

Research Paper Abstract

Research Paper Title:

Neonatal seizure detection using EEG Signals with Deep learning methods

Authors:

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Abstract:

Epileptic seizures are characterized by abnormal brain electrical activity and are particularly challenging to detect in neonates due to their subtle or absent clinical manifestations. Neonatal seizures, if untreated, can lead to adverse neurodevelopmental outcomes, underscoring the critical need for accurate and timely detection. Electroencephalography (EEG) is the gold standard for seizure detection; however, its interpretation requires expert neurophysiologists, making automation essential. This paper explores advanced deep learning models, focusing on Convolutional Neural Networks (CNNs) integrated with ResNet and attention mechanisms, for neonatal seizure detection using EEG data. The study utilizes a publicly available dataset from Helsinki University Hospital, comprising EEG recordings from 79 neonates, annotated by expert neurophysiologists. A robust preprocessing pipeline involving Independent Component Analysis (ICA) for artifact removal and robust normalization to counter data variability is proposed to enhance model performance.

Experimental results demonstrate significant improvements in seizure detection accuracy with the proposed ResNet-based CNN model augmented with attention layers, achieving a peak validation accuracy of 97.41% and a validation loss of 0.08. Comparative evaluations highlight the advantages of the proposed pipeline and architecture over baseline models, achieving superior precision, recall, and generalizability. This study establishes an efficient framework for neonatal EEG analysis, addressing challenges such as noise, class imbalance, and the complexity of neonatal EEG patterns. The findings not only advance seizure detection methodologies but also pave the way for broader applications in EEG-based neurological disorder analysis.

Index Terms:

Electroencephalography (EEG), Deep Learning, Neonatal, Seizure Detection

Note:

This paper has been submitted for publication to reputed journals and is not yet published. Therefore, I have only provided the abstract for this paper.