AI-BASED PERSONALIZED HEALTH WELLNESS MONITORING SYSTEM: INSTANT FEEDBACK ON CARDIAC & RESPIRATORY HEALTH.

<< Team: Pseudo_Spectrum >>

Sapnil Sarker Bipro | Md Anik Hasan | Muhammad Sudipto Siam Dip

ABSTRACT

This project focuses on real-time health insights through signal acquisition and analysis. Utilizing a pulse sensor for signal acquisition from the fingertip, we preprocess the recorded one-minute signal. The preprocessed data is then fed into a pretrained 1D CNN regression model for estimating respiratory rate. The system integrates an IoT-based setup with ESP32 and a Blynk app, providing instant feedback and notifications, offering a comprehensive monitoring solution for both cardiac and respiratory health.

OBJECTIVE OF THIS PROJECT

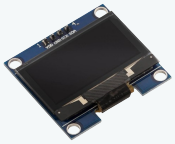
- Design a real-time physical condition measuring system.
- Implement a cost-effective health monitoring scheme
- Making a mobile health diagnostic approach

REQUIRED HARDWARE AND EXPERIMENTAL SETUP:

Arduino Uno

ESP 32

Pulse Sensor

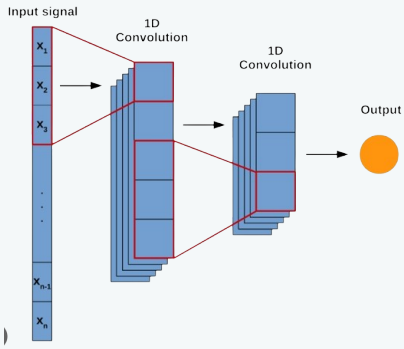


OLED Display

LIBRARIES AND FRAMEWORK

TensorFlow | PY SERIAL | ARDUINO | Blynk

IMPLEMENTED MODEL:



1D CNN, or one-dimensional convolutional neural network, is a type of neural network architecture commonly used for sequence-based data. It applies convolutional operations along one dimension, typically time or sequence length, to capture local patterns and features. This makes it effective for tasks such as time series analysis and signal processing.

GENERALIZED METHODOLOGY:

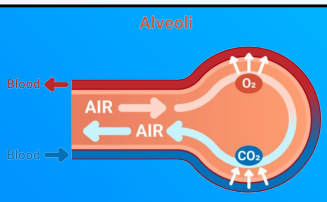
Real-Time Pulse signal Acquisition

Instant Monitoring & Signal Processing

Artificial Intelligence Based implementation to Make Estimation

IoT based Feedback Generation

CO_2 Respiratory Rate



CO2 respiratory rate is a crucial parameter for monitoring respiratory function, particularly in critical care settings. It reflects the efficiency of ventilation and provides valuable insights into a patient's respiratory status. Elevated CO2 respiratory rate indicates hypoventilation, suggesting inadequate ventilation, while low CO2 respiratory rate suggests hyperventilation, implying excessive ventilation. Continuous monitoring of CO2 respiratory rate, through end-tidal CO2 (EtCO2) monitoring, enables timely detection of respiratory distress and guides ventilator weaning decisions. Additionally, CO2 respiratory rate helps assess respiratory compensation mechanisms and provides complementary information to pulse oximetry, enhancing overall respiratory care management.

POSSIBLE APPLICATIONS OF OUR FRAMEWORK:

Mental Health Monitoring

Using EEG (Electroencephalography) to monitor brainwave patterns for early detection of mental health conditions such as depression, anxiety, and epilepsy.

Sleep Quality Assessment

EEG signals can be used to monitor sleep stages and assess sleep quality. Real-time monitoring of sleep patterns can help diagnose sleep disorders like sleep apnea.

Fitness and Exercise Tracking

Wearable devices with sensors (e.g., PPG - Photoplethysmography) can monitor heart rate and oxygen saturation during physical activities.

Cardiac Monitoring

Machine learning models can detect irregular heart rhythms (arrhythmias) and predict cardiac events by using wearable devices.

Telemedicine and Telehealth

Biomedical signal data, including EEG, ECG, and PPG, can be transmitted in real-time to healthcare professionals for remote consultations.