



Explainable hybrid convolutional and transformer network for pediatric sleep apnea diagnosis using nocturnal oximetry



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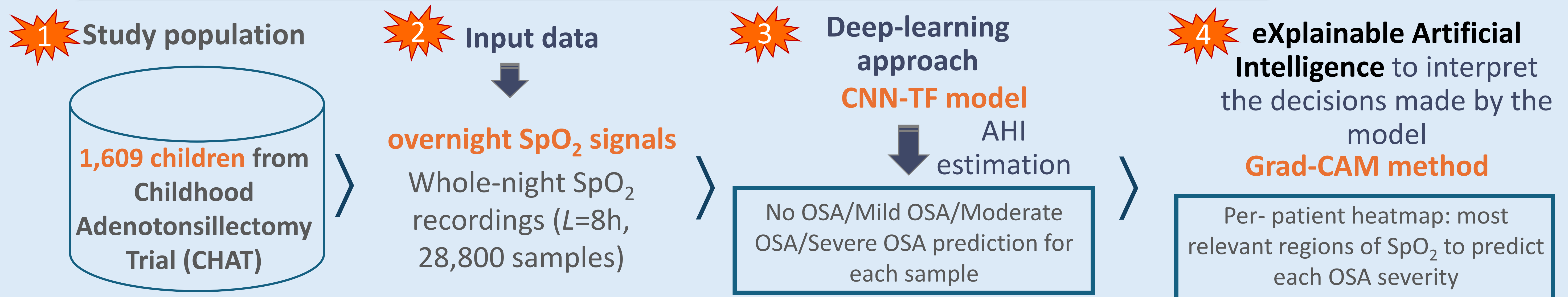
Background

- Pediatric obstructive sleep apnea (OSA) is a common respiratory disorder that leads to intermittent hypoxemia and desaturation-reoxygenation patterns in oxygen saturation (SpO_2).
- Polysomnography (PSG), the standard diagnostic method, is costly, complex, and inconvenient, particularly for children. Therefore, a timely and precise diagnosis is of utmost importance.

Objective

This study assesses the effectiveness of an **interpretable hybrid convolutional neural network and transformer (CNN-TF)** model, by **overnight SpO_2** to **estimate the 4 OSA severities** (no OSA, mild OSA, moderate OSA, and severe OSA) and **uncover relevant SpO_2 patterns** associated with the disease.

Materials and Methods



Key Results

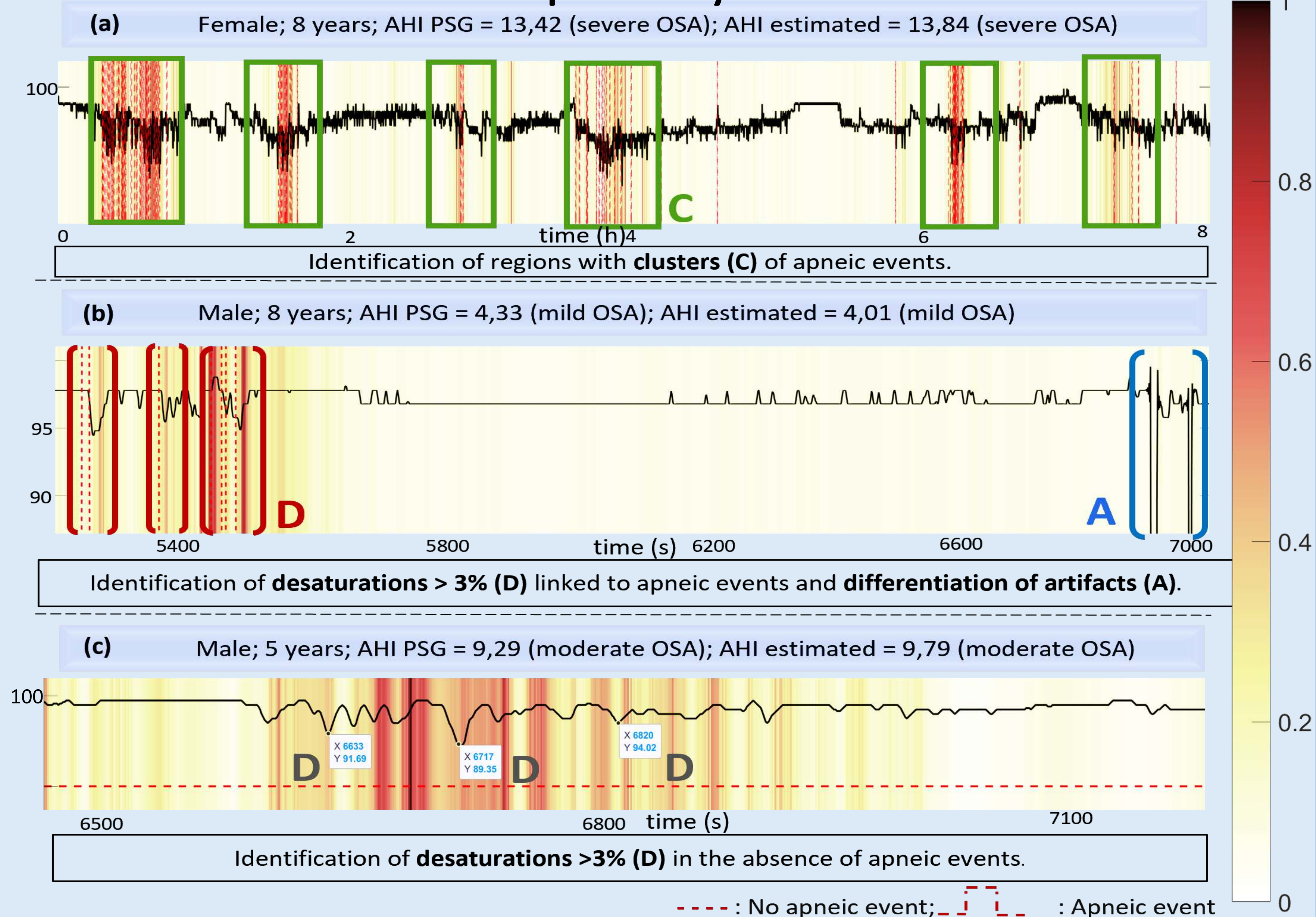
Diagnostic performance

Cohen's 4-class kappa
0.529

4-class accuracy
68.56%

AHI cutoff	Se	Sp	LR ⁺	Acc
1e/h	90.6	50.8	1.8	81.9
5e/h	85.6	93.3	12.8	91.0
10e/h	80.5	96.9	26.0	94.7

Model interpretability



Conclusions

Integrating an interpretable CNN-TF model in the analysis of nocturnal SpO_2 provides a reliable diagnosis of pediatric OSA. Grad-CAM was useful for interpreting the proposed model and enabled achieving a deeper understanding of the pathophysiological behavior of SpO_2 related to pediatric OSA.

Acknowledgement

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