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Review Paper on Sleep Apnea Detection from Single-Lead ECG: A Comprehensive Analysis of Machine Learning and Deep Learning Algorithms

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Abstract: *Sleep apnea is a common condition that is characterized by sleep-disordered breathing. Worldwide the number of apnea cases has increased and there has been a growing number of patients suffering from apnea complications. Unfortunately, many cases remain undetected, because expensive and inconvenient examination methods are formidable barriers with regard to the diagnostics. Furthermore, treatment monitoring depends on the same methods which also underpin the initial diagnosis; hence issues related to the examination methods cause difficulties with managing sleep apnea as well. Computer-Aided Diagnosis (CAD) systems could be a tool to increase the efficiency and efficacy of diagnosis. To investigate this hypothesis, we designed a deep learning model that classifies beat-to-beat interval traces, medically known as RR intervals, into apnea versus non-apnea. The RR intervals were extracted from Electrocardiogram (ECG) signals contained in the Apnea-ECG benchmark Database. Before feeding the RR intervals to the classification algorithm, the signal was band-pass filtered with an Ornstein–Uhlenbeck third-order Gaussian process.*

Keywords: Sleep Apnea Detection, Electrocardiogram (ECG), RR (R waves in ECG), Long short term memory (LSTM).

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