

ABSTRACT

Increased workload and pressure in the modern industrial world, particularly in sectors such as mining and transportation, can trigger stress disorders and poor sleep patterns. Monitoring workers' mental and physiological health has therefore become crucial; however, conventional methods such as questionnaires are subjective and ineffective for long-term monitoring. Therefore, this final project develops a stress and sleep pattern prediction system based on Heart rate Variability (HRV) data obtained from a smartwatch. The system is developed using Machine Learning algorithms, namely Long Short-Term Memory (LSTM) and Random Forest, to analyze physiological data such as heart rate, Inter-Beat Interval (IBI), and other HRV features to classify users' conditions into stress categories (normal, fatigue, or stress) as well as sleep patterns (normal, insomnia, or severe sleep deprivation). Sensor data are collected through an Android application on the smartwatch and automatically transmitted to the server for analysis. The data collection process was carried out for 14 days with 3 participants, and the data were periodically sent to the server for analysis. The model evaluation results show a relatively high prediction accuracy, ranging from 90% to 99%, demonstrating that the integration of Wearable technology and Machine Learning can serve as a reliable tool to detect stress and sleep patterns. This system is expected to support the improvement of occupational health and the prevention of risks caused by prolonged stress or sleep disorders.

Keywords: HRV, Smartwatch, Machine Learning, Stress, Sleep Pattern, Wearable, Android.