AI based stress and emergency detection using wearable sensor data

School of Computing

INSTITUTION'S INNOVATION COUNCIL (Ministry of HRD Initiative)

1.Problem Statement

Stress and medical emergencies often go undetected in real time, especially when a person is alone. Traditional monitoring systems require manual checking and cannot continuously track a person's physical condition. There is a need for an intelligent system that can automatically monitor wearable sensor data and detect abnormal health or activity patterns early.

2: Objective

To analyze wearable IoT sensor data and build a machine learning model that can identify human activities and potential stress or emergency conditions using physiological and motion sensor readings.

3.Data Collection

The system uses data collected from wearable sensors such as:

->Accelerometer (a_x, a_y, a_z)

->Gyroscope (g_x, g_y, g_z)

->Temperature sensors

->Heart rate / physiological signals

These sensors continuously record body movement and health parameters.

4.Data Cleaning

The collected data is preprocessed by:

->Removing missing and duplicate values

->converting sensor values to numeric format

->Handling outliers and invalid readings

->Labeling activities such as sitting and walking

This step ensures the data is accurate and reliable.

5: Data Exploration & Analysis (EDA)

Data visualization techniques are used to understand patterns:

-> Line plots for accelerometer and gyroscope data

->Histograms for temperature distribution

->Boxplots to detect outliers

->Correlation heatmaps to understand sensor relationships

EDA helps identify trends and important features.

6.Data Modeling

Multiple machine learning models were trained, including:

-> Logistic Regression

->K-Nearest Neighbors (KNN)

->Decision Tree

->Random Forest

Sensor features were used as input to classify activities and detect abnormal conditions.

7.Validation & Results

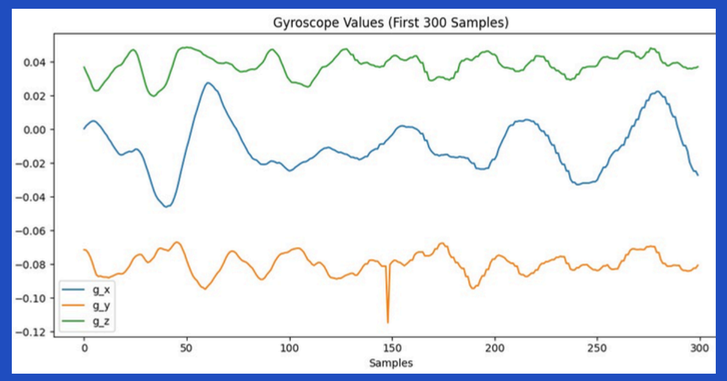
The trained models were evaluated using:

->Training accuracy

->Testing accuracy

- ->Confusion matrix

The Random Forest model achieved the highest accuracy, showing reliable classification performance.



8: Conclusion & Applications

The proposed system successfully demonstrates how wearable sensor data and machine learning can be used for continuous health monitoring.

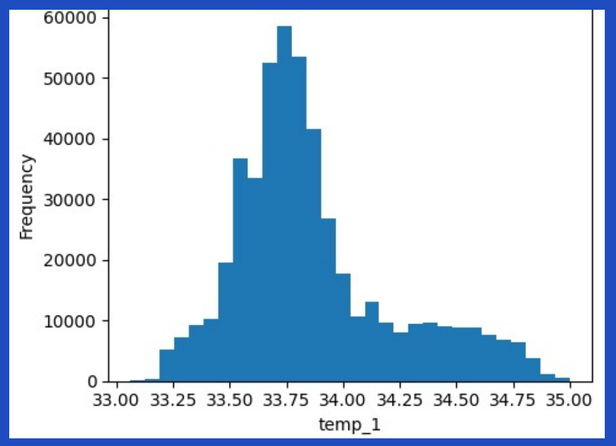
This approach can be applied in:

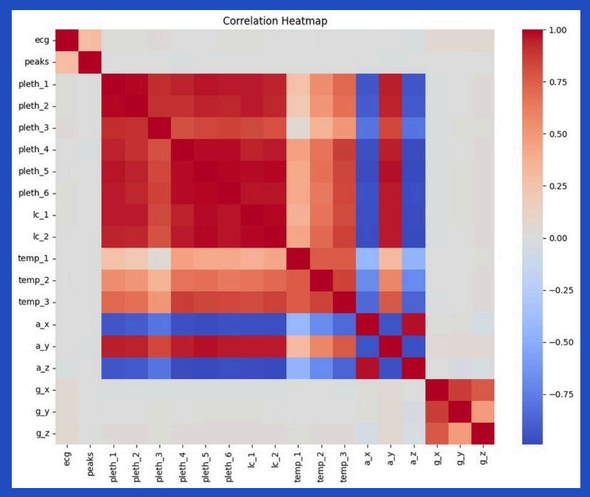
->"Smart healthcare systems

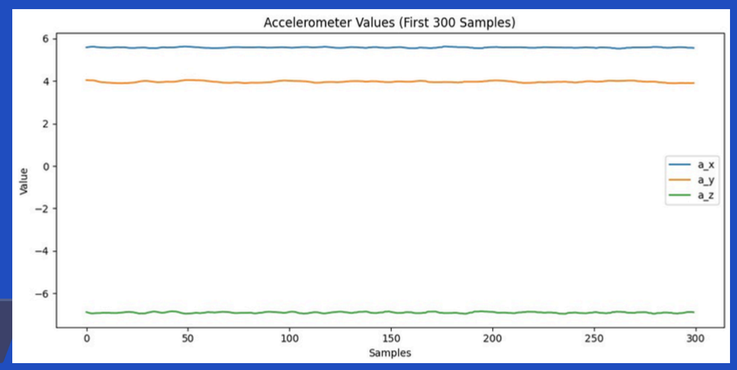
>Stress monitoring

->Emergency alert systems

->Fitness and activity tracking







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