

Non-Invasive Response of Brain Driven Breathing Irregularities

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Abstract

The work describes a home-based non-invasive respiratory monitoring platform designed to reduce the risks of sleep apnea, respiratory failure and complications associated with brain-driven neuro-respiratory diseases, such as Guillain-Barre syndrome. The system is implemented on a Raspberry Pi 4 and integrates multiple physiological sensing modalities to capture continuously and in real-time vital signals related to respiratory and neurological activity.

This paper proposes a hybrid deep learning framework based on Convolutional Neural Networks (CNN) and long short-term Memory (LSTM) networks for the processing of multimodal data for the detection of abnormal respiratory patterns such as obstructive and central apnea events. The model facilitates continuous pattern recognition and early detection of vital physiological changes. In case of an abnormal condition, the system activates a closed-loop haptic feedback mechanism to stimulate the patient to create an immediate physiological response. On the other hand, the IoT-based monitoring interface notifies the caregivers in real time for timely intervention. This proposed platform offers a low-cost and ubiquitous solution for continuous respiratory monitoring and management in a home-care setting, for supporting better patient safety and early diagnosis of individuals with risk of respiratory compromise

Index Terms

Respiratory Monitoring, CNN, Guillain-Barre Syndrome, Home-Healthcare, Brain-Driven