



Machine learning-based sleep quality monitoring

Technology No. 2019-211

IP Status: Pending US Patent; **Application #:** 16/932,348

Applications

- Quality of sleep monitoring for patients with sleeping disorder

Technology Overview

Researchers at the University of Minnesota have developed an end-to-end framework that uses deep neural networks to extract temporal transition structure of the sleep stages using raw flow signals. This method can be used to accurately track sleep metrics like sleep efficiency calculated from sleep stages as the response of CPAP therapy. Health-care providers can monitor the patients from the convenience of the patient's home, allowing for personalized proactive management of CPAP therapy, which currently suffers from substantial abandonment issues. In addition, automated daily reports and longitudinal tracking of a patient's response to the therapy could improve patient compliance to CPAP therapy.

Training Dataset

MESA (Multi-Ethnic Study of Atherosclerosis) dataset

- 400 Sleep Apnea patients
- 7.5 hours of sleep data per person
- Flow signal is sampled at 32 Hz -> 960 samples for every 30 second epoch
- Has inter-rater agreement of 85% on the annotated sleep stages

Phase of Development

TRL: 6-7

Algorithm developed and validated in a pilot study. Currently validating against a larger patient population.

Researchers

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Publications

A structured learning approach with neural conditional random fields for sleep staging.
2018 IEEE International Conference on Big Data (Big Data). IEEE, 2018.

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

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