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T1 - Polysomnographic identification of anxiety and depression using deep learning

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KW - Anxiety

KW - Depression

KW - Polysomnography

KW - Deep learning

KW - Machine learning

AB - Anxiety and depression are common psychiatric conditions associated with significant morbidity and healthcare costs. Sleep is an evolutionarily conserved health state. Anxiety and depression have a bidirectional relationship with sleep. This study reports on the use of analysis of polysomnographic data using deep learning methods to detect the presence of anxiety and depression. Polysomnography data on 940 patients performed at an academic sleep center during the 3-year period from 01/01/2016 to 12/31/2018 were identified for analysis. The data were divided into 3 subgroups: 205 patients with Anxiety/Depression, 349 patients with no

Anxiety/Depression, and 386 patients with likely Anxiety/Depression. The first two subgroups were used for training and testing of the deep learning algorithm, and the third subgroup was used for external validation of the resulting model. Hypnograms were constructed via automatic sleep staging, with the 12-channel PSG data being transformed into three-channel RGB (red, green, blue channels) images for analysis. Composite patient images were generated and utilized for training the Xception model, which provided a validation set accuracy of 0.9782 on the ninth training epoch. In the independent test set, the model achieved a high accuracy (0.9688), precision (0.9533), recall (0.9630), and F1-score (0.9581). Classification performance of most other mainstream deep learning models was comparable. These findings suggest that machine learning techniques have the potential to accurately detect the presence of anxiety and depression from analysis of sleep study data. Further studies are needed to explore the utility of these techniques in the field of psychiatry.

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