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Deep Learning based Approach for Obstructive Sleep Apnea Detection Using EEG Signals

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Abstract

In Obstructive Sleep Apnea (OSA), the most prevalent type, is characterized by abnormal breathing patterns or intervals of difficulty breathing while sleeping. The most frequent ailment is OSA. All ages are affected; however, older persons are the most typically impacted. The regular sleep cycle is dramatically altered by OSA, which results in numerous heart-related problems. The traditional way of diagnosing sleep problems is polysomnography, although, over the past few decades, various alternatives have been offered to replace traditional approaches due to their complexity and time commitment. This study proposes a deep learning-based obstructive sleep apnea detection system that uses the power of convolutional neural networks, artificial neural networks, and logistic regression algorithms to detect sleep apnea patterns from electroencephalogram (EEG) signals. The hybrid classifier technique used by the system successfully recovers spatial and temporal information from EEG data, increasing the precision and efficacy of sleep apnea detection. The study's methodology involves data collection, preprocessing, feature extraction, and model training using a labelled dataset of EEG signals from patients with obstructive sleep apnea. The deep learning-based classifier's performance is assessed using a different test dataset to determine accuracy, sensitivity, specificity, and area under the curve. The results show that the suggested method surpasses existing state-of-the-art techniques in identifying sleep apnea, giving a more accurate and efficient diagnosis. However, the system's dependability is strongly dependent on the correctness and completeness of EEG data, and more validation with varied datasets is required to establish its generalization abilities.

Keywords: *Obstructive sleep apnea, Electroencephalogram, Electrocardiogram, Deep learning*