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STRESS DETECTION USING FACIAL EMOTION RECOGNITION

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ABSTRACT

Today, mental stress has appeared to be the main issue that mainly affects youngsters and university students. The age which was believed to be least stressed is now engaged with plenty of stress. So this project will attempt to come up with a Facial Emotion Recognition System to Detect Mental Stress for students in universities and counseling departments of institutions in an attempt to fight with the stress of mind. Facial Emotion Recognition is a field of study that involves the use of technology to identify and interpret human emotions based on facial expressions. It has been used in various applications such as healthcare, human-computer interaction, and security. Stress detection is one of the most important applications of Facial Emotion Recognition, which is beneficial in the early diagnosis and treatment of stress-related disorders. The system uses computer vision and machine learning Algorithms to analyze facial features and detect emotions like happy, sad, anger, and fear. The system is for detecting mental stress; this detection could be done on individuals by analyzing facial expressions of the user.

Keywords: Real Time, Facial Emotion Recognition, Network Layering, Facial Expression.

I. INTRODUCTION

A present seriously challenging world, main mental tension is for youth and the students of a university. The most non-acting age group faces tremendous levels of stress presently. There have been many controversial instances defining "stress" while mostly emphasizing on the synonymization between that stress or unfavorable life event caused some kind of "distress" in form of being physiological, psychological or an emotional one. Academic-related problems among students studying in universities are attributed, following an investigation by Rana et al. depression, lack of interest in attending class, struggles with comprehension, and suicidal ideation due to poor self-esteem. The article further shows that the emotional signs of high stress levels include anger, impatience, frustration, or moodiness. Hence, this project targets developing a Facial Emotion Recognition system for Mental Stress Detection that can detect indication of stress on the part of university students from facial expressions. A facial expression refers to a form of nonverbal communication that uses one or more facial muscles movement to express an individual's feelings and emotional state. Nonverbal communications are communication between humans through eye contact, facial expression, gesture, body reflects a unique psychological activity with a unique expression. These six main emotions are called basic emotions and consist of anger, happy, sad, surprise, disgust, and fear.

II. METHODOLOGY

The stress analysis system developed in this research leverages facial expression recognition techniques to detect and analyze emotional states indicative of stress levels. The system comprises two main components: stress prediction and stress analysis

1.Data Collection and Pre-processing:

A dataset of facial images annotated with corresponding emotional states was collected for model training. These images were pre-processed to ensure uniformity in size (48x48 pixels) and converted to grayscale format to reduce computational complexity. The dataset was divided into training and validation sets using holdout validation.

2.Stress Prediction:

The stress prediction component utilizes a convolutional neural network (CNN) model trained to recognize facial expressions associated with different emotional states, including stress. The CNN architecture consists of multiple convolutional layers followed by max-pooling, batch normalization, dropout, and dense layers. The

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model was trained using the training dataset, with the Adam optimizer and categorical cross-entropy loss function.

3.Stress Analysis:

The stress analysis component utilizes the trained stress prediction model to analyze real-time facial expressions captured through a camera feed. The OpenCV library is used for face detection, and the predicted emotional states are logged along with timestamps into a CSV file for further analysis. Emotion labels such as 'Happy,' 'Sad,' 'Angry,' 'Surprise,' 'Neutral,' and 'Fear,' are assigned based on the model predictions.

4.Analysis and Visualization:

The logged emotional data is analyzed to generate various visualizations, including emotion trends over time, emotion distribution over time, average stress level every 20 seconds, and daily average stress level. Matplotlib and Pandas libraries are employed to create these visualizations, which provide insights into the user's emotional state fluctuations and stress levels.

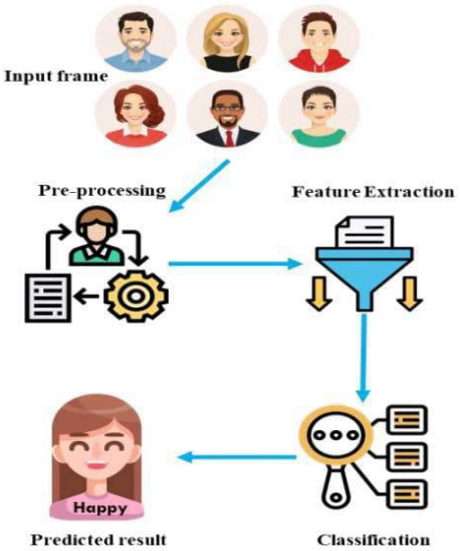
5.Recommendation System:

Based on the analysis results, personalized recommendations are generated to help users manage their stress levels effectively. These recommendations include relaxation techniques, mindfulness exercises, physical activities, and social interactions tailored to the user's current emotional state and stress level.

6.Deployment and Integration:

The stress analysis system is deployed as a web-based application using the Flask framework, allowing users to access it via a web browser. The system's user interface provides functionalities for stress prediction, real-time analysis, visualization, and recommendation display. Integration with existing software systems or standalone usage is facilitated, enabling seamless incorporation into various applications for stress management and well-being monitoring.

III. MODELING AND ANALYSIS



IV. RESULTS AND DISCUSSION

The results and discussion may be combined into a common section which is consists of integrated form of website interface and the web-application which gives the predicted result in real-time and a warning system which holds a recommendation system if the person is stressed. This research created a real-time emotion recognition system that was intended to examine facial expressions and deduce stress levels. Through the combination of deep learning and computer vision algorithms, we created a model that could identify seven different emotions. Pattern and trend analysis of emotional expressions provided useful information on stress dynamics. The visualization of the distribution and mean stress levels of various emotions showed the

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contextual variations of stress. These results highlight the necessity of ongoing stress monitoring and preventive management for general well-being. Through utilization of the system's suggestions, one can implement targeted measures to avoid stressors and improve mental health.

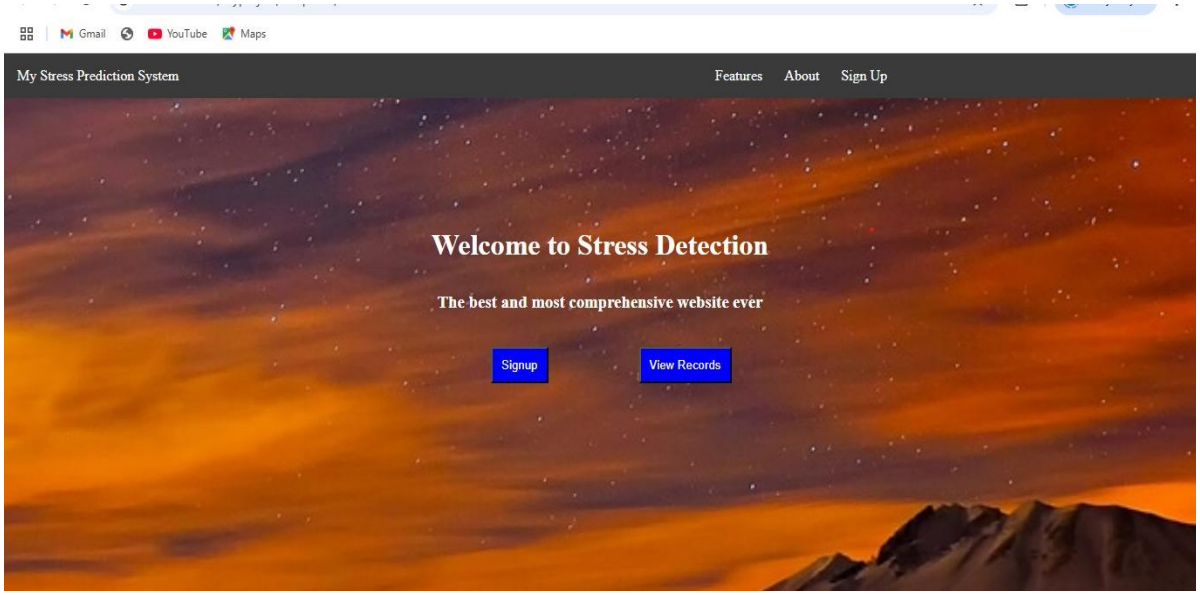

Figure 1: User Interface of Home Page

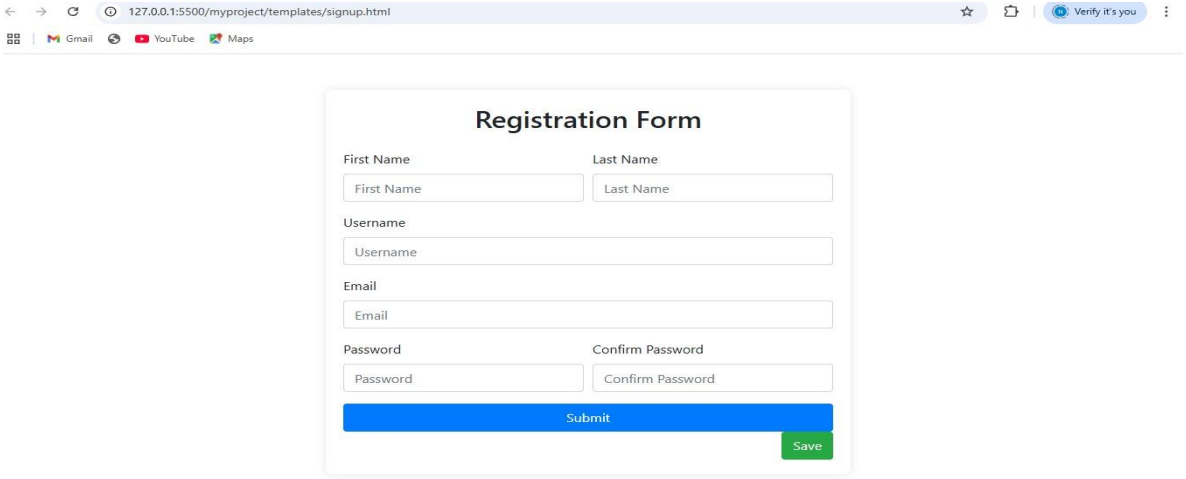

Figure 2: User Interface of Registration Form

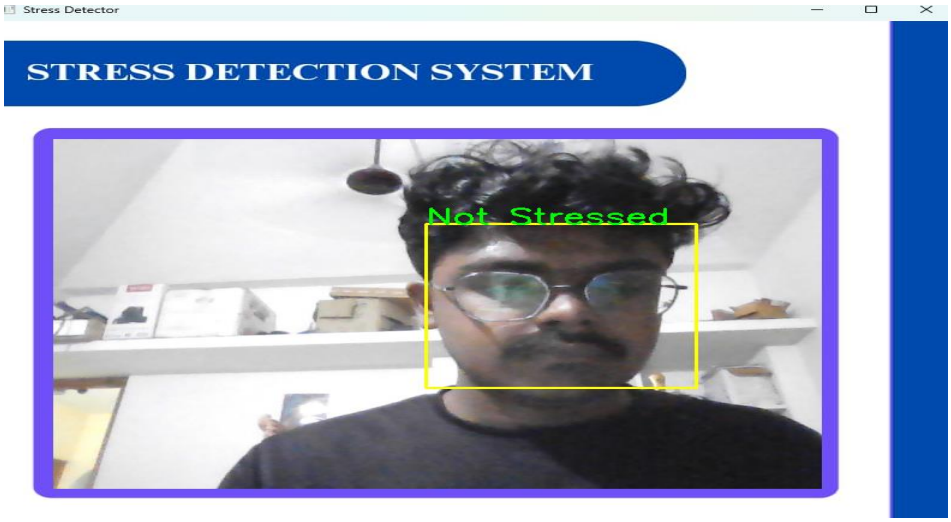

Figure 2: Classified Emotion (Not stressed)

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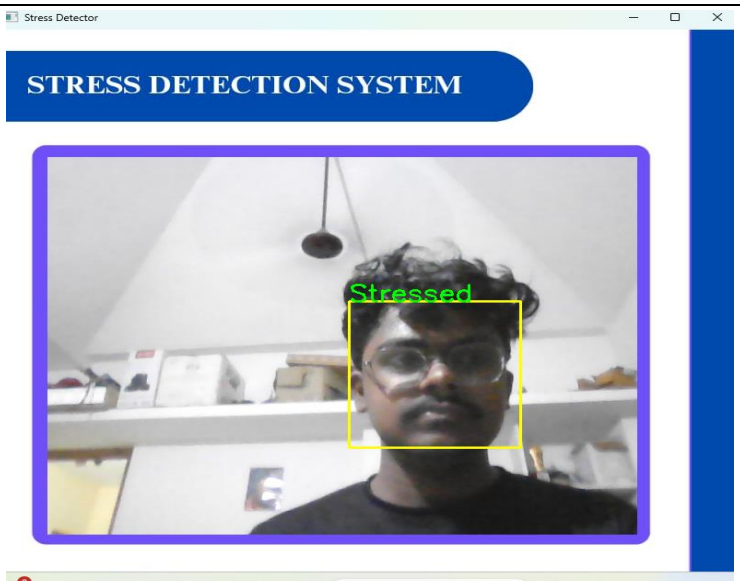

Figure 3: Classified Emotion (stressed)

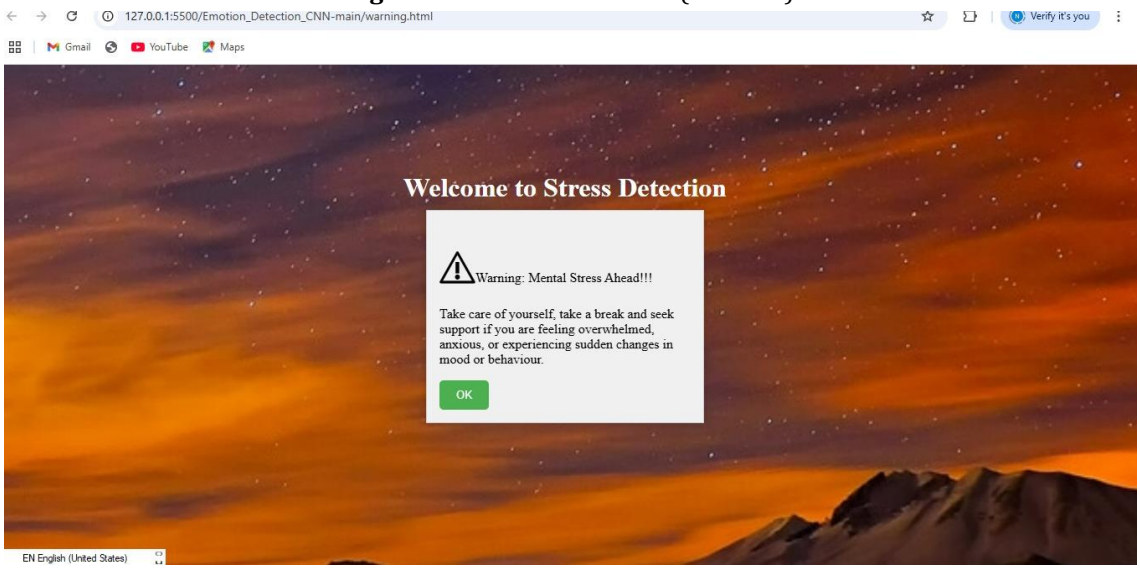

Figure 4: Recommendation System

V. CONCLUSION

In this study, we designed an emotion detection system that could look into facial expressions in real time to determine the stress levels. We have integrated machine learning techniques and computer vision algorithms in this project to train a model capable of recognizing seven different emotions, namely Happy, Sad. The patterns and trends of stress and emotional expressions analyzed in this study were worthwhile outcomes. With the visualization of trends, distribution, and average stress levels of emotions, we realize how stress arises and ebbs within different contexts. The findings highlight the need for monitoring and proactively managing stress for maintaining overall wellness. People can adopt targeted strategies through the use of recommendations that come from analyzing stress levels in reducing stressors and promoting mental well-being.

Further research areas would include enhancing the accuracy and robustness of emotion detection models in various demographic populations and environmental settings. Moreover, investigating how the suggested intervention strategies, derived from stress analysis, may actually work would strengthen the development of more targeted and personalized interventions for managing stress. In summary, our work demonstrates how machine learning and computer vision can be applied in real-time to assess stress, but more importantly, actionable insights can be used to support proactivity in personal management in order to achieve a healthy level of life.

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