Stress Detection using Bio-Signal Processing: An application of IoT and ML for Old Age Home Residents

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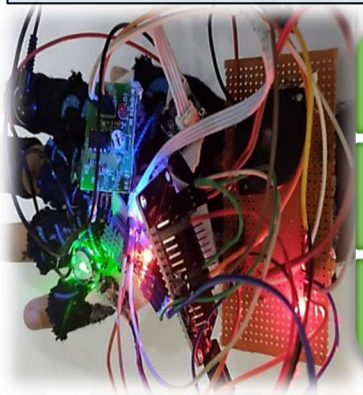
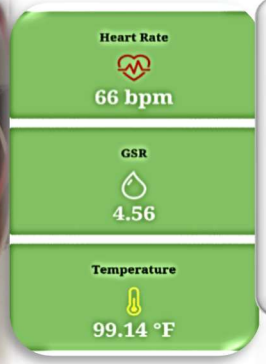
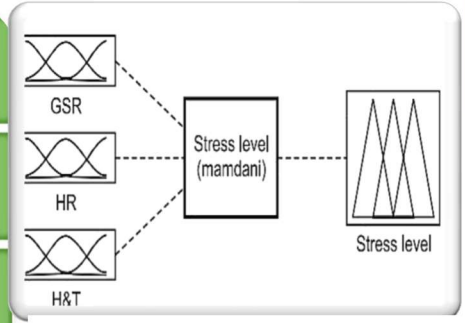
INTRODUCTION

Stress, as defined by psychobiologists, is a multifaceted response that encompasses both physiological and psychological components. Chronic stress poses a substantial risk to an individual's well-being, especially for older adults residing in assisted living facilities. This work aims to design a system using IoT and machine learning to monitor and predict stress levels in elderly individuals living in old age homes. The wearable device includes sensors like temperature, heart rate, and GSR to collect physiological data, which is analyzed using fuzzy logic and machine learning models to provide real-time insights into stress levels.







MODEL NAME	ACCURACY
Naïve Byes	73.38%
Logistic Regression	75.67%
SVM	90.87%
KNN	90.87%
Random Forest	95.06%

METHODOLOGY

The system was evaluated for its performance in terms of finding the stress level by taking a sufficiently large range of samples from old age home residents. Training and testing were conducted on the samples taken from an old age home named 'SHEOWS' (Saint Hardyal Educational and Orphans Welfare Society), which is situated at Okhla, New Delhi, India. Fuzzy logic algorithms were applied to classify stress levels into four distinct categories, 'Relax,' 'Calm,' 'Anxious,' or 'Stressed', based on the collected sensor data. Machine learning techniques were employed for stress prediction using the collected sensor data and stress level labels were obtained from the fuzzy logic classification.

RESULTS AND CONCLUSIONS

The system demonstrated promising results in classifying and predicting stress levels with high accuracy. The fuzzy logic approach successfully categorized stress levels, and machine learning models, especially Random Forest, proved effective in predicting stress.

In conclusion, in this work, a wearable IoT device was developed for stress detection in elderly old ag home residents using machine learning models. The Random Forest model achieved the highest accuracy at 95.06%, outperforming other models. Future improvements involve data enhancement for training and testing, and sensor upgrades for improved stress prediction.