EZsleep: A Low-Cost Wearable Device for Early Diagnosis of Obstructive Sleep Apnea - Validated by a Machine Learning Technique

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About 50% of Americans snore while they’re sleeping a symptom of Sleep Apnea. Some 18-20 million Americans are living with Sleep Apnea, though doctors estimate that 80-90% of them remain undiagnosed. Obstructive Sleep Apnea (OSA) occurs when part of the airway is closed off while a person is trying to inhale during sleep. OSA is linked to an increase risk of heart disease, diabetes, stroke, obesity, high blood pressure and kidney disease. Many Sleep Apnea devices out there are expensive, bulky, and time consuming which can cause the patient to have a late diagnosis and other complications. The purpose of this research is to design EZsleep, using open source micro controller that measures patterns of breath cycle (Inhale and exhale) with an embedded novel algorithm that analyzes the data and displays the information to be easily read by any user. This device is affordable, faster, portable & generic. In this research, a validation of the device's decision accuracy was integrated; a data mining model was created using Waikato Environment for Knowledge Analysis (WEKA). Weka is a collection of machine learning algorithms for data mining tasks. A real provider datasets from sleep apnea clinics is used to create the decision model. The EZsleep devise was tested, 85 % accurate compared to the doctor outcome data versus 42% subjective survey data compared to the doctor’s data. EZsleep has made two major advances by increasing the diagnosis efficiency (cost and time) and embed a validation techniques with the process.

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