Obstructive sleep apnea (OSA) affects > 900 million adults, but <20% of cases are diagnosed (Cost estimate $150 billion).

Home sleep tests use obtrusive, wired systems and rigid electrodes that delaminate overnight and disrupt sleep.

Next generation sleep diagnosis must be both high throughput and highly accurate.

Nathan Zavanelli and Woon-Hong Yeo*

Soft Sternal Patch to Detect Sleep Stages and Sleep Apnea

Motivation

- Obstructive sleep apnea (OSA) affects > 900 million adults, but <20% of cases are diagnosed (Cost estimate $150 billion).
- Home sleep tests use obtrusive, wired systems and rigid electrodes that delaminate overnight and disrupt sleep.
- Next generation sleep diagnosis must be both high throughput and highly accurate.

Methods

- The soft patch was microfabricated with ultrathin metals, integrated into an elastomer substrate, and optimized to measure SCG, PPG, and ECG from a single location on the sternum.

Physiological Monitoring

Physiological Monitoring

System Overview

Overnight Trials with Symptomatic Patients

Overnight Trials with Symptomatic Patients

Machine Learning Results

Apnea Detection

Sleep Staging

Conclusions

- First device (wearable or wired) to measure SCG, PPG, and ECG from a single location.
- Demonstrated 100% sensitivity and 95% precision in apnea detection and 82.4% accuracy 3 class sleep staging compared to clinical gold standard scoring.

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