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Five-fold cross-validation on the PhysioNet data set resulted in an ICC(2,1) of 0.59, AUPRC score of 0.45, and on the hidden test set the AUPRC score was 0.45.

**Conclusion:** Effectively scoring arousals automatically is important, as manual scoring of arousals is time consuming and difficult. The automatic analysis from the clinical data set showed better results than reported from manuals scoring. The PhysioNet dataset showed lower validation score due to the lower quality of the signals and the manual scoring. Implementing automatic arousal scoring into a commercial software will make new analysis available to the clinic.

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**TOWARDS A DEEP LEARNING-BASED JOINT DETECTION MODEL FOR NOCTURNAL POLYSOMNOMGRAM EVENTS**

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**Introduction:** Manual analysis of nocturnal polysomnograms (PSGs) is still the standard in sleep laboratories. The process is time-consuming and prone to subjective interpretation of scoring rules and scorer fatigue. Recent developments in deep learning algorithms have shown promise for micro-event detection in PSGs. We propose a modification to the recently published DOSED algorithm that can be utilized for detection of arousals, respiratory events and leg movements, and can also automatically annotate start and duration of these events.

**Methods:** We collected event data from 1000 PSG studies in the public MESA database. Central EEG, left/right EOG and chin movement; thoraco-abdominal belts, nasal pressure/flow, oxygen saturation and snore microphone; and leg EMG data were used to detect arousals; obstructive sleep apnea (OSA), central sleep apnea (CSA), and hypopnea events; and leg movements (LM), respectively. Briefly, the applied deep learning model consists of an initial spatial filtering layer followed by eight blocks of convolutional layers for feature extraction. Two types of classification layers were used to 1) detect the presence or absence of any type of event, and 2) automatically determine start times and duration of predicted events. The model was trained using 400 PSGs studies, validated on 100 PSGs and subsequently tested on 500 PSGs.

**Results:** Overall F1, precision and recall scores for arousal event detection were 0.712, 0.721, and 0.703, respectively, while the same metrics for OSA, CSA and hypopnea detection were 0.629, 0.546, 0.743; 0.328, 0.386, 0.284; and 0.47, 0.385, 0.604, respectively. LM detection yielded poorer performance with overall F1, precision and recall of 0.29, 0.226, and 0.402, respectively.

**Conclusion:** Preliminary results indicate that a concurrent detection model can detect and annotate with start and duration of multi-variate events in the nocturnal polysomnogram, although more work in a larger cohort is needed in order to improve LM and CSA detection. However, this is a positive step towards an all-purpose sleep analysis algorithm.

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