

Extreme learning adaptive neuro-fuzzy inference system model for classifying the epilepsy using Q-Tuned wavelet transform

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Abstract. Epilepsy is a nervous disorder that causes arbitrary recurrent seizures within the cerebral cortex region of the encephalon. The early diagnosis of a seizure is important in clinical therapy. An automatic epileptic seizure detection method for electroencephalogram (EEG) signals can significantly enhance the patient's life in clinical aspect. The proposed paper is principally based on a completely unique approach of epileptic seizure detection using Q-Tuned Wavelet Transform (QTWT) and Approximate entropy (ApEn). This work focuses by utilizing and testing the common sense of Extreme Learning Adaptive Neuro-Fuzzy Inference System Model (EXL-ANFIS) which foresees the elements of the mind states as a trajectory that results in the seizure event. QTWT is used for decomposing EEG signals into sub-band frequency signals. Approximate entropy is carried out to those sub-band signals as a discriminatory function because of its indefinite disordered feature. The solutions obtained by directing towards EXL- ANFIS shows an incredible advancement in the perpetual performance outlay for the classification of an epileptic seizure. The proposed classification method is implemented on publicly available Bonn dataset. The outcome confirms that by combining extreme learning and ANFIS model improves the classification accuracy and decrease the feature dimension with reduced computational complexity. This method achieves 99.72% of classification accuracy over existing models.

Keywords: Epilepsy, electroencephalogram (EEG), Q-Tuned wavelet transform (QTWT), approximate entropy (ApEn), extreme learning adaptive neuro-fuzzy inference system model (EXL-ANFIS)

1. Introduction

This The human brain is a compound system manifesting space-time dynamics. Nearly 0.08 billion people worldwide suffer from a brain disorder, namely epilepsy [1]. Epilepsy disease is typically referred to as an Epileptic seizure, it is determined with the aid of an abrupt irregular firing of the nerve cell inside in cerebral cortex area [2]. The epileptic affected people have no apparent abnormal symptoms but may suddenly show attacks or seizures that

damage their everyday capabilities partially or absolutely [3]. Despite the fact that the discovery of a great deal non-invasive method is decided to analysis human mind activities, electroencephalogram is indisputable in representing the electric motion of the brain in millisecond resolution. In the biomedical signal processing, EEG has broadly used the signal for detecting the seizure at specific brain parts that assist in the right analysis of epilepsy. The signs and indication of seizures range by type. Additionally, medical aid is vital to examine EEG recording. An automated classification system has been materialized in latest years for suitable remedy and development of epilepsy detection. Many works have been done to compare normal brain signals, and epilepsy affected

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