
Performance evaluation of machine learning models for epileptic seizures and brain tumor prediction from EEG

Supuni H.D.S.^{1*}, Chathuranga P.D.T.¹, Chathuranga L.L.G.¹,
Lorensuhewa S.A.S.¹ and Pathirana K.D.²

¹*Department of Computer Science, University of Ruhuna, Wellamadama, Matara, Sri Lanka.*

²*Department of Medicine, Faculty of Medicine, University of Ruhuna, Galle, Sri Lanka.*

An epileptic seizure is a symptom due to abnormal paroxysmal excessive neuronal activity in the cerebral cortex. Seizures are one of the symptoms leading to a diagnosis of a brain tumor in adults. Epilepsy is a tendency to have repeated epileptic seizures. The diagnosis is confirmed by detecting specific brain patterns of the electroencephalography (EEG). Existing work shows that epileptic seizures can be detected using machine learning methods with high accuracies. However, there is a need for classifying epileptic seizure patterns to predict possible tumors. In this paper, EEG data is used to predict possible brain tumors and classify epileptic seizure patterns using machine learning methods such as Random Forest, Logistic Regression, Naive-Bayes, and Neural Networks. We investigated the performance of these models using the EEG dataset available at the UCI machine learning repository. From the results, we concluded that the Neural Network model had the highest accuracy of 95.73% in predicting the possibility of brain tumors. Additionally, the results showed that EEG recordings taken from the tumor area and healthy area of the brain did not show a significant difference in their accuracies. The study also produced the highest accuracy of 87% from the Neural Network model by multi-classifying the EEG dataset under its five classes. Class 1, 2, and 3 originated from a presurgical diagnosis, with their epileptic zone correctly identified. Class 4 and 5 consist of EEG recording segments taken from healthy individuals with eyes open and closed respectively.

Keywords: Machine learning, Epilepsy, Electroencephalography (EEG), Neural networks, Brain tumor

*Corresponding author: supunih@dcs.ruh.ac.lk