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# Automatic diagnosis of epilepsy using non-stationary signal decomposition-based methods

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Epilepsy is a common neurological disorder which affects the quality of the life of the patient, leads to social impairment, and high risk of death. These epileptic seizures can be analyzed by observing the patterns in the electroencephalogram (EEG) signals. Usually, diagnosis of epilepsy requires the manual inspection of the long EEG records to identify the epileptic seizure activities. These EEG records can be considerably long to analyze manually. Moreover, the judgment and interpretation of the seizure events also depends on the subjective nature of the expert. Therefore, computer aided automatic analysis method to identify the seizure activity can play a significant role in the diagnosis of the epilepsy. The empirical mode decomposition (EMD) method decomposes an EEG signal into set of amplitude and frequency modulated (AM-FM) oscillatory components known as intrinsic mode functions (IMFs). These IMFs are used for the extracting features. The features play an important role in the identification of the different pathological states of the brain. The epileptic activity manifests the clear and abnormal transient patterns in a normal EEG signal. These transient patterns can be captured using the features extracted from the IMFs of EEG signals. We have developed new methodologies based on the features extracted from the IMFs of EEG signals for classification and detection of the epileptic seizure EEG signals. The developed new features are mean frequency of IMFs using Fourier-Bessel series expansion, area of analytic signal representation of IMFs, 95% confidence ellipse area of second-order difference plots of IMFs, 95% confidence ellipse area for 2D phase space reconstruction (PSR) and inter-quartile range of the Euclidian distances for 3D PSR of IMFs, amplitude modulation bandwidth and frequency modulation bandwidth, Instantaneous area of analytic IMFs. The developed methodologies for classification of epileptic seizures from EEG signals have shown better results as compared to other existing methods.

## Biography

Ram Bilas Pachori received the PhD degree in Electrical Engineering from Indian Institute of Technology (IIT) Kanpur, Kanpur, India, in 2008. He worked as a Postdoctoral Fellow at the University of Technology of Troyes, Troyes, France for one year (2007-2008). He also worked as an Assistant Professor at International Institute of Information Technology, Hyderabad, India from 2008-2009. Presently, he is working as an Associate Professor in Discipline of Electrical Engineering, IIT Indore, Indore, India. He worked as a Visiting Scholar at University of Ulster, Northern Ireland, UK for one month (December 2014). His research interests include Bio-medical Signal Processing, Speech Signal Processing, Brain-Computer Interface, and Signal Processing Applications. He has published more than 60 papers in the reputed journals, conference proceedings, book, and book chapters. He is reviewer of many reputed journals like IEEE, Elsevier, and Springer.

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