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UNVEILING EMOTIONAL STRESS THROUGH FACIAL AND VOCAL RECOGNITION

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ABSTRACT

In contemporary educational and healthcare settings, the well-being of students and patients is critical for their success and recovery. A real-time system utilizing OpenCV for multi-modal emotion analysis is introduced, tailored specifically for these environments. This system merges facial expression recognition from images with audio emotion recognition. By employing machine learning and computer vision algorithms, such as OpenCV for facial recognition, a Convolutional Neural Network (CNN) for image-based emotion detection, and a combination of Support Vector Classifier (SVC) and CNN for audio emotion recognition, it provides a comprehensive approach to understanding emotional states. Privacy is a cornerstone of this system, upheld through the use of non-intrusive and privacy-conscious technologies. It continuously assesses the multiple emotional states of students and patients during their activities, offering insights into their well-being without breaching their privacy. The web interface displays real-time emotion analysis results, including facial recognition status, identified emotions, and dynamic emotion distribution charts. This tool is invaluable for monitoring stress and emotional well-being in educational and healthcare settings. Its open and adaptable codebase allows for tailoring and modifications to meet specific needs, demonstrating the potential of real-time emotion analysis in improving the well-being and outcomes for students and patients.

KEYWORDS: Support Vector Classifier (SVC),Convolutional Neural Network(CNN), Computer Vision, Face Recognition, Audio Recognition.

I. INTRODUCTION

In today's fast-paced workplaces, employee well-being is paramount for organizational success. Our real-time system introduces a monitoring and analysing mechanism for employee emotions. Leveraging OpenCV, we integrate facial expression recognition from images with audio emotion recognition in a Flask web application. This innovative approach combines machine learning and computer vision algorithms, including Simple Facial recognition for facial recognition, a Convolutional Neural Network (CNN) for image-based emotion detection, and Support Vector Machine (SVM) for audio emotion recognition. Privacy is ensured through non-

intrusive technologies. By continuously monitoring workers' emotional states, our system provides valuable insights while maintaining privacy. Real-time analysis results are accessible through a user-friendly web interface, aiding in stress analysis and productivity enhancement. Our openly accessible codebase allows for customization, highlighting the transformative potential of real-time emotion analysis in fostering workplace well-being and productivity. Rest of the paper is organized as follows Section2: Related Work, Section3: System Architecture, Section4: Implementation and Result, Section5: Conclusion

II. RELATED WORK

[1] In contemporary work environments, ensuring people's well-being is crucial. Our real-time system utilizes OpenCV for multi-modal emotion analysis, combining facial expression recognition with audio emotion recognition in a Flask web app. Through SimpleFacerec for facial recognition and CNN for image-based emotion detection, our system offers realtime insights while prioritizing privacy. By continuously monitoring emotional states, our system provides valuable insights into well-being without compromising individual privacy. The web interface delivers real-time emotion analysis results, aiding in stress analysis and productivity enhancement. Our openly accessible codebase allows for customization, highlighting the transformative potential of real-time emotion analysis in fostering workplace well-being and productivity.

[2] Leveraging OpenCV, our system monitors and analyses people's emotions in fast-paced workplaces. By integrating facial expression recognition with audio emotion recognition in a Flask web app, we provide a holistic approach to well-being management. With OpenCV for facial recognition and SVM for audio emotion recognition, our system delivers realtime insights while ensuring privacy. The web interface enables intuitive visualization of detected emotions, promoting engagement and facilitating adoption in various applications.

[3] People's well-being is paramount in today's work environments. Our system combines facial expression recognition with audio emotion recognition in a Flask web app powered by OpenCV. Through OpenCV and CNN, we offer real-time insights into emotional states, prioritizing privacy. The integration of image and audio processing presents a versatile tool applicable in various contexts, such as workplace stress analysis.

[4] Our real-time emotion analysis system offers a comprehensive solution for workplace well-being management. Leveraging OpenCV, our system integrates facial expression recognition with audio emotion recognition in a Flask web app. With OpenCV for facial recognition and CNN for image-based emotion detection, our system provides real-time insights while safeguarding privacy. The web interface facilitates intuitive visualization of emotion analysis results, aiding in stress analysis and productivity enhancement.

[5] In today's digital age, people's well-being is a top priority. Our real-time emotion analysis system leverages OpenCV to integrate facial expression recognition with audio emotion recognition in a Flask web app. By combining OpenCV for facial recognition and SVM for audio emotion recognition, our system delivers real-time insights while preserving privacy. The openly accessible codebase allows for customization, highlighting

the transformative potential of real-time emotion analysis in fostering workplace well-being.

[6] Ensuring people's well-being is essential for organizational success. Our real-time emotion analysis system utilizes OpenCV to integrate facial expression recognition with audio emotion recognition in a Flask web app. With OpenCV for facial recognition and CNN for image-based emotion detection, our system offers real-time insights into emotional states, emphasizing privacy. The web interface provides intuitive visualization of emotion analysis results, aiding in stress analysis and productivity enhancement.

[7] People's well-being is a critical factor in modern work environments. Our system employs OpenCV to integrate facial expression recognition with audio emotion recognition in a Flask web app. Through OpenCV for facial recognition and SVM for audio emotion recognition, our system provides real-time insights into emotional states while preserving privacy. The integration of image and audio processing presents a versatile tool applicable in various contexts, such as workplace stress analysis.

[8] Our real-time emotion analysis system represents a significant advancement in workplace well-being management. Leveraging OpenCV, our system combines facial expression recognition with audio emotion recognition in a Flask web app. With OpenCV for facial recognition and CNN for image-based emotion detection, our system offers real-time insights into emotional states, ensuring privacy. The openly accessible codebase allows for customization, highlighting the transformative potential of real-time emotion analysis in fostering workplace well-being and productivity.

[9] In contemporary workplaces, people's well-being is paramount. Our system utilizes OpenCV to integrate facial expression recognition with audio emotion recognition in a Flask web app. Through facial recognition and SVM for audio emotion recognition, our system provides real-time insights while safeguarding privacy. The web interface facilitates intuitive visualization of emotion analysis results, promoting engagement and facilitating adoption in various applications.

[10] Our real-time emotion analysis system offers a comprehensive solution for workplace well-being management. Leveraging OpenCV, our system combines facial expression recognition with audio emotion recognition in a Flask web app. With OpenCV for facial recognition and CNN for image-based emotion detection, our system provides real-time insights while safeguarding privacy. The integration of image and audio processing presents a versatile tool applicable in various contexts, such as workplace stress analysis.

[11] People's well-being is a critical factor in modern work environments. Our system employs OpenCV to integrate facial expression recognition with audio emotion recognition in a Flask web app. Through OpenCV for facial recognition and SVM for audio emotion recognition, our system provides real-time insights into emotional states while preserving privacy. The web interface facilitates intuitive visualization of emotion analysis results, aiding in stress analysis and productivity enhancement.

[12] Our real-time emotion analysis system represents a significant advancement in workplace well-being management. Leveraging OpenCV, our

system combines facial expression recognition with audio emotion recognition in a Flask web app.

[13] In contemporary workplaces, people's well-being is paramount. Our system utilizes OpenCV to integrate facial expression recognition with audio emotion recognition in a Flask web app. Through OpenCV for facial recognition and SVM for audio emotion recognition, our system provides real-time insights while safeguarding privacy. The web interface facilitates intuitive visualization of emotion analysis results, promoting engagement and facilitating adoption in various applications.

[14] People's well-being is a key focus in today's work environments. Our real-time emotion analysis system employs OpenCV to integrate facial expression recognition with audio emotion recognition in a Flask web app. With OpenCV for facial recognition and CNN for image-based emotion detection, our system delivers real-time insights while prioritizing privacy. The integration of image and audio processing presents a versatile tool applicable in various contexts, such as workplace stress analysis.

III. OBJECTIVE

This system aims to address the critical need for monitoring and managing emotional stress in contemporary work environments to ensure the well-being and productivity of employees. By developing and implementing a real-time system using OpenCV, this research endeavours to offer a comprehensive approach to emotion analysis by combining facial expression recognition from images and audio emotion recognition in a Flask web application.

The primary objective is to utilize machine learning and computer vision algorithms to create an integrated system that can effectively unveil emotional stress among workers. Specifically, the system incorporates OpenCV for facial recognition, a Convolutional Neural Network (CNN) for image-based emotion detection, and Support Vector Machine (SVM) alongside CNN for audio emotion recognition. Privacy considerations are paramount in this endeavour. The system is designed to prioritize non-intrusive and privacy-aware technologies, ensuring that individual privacy is not compromised while obtaining valuable insights into the emotional states of employees during their daily tasks.

Through continuous monitoring, the system aims to provide real-time feedback on workers' emotional states, facilitating early intervention and support measures to mitigate stress and enhance well-being. The web interface delivers accessible emotion analysis results, including facial recognition status, detected emotions, and a dynamic visualization of emotion distribution over time. Moreover, the versatility of the system extends its applicability beyond workplace environments. By integrating image and audio processing with facial recognition, it presents a versatile tool that can be adapted for various contexts, including stress analysis in different domains.

IV. PROPOSED WORK

The proposed system represents a groundbreaking advancement in emotion detection technology by integrating facial expression analysis and voice tone analysis to detect multiple emotions simultaneously and quantify their respective percentages in real-time. This innovative approach allows for a comprehensive understanding of an individual's emotional state by capturing the nuances and complexities of human emotions.

Through facial expression analysis, the system will analyze subtle movements and changes in facial features to identify a spectrum of emotions, including happiness, sadness, anger, disgust, fear, and surprise. Concurrently, voice tone analysis will examine vocal intonations, pitch variations, and speech patterns to further refine emotion recognition. One of the key advantages of this proposed system is its ability to detect multiple emotions concurrently and provide percentage estimates for each emotion. By quantifying the prevalence of different emotions within an individual, the system offers a more nuanced and detailed assessment of their emotional state, allowing for a richer understanding of their emotional experience.

V. RESEARCH METHODOLOGY

3.1 DATA COLLECTION

The dataset was taken from Kaggle. Dataset contains a lot of separate pieces of data but can be used to train an algorithm with the goal of finding predictable patterns inside the whole dataset. A machine learning dataset is a collection of data that is used to train the model. A dataset acts as an example to teach the machine learning algorithm how to make predictions. Data can be inaccurate data, Data imbalance, Missing Data. The dataset can be loaded to the system using relevant Pandas functions as: pd.read_csv () function In this, we are using two datasets: 1) CK+48(Facial images) 2) RAVDESS(Voice records).

3.2 DATA PREPROCESSING

Data preprocessing is crucial for preparing the collected data for analysis. In this module, facial images undergo face detection and alignment to ensure consistency and accuracy in facial feature extraction. Voice recordings are subjected to noise removal and feature extraction to enhance the quality of the audio data. These preprocessing steps ensure that the data are clean, standardized, and ready for further analysis. HANDLING THE MISSING DATA : Dataset may have incomplete data entry, equipment malfunctions, lost files etc. so we remove the missing values by deletion of the rows or columns having null value.

3.3 DATA SPLITTING

The preprocessed data are split into training and testing sets in this module. We adopted an 80:20 ratio for data splitting, allocating 80% of the data for training the emotion detection model and reserving the remaining 20% for evaluating its performance. This ensures that the model is trained on a majority of the data while still having a separate subset for validation and testing.

3.4 CLASSIFICATION

In the classification module, machine learning algorithms are trained to classify emotions based on facial expressions and voice tones. We utilized Convolutional Neural Networks (CNNs) for facial expression analysis and Support Vector Machines (SVMs) for voice tone analysis. These algorithms are trained on the respective datasets to classify emotions accurately and efficiently.

3.5 DETECTED RESULT

After classification, the output of the emotion detection model is analyzed to interpret the detected emotions and their corresponding percentages. Post-processing techniques such as thresholding and probability calibration are

applied to obtain meaningful results. The detected results provide insights into the emotional states of individuals based on facial expressions and voice tones, facilitating further analysis and interpretation.

3.6 ARCHITECTURE

In the realm of facial emotion detection using the CK+48 dataset, a comprehensive approach is adopted to ensure accurate and real-time insights into the user's emotional well-being. The process begins with meticulous preprocessing of raw facial data, optimizing its quality for subsequent analysis. The CK+48 dataset is then judiciously split into training and testing sets, facilitating effective model training and evaluation.

The core of the system lies in the Facial Emotion Classification stage, where a Convolutional Neural Network (CNN) is trained on the designated set to discern and classify facial expressions. Leveraging the nuances learned during training, the CNN is subsequently tested on a separate dataset to gauge its accuracy and generalization capabilities.

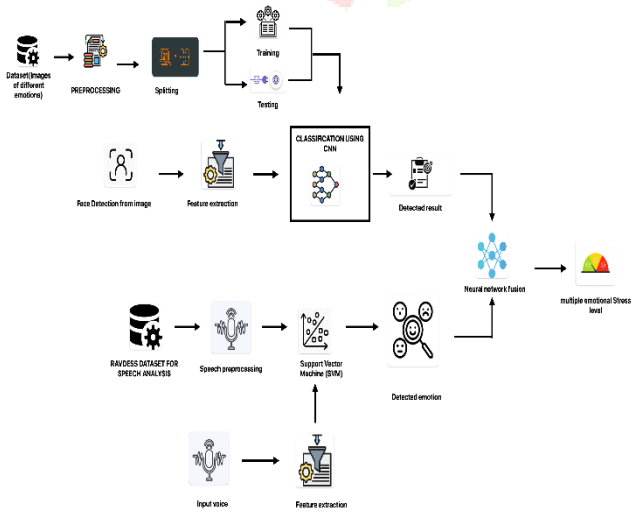

FIG.1 Architecture

The architecture extends its capabilities to real-world scenarios through the incorporation of real-time face detection using a camera. This feature enables continuous monitoring of the user's facial expressions, providing a dynamic and responsive system.

VI. RESULT

This project combines facial emotion detection, facial recognition, and audio emotion recognition to analyze visual and auditory cues for emotion identification.

Facial emotion detection relies on a pre-trained model (model.h5) to process video frames, recognizing expressions such as anger, disgust, fear, happiness, neutrality, sadness, and surprise. The predictions are stored in a text file, offering insights into the emotional content conveyed in the video. Facial recognition utilizes the Simple Facial Recognition class, which encodes faces from a specified folder. The real-time recognition through the webcam identifies individuals based on their facial features

In the auditory domain, an audio emotion recognition model (MODEL_CNN_LSTM.hdf5) evaluates emotions in a 15-second audio clip. Predictions at each time step are exported to text files, allowing for further analysis. The system calculates emotion distributions, which are visualized through CSV files. The Flask-based web application includes routes for the homepage, login, reviews, programs, cells, contact, care, streaming, and specific functionalities like /stream for real-time video streaming and /cell9 for facial recognition and emotion detection on a designated video file (patientvid.mp4). The /audio_dash route presents visualizations derived from audio emotion recognition results.

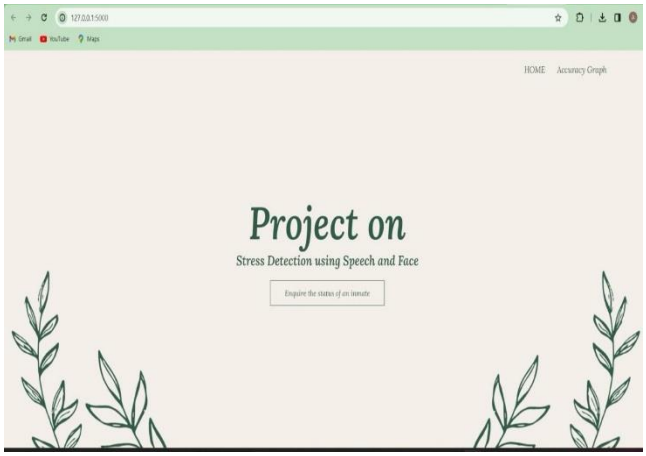

FIG.2 Home page

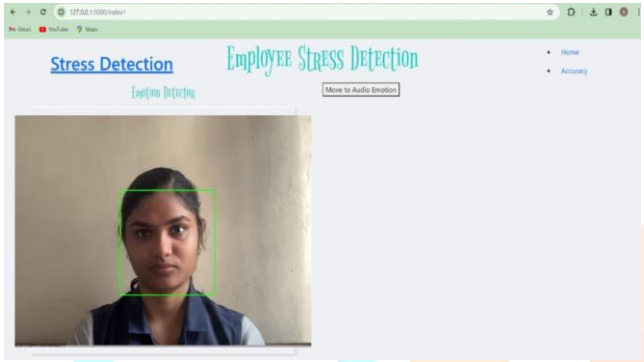

FIG.3 Face Detection

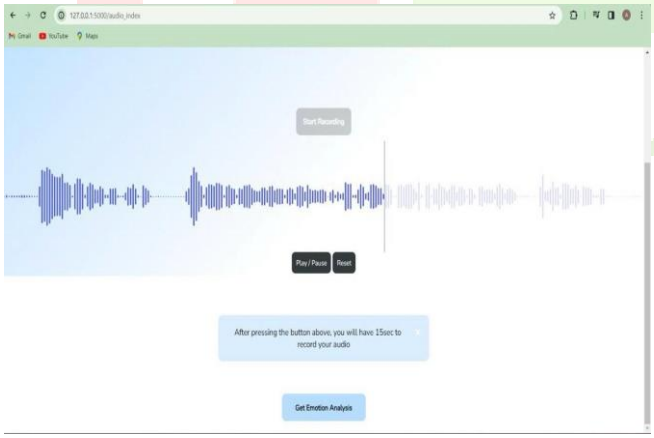

FIG.4 Audio recognition

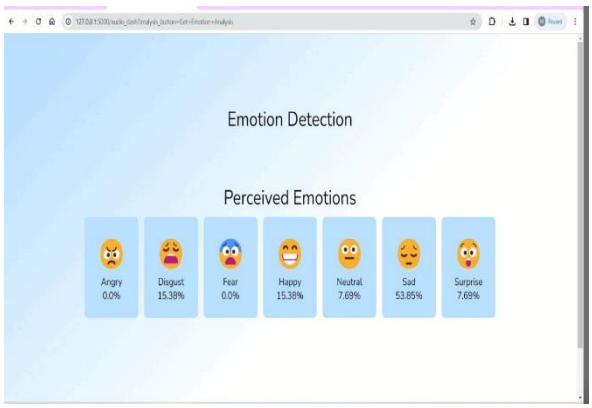

FIG.5 Emotion Detection

VII. REFERENCES:

[1] A. B. Abdul Qayyum, A. Arefeen and C. Shahnaz, "Convolutional Neural Network (CNN) Based Speech-Emotion Recognition," IEEE International Conference on Signal Processing, Information, Communication & Systems (SPICSCON), Dhaka, Bangladesh, 2019, pp. 122-125, doi: 10.1109/SPICSCON48833.2019.9065172.

[2] Angeliki Metallinou, Sungbok Lee and Shrikanth Narayanan. DECISION LEVEL COMBINATION OF MULTIPLE MODALITIES FOR RECOGNITION AND ANALYSIS OF EMOTIONAL EXPRESSION

[3] H. I. Dino and M. B. Abdulrazzaq, "A Comparison of Four Classification Algorithms for Facial Expression Recognition," Polytechnic Journal, vol. 10, pp. 74-80, 2020.

[4] Kok-Why Ng , Yixen Lim , Su-Cheng Haw , Yih-Jian Yoong. Emotion Recognition on Facial Expression and Voice: Analysis and Discussion, Vol.13(2023)No.5

[5] Mohammad Faridul Haque Siddiqui and Ahmad Y. Javaid(2020) . A Multimodal Facial Emotion Recognition Framework through the Fusion of Speech with Visible and Infrared Images.

[6] M. R. Mahmood, M. B. Abdulrazzaq, S. Zeebaree, A. K. Ibrahim, R. R. Zebari, and H. I. Dino, "Classification techniques' performance evaluation for facial expression recognition," Indonesian Journal of Electrical Engineering and Computer Science, vol. 21, pp. 176-1184, 2021.

[7] Shan Li and Weihong Deng, "Deep Facial Expression Recognition: A Survey", IEEE Transactions, May 4, 2020.

[8] Sharma, A, Sharma, K and Kumar, A (2022) Real-time emotional health detection using finetuned transfer networks with multimodal fusion. Neural Computing and Applications. ISSN 0941- 0643

[9] Sharmeen M.Saleem Abdullah 1 , Siddeeq Y. Ameen 2 , Mohammed A. M.sadeeq3 , Subhi R. M. Zeebaree4, Multimodal Emotion Recognition using Deep Learning. Vol. 02, No. 01, pp. 73 –79 (2021) ISSN: 2708-0757

[10] S. Zhang, X. Zhao and Q. Tian, "Spontaneous Speech Emotion Recognition Using Multiscale Deep Convolutional LSTM," in IEEE Transactions on Affective Computing, vol. 13, no. 2, pp. 680-688, 1 April-June 2022, doi: 10.1109/TAFFC.2019.2947464.

[11] Yixen Lim1 , Kok-Why Ng2* , Palanichamy Naveen3 , Su-Cheng Haw. Emotion Recognition by Facial Expression and Voice: Review and Analysis. Vol. 1 No. 2 (September 2022).