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(57) Abstract :
Electroencephalography (EEG) signals are crucial for monitoring brain activity and diagnosing neurological disorders. However, detecting anomalies in real-time EEG data remains challenging due to the non-stationary nature of brain signals and the high prevalence of noise. This study proposes an AI-driven algorithm for the real-time detection and analysis of anomalies in EEG signals, leveraging advanced machine learning and deep learning techniques. The proposed framework integrates signal preprocessing, feature extraction, and anomaly classification to enhance detection accuracy and latency. A hybrid model combining convolutional neural networks (CNNs) for spatial feature extraction and long short-term memory (LSTM) networks for temporal dependencies is developed to identify epileptic seizures, artifacts, and other abnormal patterns. The algorithm is validated on publicly available EEG datasets, demonstrating superior performance in sensitivity, specificity, and computational efficiency compared to traditional methods. Additionally, the system is optimized for real-time processing, enabling immediate clinical decision-making. The results highlight the potential of AI-driven approaches in improving early diagnosis and intervention for neurological conditions, paving the way for automated, scalable EEG monitoring systems.

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