

# Soft Sternal Patch to Detect Sleep Stages and Sleep Apnea

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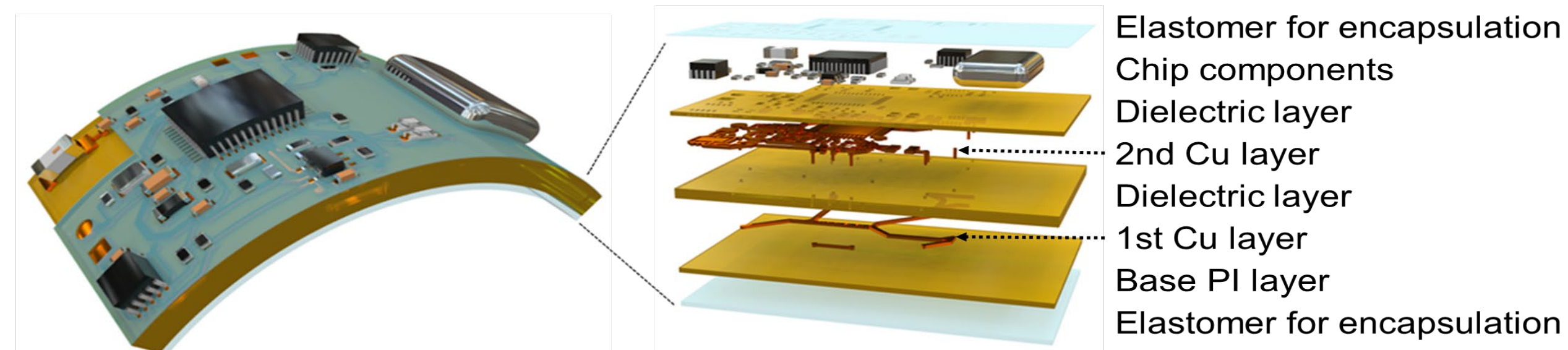
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## Motivation

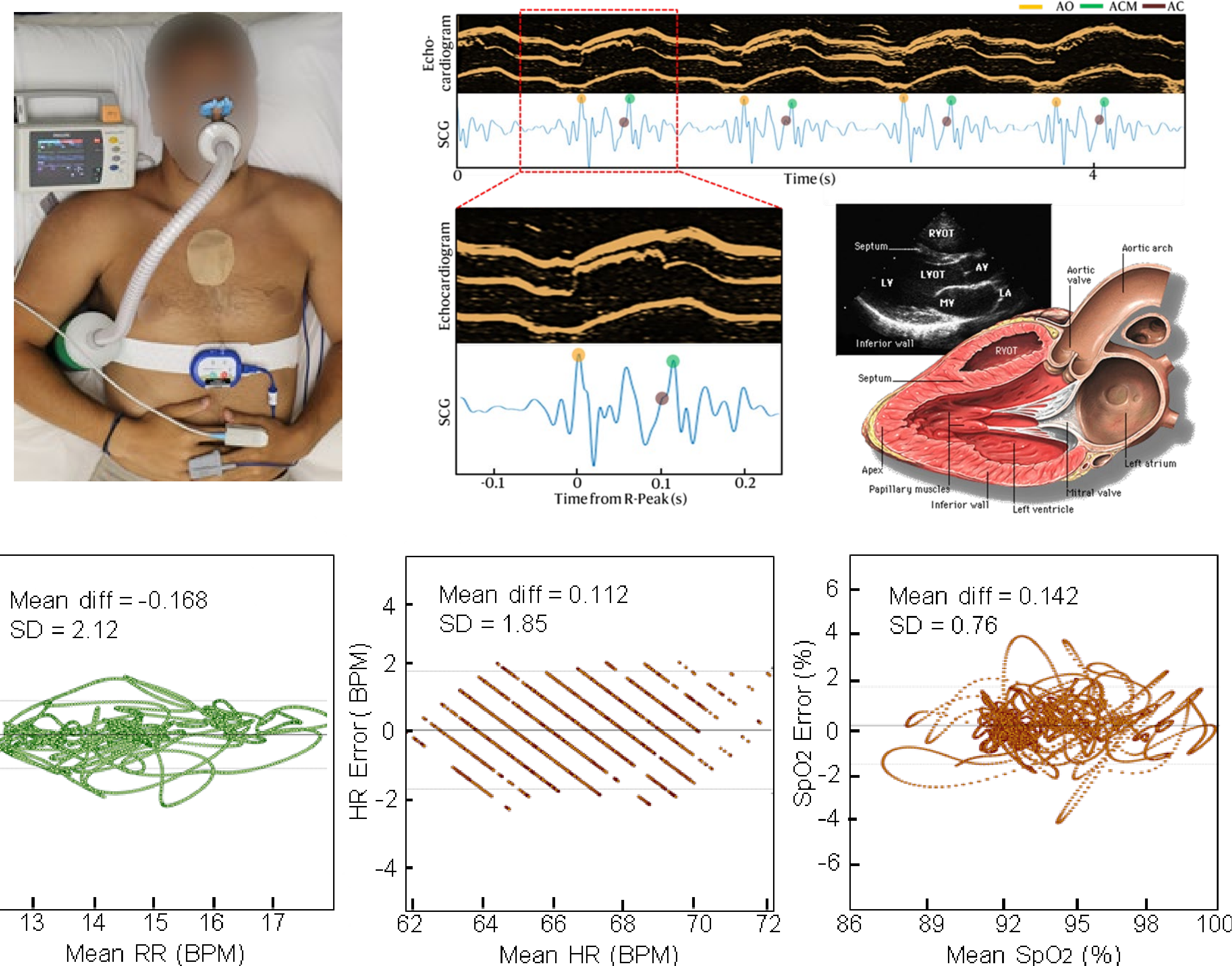
- Obstructive sleep apnea (OSA) affects > 900 million adults, but <20% of cases are diagnosed (Cost estimate \$150 billion).
- Home sleep tests use obtrusive, wired systems and rigid electrodes that delaminate overnight and disrupt sleep.
- Next generation sleep diagnosis must be both high throughput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

## Methods

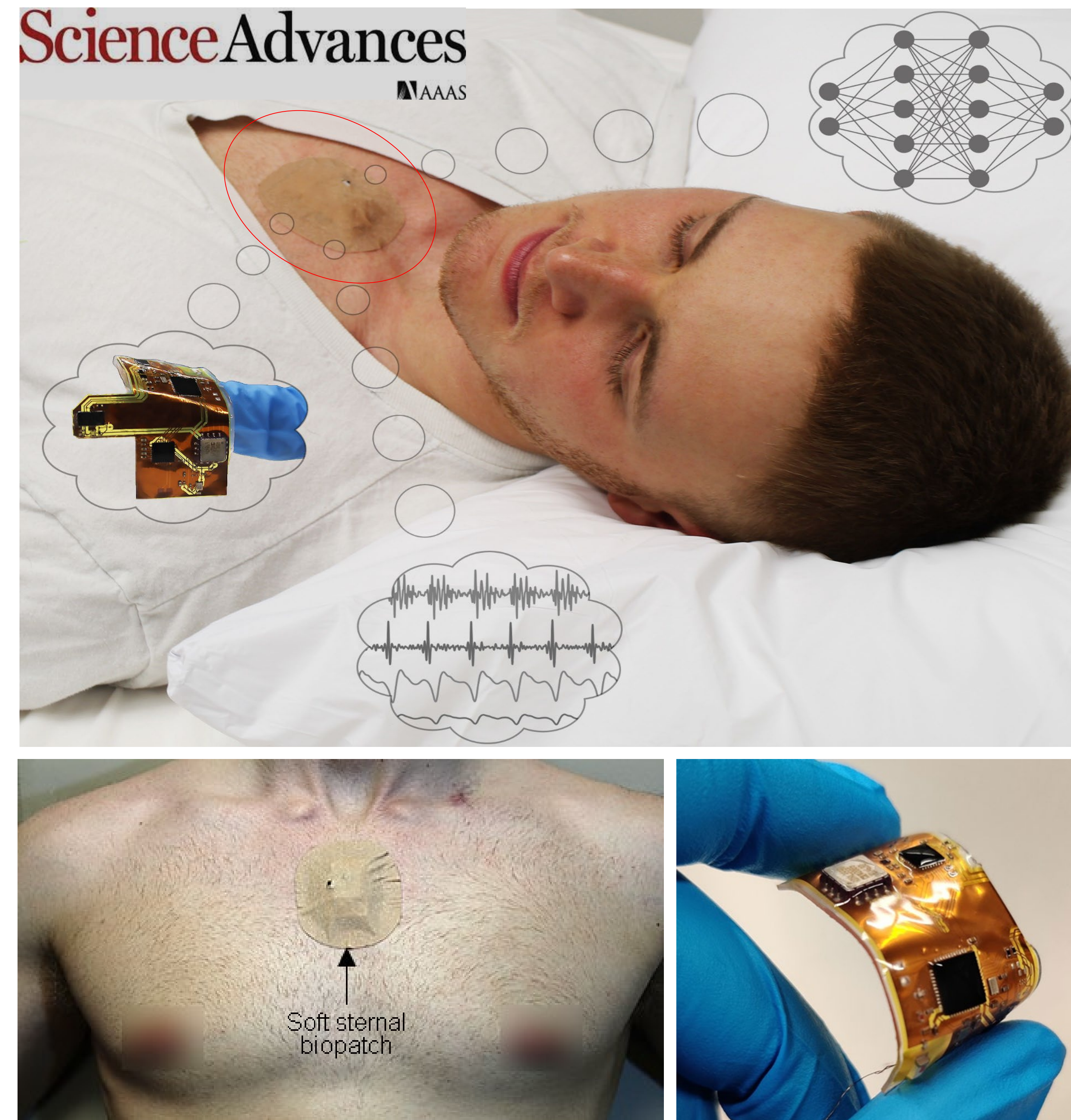
- The soft patch was microfabricated with ultrathin metals, integrated into an elastomer substrate, and optimized to measure SCG, PPG, and ECG from a single location on the sternum.



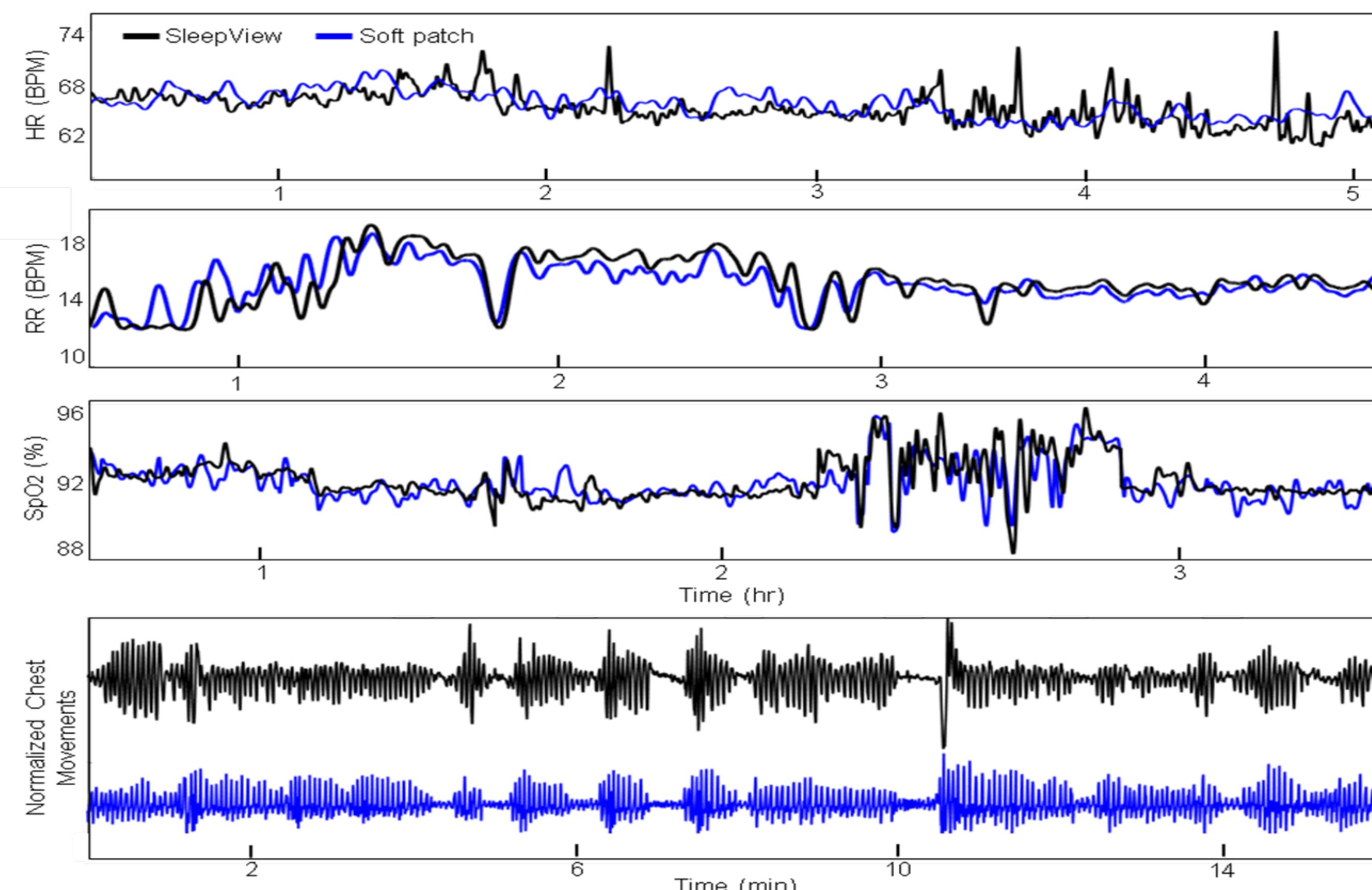
## Physiological Monitoring



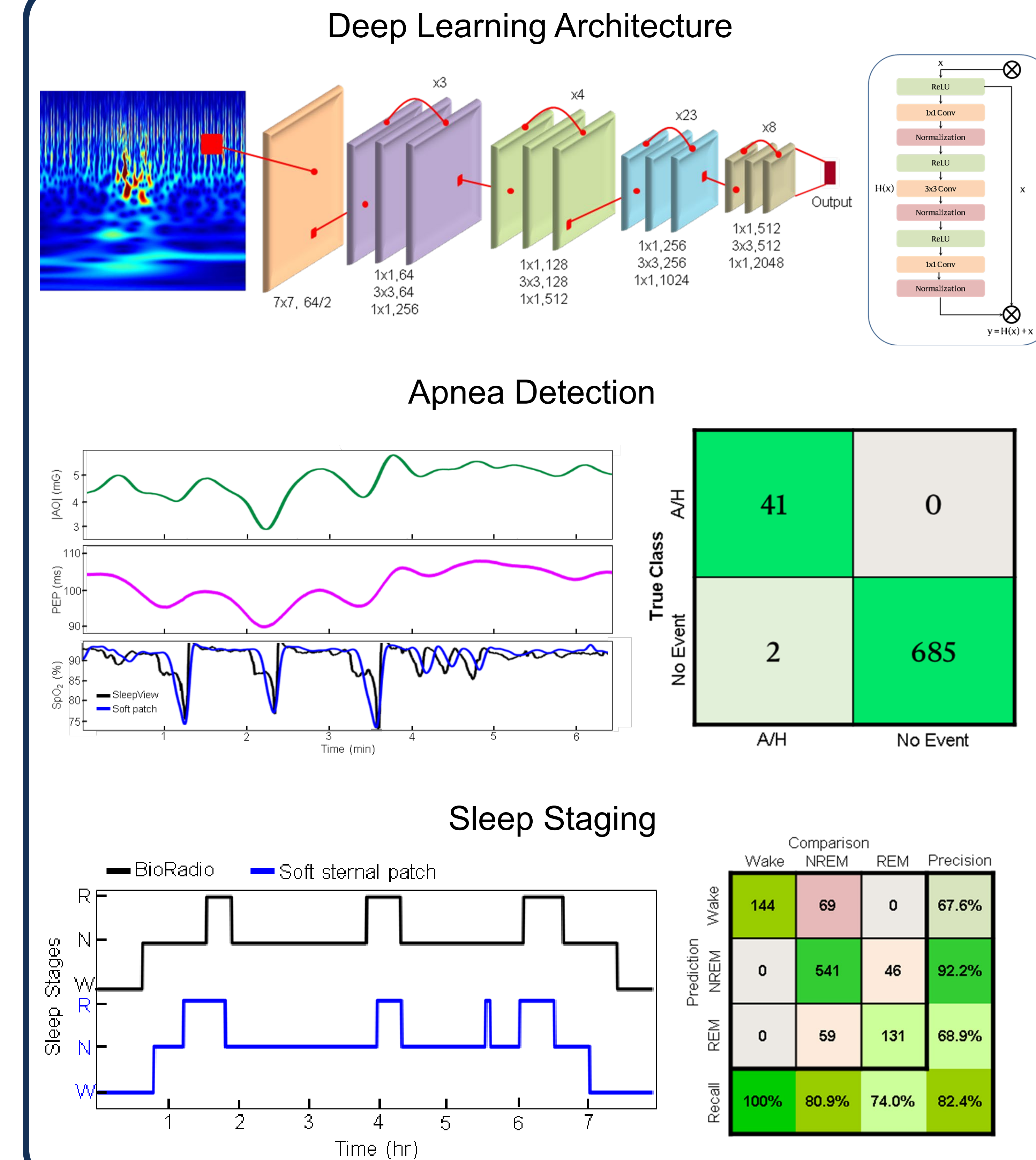
## System Overview



## Overnight Trials with Symptomatic Patients



## Machine Learning Results



## 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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