

AN OPTIMIZED DEEP LEARNING APPROACH FOR THE PREDICTION OF PARKINSON'S DISEASE

ABSTRACT

Parkinson's Disease is a progressive neurological disorder which is characterized by motor dysfunction such as tremors, difficulty in balancing and coordination issues. This issue is due to degeneration of dopamine producing brain cells. Since there is no cure, only medication and therapy can significantly improve the quality of the life. After a detailed study on the limitations of existing predictive methods, in initial phase, a novel Convolutional Neural Network Long Short-Term Memory Unsupervised Fine-Tuned Deep Self-Organizing Map (CNN-LSTM-UFDSOM) is proposed. The gathered datasets were processed by the ODBN model to remove extraneous features and reduce the dimensionality of the data. The extracted features are then classified into types of Parkinson's disease using a CNN-LSTM based classifier which is augmented by Unsupervised Fine-tuned Deep Self-Organizing Map (UFDSOM). This model is evaluated with the number performance criteria, including accuracy, precision, recall, F1-measure, Root Mean Square Error (RMSE), error rate, and Mean Absolute Error (MAE). In comparison to all other models, the ODBN with CNN-LSTM-UFDSOM model has a mean accuracy of 98.12% and an error rate of 3.0. In second phase, an innovative Genetic Wild Horse Optimization (G-WHO) based Augmented Gated Recurrent Unit (AGRU) model is presented. This model undergoes the preprocessing using standardization with an Electroencephalography (EEG) dataset of 756 incidents and 754 characteristics. In this model, the features are extracted using Genetic Wild

Horse Optimization (G-WHO) inspired by the social behaviours of wild horses. These features are subsequently classified using an Augmented Gated Recurrent Unit (AGRU). The comparative analysis of the G-WHO+AGRU model with existing methods produces accuracy (98.18%), precision (98%), F1-measure (97.18%), and recall (98.18%). In the final phase, a novel Honey Badger inspired Augmented Gated Recurrent Unit (HB-AGRU) is recommended. In this model, An EEG dataset containing 756 instances and 754 features has been used. In preprocessing, to ensure the consistency and scalability, the Min-Max normalization is employed. To identify the significant features that contribute to Parkinson's disease, Honey Badger (HB) algorithm is used. To classify the PD labels, an Augmented Gated Recurrent Unit (AGRU) was employed. The proposed method's performance is evaluated against that of existing methods in terms of factors including F1-measure (98.1%), accuracy (98.2%), recall (98.4%), and precision (98.2%). The algorithm's capacity to precisely detect minor trends that point to early signs of PD and gradual modifications over time was made possible by the combination of the Honey Badger's adaptability and Gated Recurrent Unit's sequential learning capabilities. Furthermore, from the comparative analyses across three phases, the HB-AGRU method performs superiorly in predicting Parkinson's disease.