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Real time stress monitoring system for workers using IOT and Machine Learning

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Abstract
The work presents the design of a real-time stress estimation system using wearable sensors and machine learning techniques. Through ongoing sensing of physiological responses such as heart rate, skin conductance, and motion data, the system is able to estimate levels of stress in close to real time. A slim machine learning approach offers fast and effective processing in order for the system to be used in real time. Customers receive immediate alerts and stress-reducing advice specifically for them through a smartphone application. The technology also solves main pain points like noise in signals, delay, and data privacy. Its flexibility and accuracy allow it to be applied to many areas including health care, office wellness, and personal mental well-being assistance

***Key Words*:** Real-time stress prediction, worker stress monitoring, physiological sensors, machine learning, vibration therapy, workplace wellness, stress relief system.

1. INTRODUCTION
Stress has become a common issue in the fast-paced world of today, having a great impact on mental health, productivity, and overall quality of life. Chronic stress can cause serious health complications like anxiety disorders, depression, and cardiovascular diseases. Conventional methods of stress evaluation, such as questionnaires and clinical assessments, are based on This project proposes a real-time stress recognition system based on physiological signals, which are heart rate variability (HRV), electrodermal activity (EDA), and skin temperature. The aim is to create an intelligent and interactive solution that delivers instant feedback and useful insights for the users. Major challenges tackled in this research include reducing sensor noise, low-latency processing, and preserving the privacy of users' data. The system is not only intended for personal use but also for more extensive applications in corporate wellness programs and preventive medicine. The work adds to affective computing by suggesting a real-time and scalable stress detection framework, ultimately with the goal of enabling early intervention and enhancing mental health outcomes

2. Body of Paper

1. GSR Sensor: Measures electrodermal activity, a reflection of stress and emotional arousal. It's one of the system's important inputs for its stress detection functionality.

2. Input Mode Switches: They enable the calibration of the sensor or changing modes of operation to provide better control to the users.

3. Display Unit: Feedback in real time is given here, e.g., indicators of stress level or system status messages.

4. ATMega328 Controller: The central core of the system, this microcontroller handles input data from the sensors and regulates overall system operations.

5. Power Supply: Provides stable power supply to all hardware components.

6. UART Communication: Facilitates serial data transfer between the microcontroller and external devices, like computers, for detailed data analysis.

7. IoT Integration: Enables the system to wirelessly connect to cloud platforms or mobile devices, allowing remote monitoring, data logging, and future integration with machine learning services.

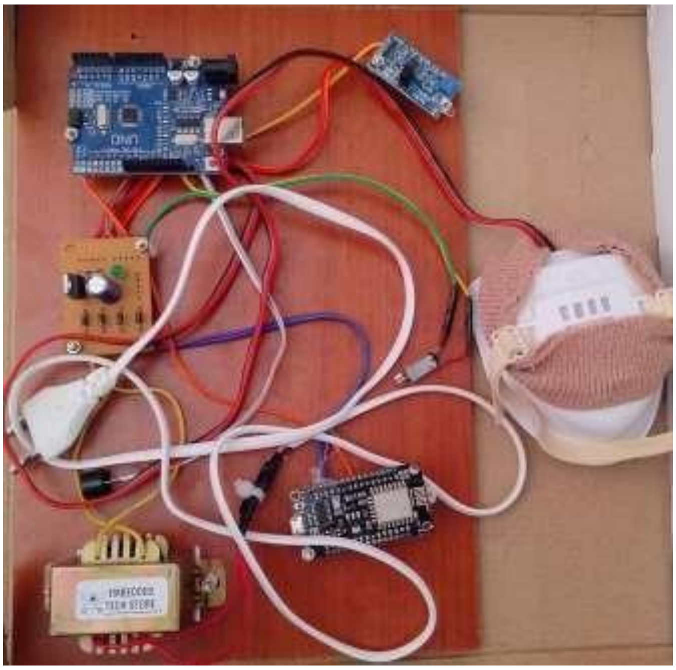
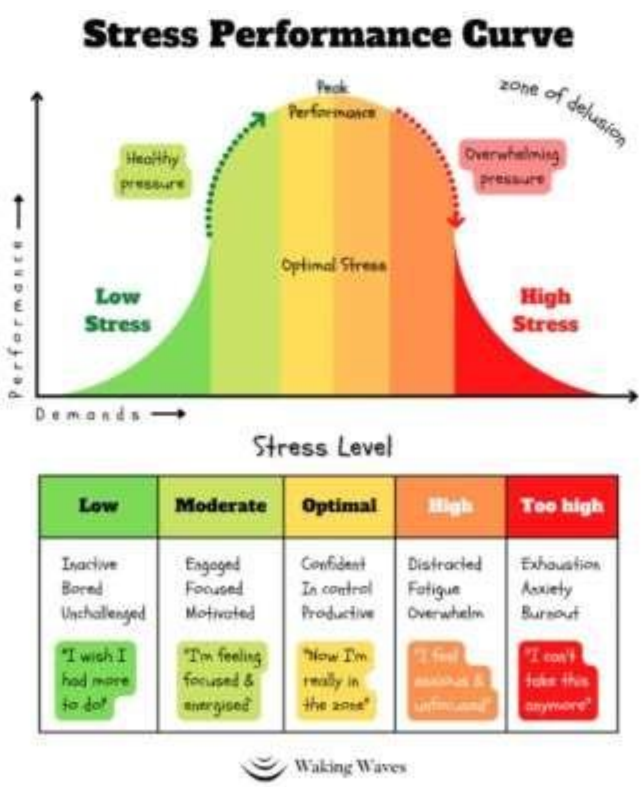


Fig -1: Figure

Charts



3. CONCLUSIONS

CONCLUSION

This project demonstrates a compact yet powerful stress monitoring solution that integrates physiological sensing with modern embedded systems and IoT connectivity. By leveraging the capabilities of the ATMega328 microcontroller and a GSR sensor, the system effectively captures and processes skin conductance data, a reliable measure of stress. User-friendly features like input switches and a display screen improve usability, while UART communication supports data interfacing with external systems.

The integration of IoT components extends the system's reach, enabling real-time remote monitoring and cloud-based analytics. Such functionality is particularly valuable for tracking stress trends over time or conducting large-scale mental health studies. The modular and scalable architecture of this design provides a strong foundation for future enhancements, including the addition of more sensors and the integration of machine learning models to enable personalized stress profiling.

Ultimately, this work offers a practical and accessible tool for mental health monitoring, with potential applications in clinical settings, corporate wellness programs, and individual stress management. It paves the way for smarter, more proactive approaches to mental well-being in everyday life.

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We express our gratitude and thanks to Our Parents first forgiving health and a sound mind for completing this project. We give all the glory and thanks to our almighty GOD for showering upon, the necessary wisdom and grace for accomplishing this project.

REFERENCES

Giannakakis, Giorgos, et al. (2019)
Giannakakis and colleagues presented an extensive overview of biosignal-based methods of detecting stress. They grouped the physiological responses into electrophysiological signals (EEG, ECG, EDA, EMG) and physical indicators (respiration, speech, skin temperature, eye movement). The review established the fact that observable changes in physiology are present during psychological stress, and biosignals can be used with assured reliability for detecting stress using sensor-based monitoring systems.