

## Using Wearable Device with Neuron Network to Classify Severity of Sleep Disorder

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**Abstract :** Background: Sleep breathing disorder (SDB) is a condition demonstrated by recurrent episodes of the airway obstruction leading to intermittent hypoxia and quality fragmentation during sleep time. However, the procedures for SDB severity examination remain complicated and costly. Objective: The objective of this study is to establish a simplified examination method for SDB by the respiratory impedance pattern sensor combining the signal processing and machine learning model. Methodologies: We records heart rate variability by the electrocardiogram and respiratory pattern by impedance. After the polysomnography (PSG) been done with the diagnosis of SDB by the apnea and hypopnea index (AHI), we calculate the episodes with the absence of flow and arousal index (AI) from device record. Subjects were divided into training and testing groups. Neuron network was used to establish a prediction model to classify the severity of the SDB by the AI, episodes, and body profiles. The performance was evaluated by classification in the testing group compared with PSG. Results: In this study, we enrolled 66 subjects (Male/Female: 37/29; Age:  $49.9 \pm 13.2$ ) with the diagnosis of SDB in a sleep center in Taipei city, Taiwan, from 2015 to 2016. The accuracy from the confusion matrix on the test group by NN is 71.94 %. Conclusion: Based on the models, we established a prediction model for SDB by means of the wearable sensor. With more cases incoming and training, this system may be used to rapidly and automatically screen the risk of SDB in the future.

**Keywords :** sleep breathing disorder, apnea and hypopnea index, body parameters, neuron network

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