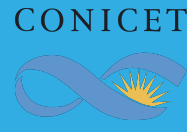


Wavelets for sleep scoring: A machine learning approach

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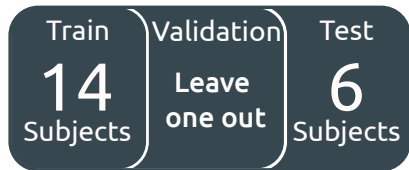
Motivation

Sleep scoring is a common method used by experts to monitor the quantity and quality of sleep in people, but it is a time-consuming and labour-intensive task.

Materials

Sleep-EDF public dataset was used, considering only the Fpz-Cz channel [1].

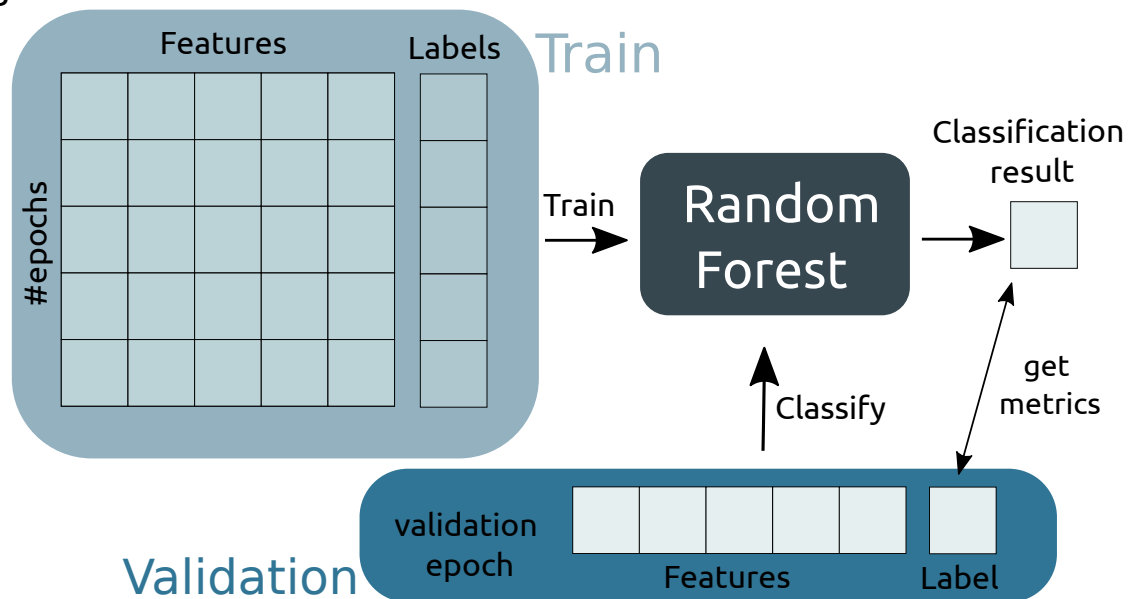
Data was classified into different sleep stages according to Rechtschaffen and Kales (R&K) sleep manual [2]. REM and Awake stage were not considered.



Methods

Discrete Wavelets were used to extract features from each epoch and perform a classification into 3 sleep stages (S1, S2 and S3) [3].

Different discrete Wavelets' families were considered for feature extraction. Due to a strong imbalance between data samples in each sleep stage, Random Under Sampling (RUS) was used for balancing and, posteriorly, Principal Component Analysis (PCA) was used to reduce dimensionality.



Results

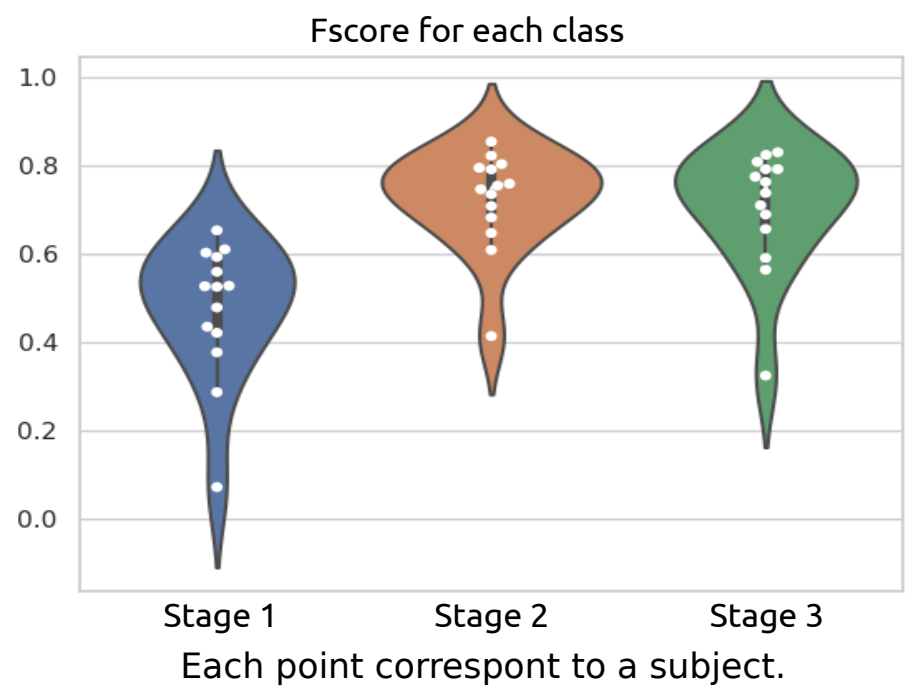
Haar Wavelet Level 3

RUS 20%

PCA 100

per class	Accuracy	Fscore
Stage 1	83,66%	49,05%
Stage 2	70,79%	72,83%
Stage 3/4	85,42%	70,80%

An accuracy = 69,94% and a Fscore Macro = 64,23% was obtained.



Conclusion

We observed that wavelets are a good choice when identifying different sleep stages.

Automated classification of Stage 1 showed the worst performance, a previously observed in other works [4,5,6]. Improvement of results in Stage 1 is work in progress.

Further, classification including information from the previous epoch is considered, to provide further predictive accuracy to the method.

Acknowledgement

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References

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