AN EMPIRICAL ANALYSIS ON PREDICTION OF MENTAL HEALTH USING NOVEL DEEP LEARNING APPROACHES

ABSTRACT

Mental illness affects thoughts, emotions, and behavior, often impairing daily life, relationships, and well-being. Common types include anxiety disorders, depression, bipolar disorder, and schizophrenia. Early diagnosis enables prompt treatment, helping to manage symptoms, enhance quality of life, and prevent long-term emotional and social challenges. The percentage of people affected by mental illness annually can vary depending on the region, demographics, and specific disorders. Surveys show that one-quarter of the global population will face a mental health issue at some stage in their lives. However, the annual prevalence rates can range from 10% to 30% in different populations

Artificial Intelligence (AI) techniques are crucial in advancing mental health studies. Machine Learning (ML) and Deep Learning (DL) algorithms analyze mental health-related datasets to identify psychological issues. The impact of feature selection on diagnostic model accuracy is also explored, aiming to enhance the precision of mental health diagnosis. These insights contribute to the development of optimal clinical strategies, combining AI capabilities with human expertise to offer efficient and personalized mental health care.

This thesis makes three contributions, the first part of research is focusing on biological inputs from the brain, and emotion recognition requires advanced signal processing and feature extraction methods. The main goal is to increase the

efficacy of emotion recognition using brain signals by applying the Enhanced BiLSTM (E-BiLSTM) technique. The method picks up on unique features in brain activity that differ among individuals using an emotional EEG dataset. Based on cognitive behavioral research, three different states neutral, positive, and negative were identified using an EEG headband with four sensors (AF7, AF8, TP9, and TP10). The Principal Component Analysis (PCA) is used to reduce the larger dataset that was produced by statistical brainwave extraction of alpha, beta, theta, delta, and gamma. With an accuracy of 98.12%, E-BiLSTM outperformed the state of the art in terms of overall accuracy.

The second part of the research presents an optimized Dynamically Stabilized Recurrent Neural Network (DSRNN) for the automatic diagnosis of mental illness. This method aims to automatically diagnose mental health problems from Open Source Mental Illness (OSMI) data sets in contrast to typical machine learning methodologies. Using a dual-domain feature extraction technique, it extracts time-domain features and statistical features from OSMI datasets. This approach obtains a 98.52% accuracy rate.

This research introduces an Enhanced BiLSTM (E-BiLSTM) and Dynamically Stabilized Recurrent Neural Network (DSRNN) for mental illness prediction. E-BiLSTM achieved 98.12% accuracy, while DSRNN reached 98.52% accuracy, outperforming traditional models. These methodologies enhance early diagnosis by improving classification precision and feature selection efficiency