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Advancing Epilepsy Diagnosis through EEG Analysis and Independent Component Analysis Algorithms

Authors : Eyad Talal Attar

Abstract : Epilepsy is a prevalent neurological condition that impacts a considerable population of around 50 million individuals globally, rendering it one of the most widespread neurological disorders. The condition is distinguished by recurring seizures, which are abrupt and transient disruptions in a cerebral activity that can induce alterations in perception, conduct, and awareness. Seizures can be classified as focal or generalized, based on the specific site and scope of the atypical brain activity. Focal seizures are identified by confinement to a particular brain area and can elicit localized manifestations. Generalized seizures are identified by extensive electrical activity throughout the brain, and they can appear in various symptoms such as convulsions, muscle rigidity, and loss of consciousness. This study represents seven individuals chosen according to the number of seizures in the range of three to five seizure and investigates the ability to detect brain seizure activity. The EEG recording Siena Scalp Database was used from PhysioNet databases. EEGLAB is a robust tool utilized for processing and analyzing electroencephalogram (EEG) data and is used to analyze the raw data. The efficacy of Independent Component Analysis ICA algorithms has been demonstrated in the separation of arterial EEG sources and neuronal-generated EEG sources.

Keywords : EEG, MATLAB software, power spectral density, PSD, signal analysis, attention, alpha, beta, gamma
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