Characterization and parameter stability of entropic network state alterations before epileptic seizures

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About 50 million people suffer from epilepsy, making it one of the most common neurological diseases worldwide. The possibility of forecasting the onset of epileptic seizures by recognizing events during the preictal phase would have a positive impact on the development of neuromodulation treatments in drug-resistant patients. Currently, the identification of preictal biomarkers by intracranial electroencephalography (iEEG) is an active area of research, as iEEG recordings can detect changes in brain activity that occur prior to a seizure. On this basis, we propose a methodology to characterize the passive dynamics of brain activity during the hours/days preceding a seizure. The results we have obtained are the following: a) retrieval of results determining that high connectivity states (HCS) may be a possible biomarker in two patients., b) stability of the results with respect to different montages (monopolar, average and bipolar references), c) correlation of HCS probability with power, connectivity and heart rate, d) results of the network model. Specifically, we focus on performing an analysis of network states that is more in-depth than conventional power or functional connectivity analysis, yielding a more robust result that can adapt to the heterogeneity that exists between patients. In summary, we have found that HCS probability may be a very promising biomarker for the prediction of epileptic seizures.