# Neonatal Seizure Detection and Severity Identification Using Deep Convolutional Neural Networks

**Authors :** Biniam Seifu Debelo, Bheema Lingaiah Thamineni, Hanumesh Kumar Dasari, Ahmed Ali Dawud

**Abstract :** Background: One of the most frequent neurological conditions in newborns is neonatal seizures, which may indicate severe neurological dysfunction. They may be caused by a broad range of problems with the central nervous system during or after pregnancy, infections, brain injuries, and/or other health conditions. These seizures may have very subtle or very modest clinical indications because patterns like oscillatory (spike) trains begin with relatively low amplitude and gradually increase over time. This becomes very challenging and erroneous if clinical observation is the primary basis for identifying newborn seizures. Objectives: In this study, a diagnosis system using deep convolutional neural networks is proposed to determine and classify the severity level of neonatal seizures using multichannel neonatal EEG data. Methods: Clinical multichannel EEG datasets were compiled using datasets from publicly accessible online sources. Various preprocessing steps were taken, including converting 2D time series data to equivalent waveform pictures. The proposed models underwent training, and their performance was evaluated. Results: The proposed CNN was used to perform binary classification with an accuracy of 92.6%, F1-score of 92.7%, specificity of 92.8%, and precision of 92.6%. To detect newborn seizures, this model is utilized. Using the proposed CNN model, multiclassification was performed with accuracy rates of 88.6%, specificity rates of 92.18%, F1-score rates of 85.61%, and precision rates of 88.9%. A multiclassification model is used to classify the severity level of neonatal seizures. The results demonstrated that the suggested strategy can assist medical professionals in making accurate diagnoses close to healthcare institutions. Conclusion: The developed system was capable of detecting neonatal seizures and has the potential to be used as a decision-making tool in resource-limited areas with a scarcity of expert neurologists.

**Keywords :** CNN, multichannel EEG, neonatal seizure, severity identification

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