of stress during examinations and its potential consequences on students. The authors highlight the growing concern regarding the mental health of students. By incorporating data analytics, the authors aim to identify patterns and factors contributing to stress levels among students, and effective measures to cope up with this problem. The paper develops the concept of face detection with the help of machine learning algorithms although there is ample scope for further research on this model. Overall, the paper is well-written, well-structured, and provides a comprehensive analysis of Stress during exam and measures to mitigate them. After comprehensive reviews and editorial board's remarks the manuscript has been categorized and decided to publish under the "**View Point**" category.

Acknowledgement

The acknowledgment section is an essential part of all academic research papers. It provides appropriate recognition to all contributors for their hard work and effort taken while writing a paper. The data presented and analyzed in this paper by authors (Rajbala, Garvit and Laxmi) were collected first headedly, and wherever it has been taken the proper acknowledgment and endorsement depicts. The authors are highly indebted to others who facilitated accomplishing the research. Last but not least, endorse all reviewers and editors of GJEIS in publishing in the present issue.

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