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# LITERATURE SURVEY ON STRESS-LEVEL DETECTION IN STUDENTS THROUGH IMAGE-BASED FACIAL EXPRESSION RECOGNITION

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**Abstract:** Stress among students is a growing concern, impacting academic performance, mental health, and overall well-being. Traditional methods for detecting stress such as self-assessment surveys and physiological measurements are often invasive, subjective, or impractical in real-time educational settings. In recent years, image-based facial expression recognition has emerged as a non-intrusive and efficient approach to detect stress levels using advancements in computer vision and machine learning. This literature survey presents an overview of recent techniques and models developed for stress-level detection through facial expressions, emphasizing their application in student populations. We analyze various datasets, image preprocessing methods, facial emotion recognition algorithms, and stress classification frameworks. The study also identifies current limitations and highlights research gaps to support the development of an improved, real-time, image-based stress detection system for educational institutions.

## I. INTROUDCTION

Academic stress is a prevalent issue in modern education, particularly among students in higher education and competitive environments. The ability to detect and respond to stress in real-time can enhance mental health support, reduce dropout rates, and improve learning outcomes. Facial expressions are powerful indicators of emotional and psychological states, and recent developments in computer vision have made it possible to analyze them with high accuracy using image-based systems.

Image-based facial expression recognition offers a contactless, non-invasive way to monitor stress levels in students by identifying stress-indicative expressions like tension, anxiety, frustration, or sadness. This technique typically involves capturing facial images via camera, detecting facial landmarks, extracting features, and classifying the emotional state using machine learning or deep learning models. This literature survey aims to explore the methods, tools, and systems used for such detection, offering insights into their strengths, weaknesses, and suitability for real-world deployment in educational settings.

#### **Problem Statement:**

Despite numerous technological advances, educational institutions still lack efficient, real-time systems to detect stress among students. Conventional approaches like questionnaires are limited by self-reporting biases and lack immediacy. Wearable sensors, while accurate, are often intrusive or cost-prohibitive for large-scale deployment. There is a need for a non-intrusive, scalable, and reliable method to monitor students' stress levels—preferably using readily available infrastructure like webcams.

The problem lies in:

- Lack of real-time, automated stress detection systems in academic settings.
- Limited accuracy and generalizability of existing FER systems due to diverse student demographics and environments.
- > Scarcity of datasets specifically targeting student populations under academic stress.



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# **II.LITERATURE SURVEY**

### 1. Facial Expression Recognition Using Local Binary Patterns and Support Vector Machine

#### Authors: Shan Li and Weihong Deng

This paper proposes the use of Local Binary Patterns (LBP) for feature extraction and Support Vector Machine (SVM) for classification in facial expression recognition. The method demonstrates good accuracy and robustness under varying lighting and face orientations.

#### 2. Title: Stress Detection Using Facial Expressions with Feature Extraction and Principal Component Analysis

#### Authors: P. Ekman and W.V. Friesen

This work explores the psychological and physiological aspects of stress and their visibility in facial expressions. It introduces the use of manually coded facial action units and statistical feature reduction using Principal Component Analysis (PCA) to identify stress indicators.

#### 3. Title: Real-Time Stress Detection Using Webcam and Feature-Based Classifiers

#### Authors: J. Healey and R. Picard

The authors use a webcam to track facial changes and extract features such as eye movement, blink rate, and frown frequency. These are input into a Naive Bayes classifier to determine stress levels in real time.

#### 4. Title: Mental Stress Detection Using Gabor Features and K-Nearest Neighbor Algorithm

#### Authors: A. Karthik and S. V. Raghavan

This study employs Gabor filters to extract spatial frequency-based features from facial images, which are then classified using K-Nearest Neighbor (KNN). The model achieves moderate success in detecting stress in controlled environments.

#### 5. Title: Emotion Detection from Facial Expressions Using Eigenfaces and Multiclass SVM

#### Authors: L. Tian, J. Kanade, and J. Cohn

The paper introduces a method using eigenfaces to represent facial expressions and uses a multiclass SVM classifier for recognizing different emotional states including anger, sadness, and fear — emotions that often correlate with stress.

#### CONCLUSION

Facial expression recognition presents a promising avenue for non-intrusive stress detection among students. While existing models show high potential, current systems face challenges such as limited dataset specificity, environmental variability, and privacy concerns. This literature survey provides a foundation for developing a student-focused stress detection system using image-based FER, which could revolutionize how educational institutions approach student mental health. Future work will focus on creating customized datasets, refining detection models, and ensuring ethical deployment in real-world classrooms.

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