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Short Communication

Simultaneous Sleep Stage and Sleep Disorder Detection

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DESCRIPTION

In order to identify probable sleep problems, sleep scoring entails reviewing multimodal records of sleep data. The simultaneous identification of a sleep stage and a sleep problem often supports the diagnosis because the symptoms of sleep disorders may be linked to particular sleep stages. This study examines how multimodal sensory data can be used to automatically identify various sleep disorders and stages (EEG, ECG, and EMG) [1-3]. A new distributed multimodal and multi label decision-making system is what we suggest (MML-DMS). It consists of a number of interconnected classifier modules, such as shallow perceptron neural networks and deep Convolutional Neural Networks (CNNs) (NNs). Each module utilizes a unique data label and data modality. The ultimate diagnosis of the sleep state and sleep disorder is made possible by the information exchange between MML-DMS modules. We demonstrate that the combined multilabel and multimodal strategy outperforms single-label and single-modality approaches in terms of diagnostic performance. We tested the proposed MML-DMS on the Physio Net CAP Sleep Database using VGG16 CNN structures, and we were able to identify six stages of sleep with an average classification accuracy of 94.34% and an F1 score of 0.92, as well as sleep disorders with an average classification accuracy of 99.09% and an F1 score of 0.99 [3-5]. (Eight disorders). Comparing the proposed strategy to similar research reveals that it greatly outperforms the current state-of-the-art methods. A vital aspect of human life is sleep. Many physical and mental health issues can result from poor sleep quality. The two main stages of alertness and sleep, which are further split into light sleep, deep sleep, and Rapid Eye Movement (REM) behavior, are identified by sleep experts. The deep sleep period taking up a sizable amount of the total sleep time is a sign of high-quality sleep. Thus, precise sleep stage detection and analysis are very important in determining how well a patient is doing overall. The patient must sleep in a testing room while wearing a set of sensors to capture physiological data from several modalities, such as Electromyography, Electrocardiograms, and Electroencephalograms (EEG) (EMG). An eight-hour recording session is common. At least two qualified assessors manually analyses (score) the physiological data offline to identify sleep stage intervals and sleep anomalies that could be signs of sleep disorders. The American Academy of Sleep Medicine or Rechtschaffen and Kales standards are followed in the sleep scoring process. It costs money, takes time, and needs highly skilled personnel [6-9].

Because of this, there aren't many sleep diagnosis centers available despite their significance. An automatic sleep scoring algorithm that can evaluate multimodal recordings and automatically identify sleep stages and sleep disorders may be able to provide a solution to this conundrum. Feature-based strategies and traditional classifiers like the Support Vector Machine (SVM), Random Forest (RF), or Artificial Neural Networks (ANNs) have been thoroughly examined in early sleep scoring investigations. For instance, these papers investigated sleep stage classification systems employing ANNs. Depending on the acknowledged stages, the performance changed [10]. A comparison study that sought to determine the best features and the best algorithm for classifying sleep stages was published. A 98% accuracy rate was recorded. In order to determine the best Machine Learning (ML) and feature extraction, only one EEG channel was used. The best classification performance was achieved while still allowing for real-time online processing, using spectral linear features and an RF classifier. a thorough analysis of the most recent research on computerized sleep scoring.

CONCLUSION

In this study, we looked into how three different sensor modalities EEG, ECG, and EMG could simultaneously recognize six stages of sleep and eight conditions associated with sleep disorders. A brand-new multimodal and multi label classification system was put forth by us (MML-DMS). A shallow NN was utilized to make the final determination using the classification results that were obtained independently for each modality by a parallel set of CNNs that identified either sleep stages or sleep disorders. The system's classification accuracy for identifying sleep stages was 94.34% and for identifying sleep disorders was 99.09%, respectively, when tested against the Physio Net CAP Sleep database.

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REFERENCES

1. Xie WY, Shen Y, Chen Y, Zhuang S, Wang YL, Jin H. REM sleep without atonia and vestibular-evoked myogenic potentials: clinical brainstem dysfunction in early-stage Parkinson's disease and isolated REM sleep behavior disorder. Sleep Med. 2022; 89:122-129.
2. Zammit G, Mayleben D, Fietze I, Pain S, Gimona A, Kinter DS. Effects of daridorexant on Total Sleep Time (TST) and sleep stage proportions in patients with insomnia disorder. Sleep Med. 2022;100:S118.
3. Krishnan V, Collop N. Systemic and Pulmonary Hypertension and Sleep.
4. Tiwari S, Arora D, Nagar V. Comparative Approach to Detect Nocturnal Frontal Lobe Epilepsy Sleep Disorder through Frequency spectrum and its Energy Levels. Proc Comp Sci. 2023; 218:479-487.
5. Kobayashi I, Lavela J, Bell K, Mellman TA. The impact of posttraumatic stress disorder versus resilience on nocturnal autonomic nervous system activity as functions of sleep stage and time of sleep. Physiology & behavior. 2016; 164:11-18.
6. Hanly P. Sleep disorders and end-stage renal disease. Current opinion in pulmonary medicine. 2008;14(6):543-550.
7. Monegro A, Gawri K. Heart rate variability in children with sleep disordered breathing. Pro Pediatr Cardiol. 2023.
8. Sheibani M, Shayan M, Khalilzadeh M, Ghasemi M, Dehpour AR. Orexin receptor antagonists in the pathophysiology and treatment of sleep disorders and epilepsy. Neuro. 2023:102335.
9. Simor P, Horváth K, Ujma PP, Gombos F, Bódizs R. Fluctuations between sleep and wakefulness: wake-like features indicated by increased EEG alpha power during different sleep stages in nightmare disorder. Biologi psycho. 2013;94(3):592-600.
10. Yan H, Huang Z, Lu Y, Qiu Y, Li M, Li J. Associations between metabolic disorders and sleep disturbance in patients with schizophrenia. Compre Psychia. 2023; 122:152369.