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Entertainment suggestion for handicap dumb (Speechless) people using EEG Signal (Deep Learning)

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Abstract
Sentiment categorization is now popular because of the growth of machine learning and deep learning technologies in IoT platforms. Emotions may be identified via several means, including social media posts, facial expressions in photos and videos, users' voices, EEG-based brain signals, and more. Millions of persons in India suffer from numerous illnesses. It is impossible to amuse them. The EEG device is used to monitor an individual's brain activity. It helps determine the emotions of paralyzed and bedridden individuals by collecting electroencephalogram signals using EEG equipment, utilizing this data, and applying the circumplex model. The music recommendation system has been completed using recurrent neural network (RNN) classification. The technology provides music suggestions based on the emotions of the disabled and bedridden patient. To provide entertainment as a kind of therapy for those who are paralyzed or confined to bed rest, allowing them to enjoy and relax. The music recommendation system relies on two approaches: expert-based music and music characteristics.

Keywords : EEG classification, clasisifcation, music recommendation, music recommendation, machine learning, feature extraction, feature selection

I. INTRODUCTION

An electrocardiogram (ECG) is a noninvasive diagnostic technique often used for cardiovascular disorders. A purified ECG signal has crucial data on the electrophysiology of heart conditions and potential ischemic alterations. It provides valuable insights into the functional characteristics of the heart and circulatory system. The thesis aims to automatically detect heart arrhythmias in ECG readings. This thesis utilizes a newly found digital signal processing and pattern reformation method to detect cardiac arrhythmias. The process of identifying cardiac arrhythmias in an ECG signal involves three main phases: detecting QRS complexes, extracting features from these complexes, and classifying beats based on the extracted features. Automated detection of cardiac arrhythmias in an ECG signal involves categorizing heartbeats automatically. We developed automated methods to categorize heartbeats and detect cardiac arrhythmias in ECG data for this thesis. Identifying the QRS complex in an ECG signal is the first stage in automating the detection of cardiac arrhythmias. An innovative approach is used in ECG signal analysis to accurately identify the QRS complex in peak classification for detecting various diseases.

Emotion awareness is a vital subject in the field of affective computing. Nonverbal behavioural strategies, verbal behavioural techniques, and physiological indicators can be utilised to predict human emotions. Data collected from nonverbal and vocal acts serve as indirect emotional cues indicating brain activity. EEG signals, unlike nonverbal or verbal acts, are directly recorded from the human brain cortex and may be more successful in reflecting the brain's underlying emotional states. Therefore, EEG data may provide more precise measurements of human mood compared to behavioral data. Identifying human emotions from EEG data is a crucial research topic in contemporary emotional brain-computer interfaces (BCIs) that try to deduce human emotional states from recorded EEG signals. Observing the patient's mental condition to avoid stress-induced diseases. Both teens and adults often die by suicide. Emotions leading to suicide may be prevented by verifying user identification. Assist individuals with mental health challenges by providing guidance. To develop a training model including physiological data (EEG signals from the Synchronized Dataset) to identify prolonged or sudden increases in mental fatigue, emotional reactions, facial expressions, and speech patterns in order to detect user emotions. Monitoring solutions are required to detect indicators of stress-induced occupational disorders or quickly identify

sudden increases in stress levels in high-risk work environments.

II. LITERATURE REVIEW

According to [1] Developing a system to analyze a user's mood by collecting data from a wearable device connected to physiological sensors like galvanic skin response (GSR), photo plethysmography (PPG), and electroencephalography (EEG), together with data from a camera. This data is included into the music recommendation engine as an enhancement. Utilizing sensor and facial expression data may enhance the recommendation engine's effectiveness and precision.

According to [2] A commercially accessible EEG Bluetooth headset equipped with sensors to identify variations in brain waves, including alpha and beta waves. Data may be securely exchanged using Bluetooth on the mobile device. The EEG signal may provide abundant information on a wide range of cognitive problems and diseases. The EEG signal, categorization, and classification of depression level may serve as a basis for assessing the effectiveness of music therapy in addition to guiding medical professionals in treatment. This article will construct a music recommendation system to provide users with a selection of calming music based on different symptoms and intensities.

According to [3] An attention device was developed to use a specific electroencephalographic (EEG) to measure and assess attention based on the individual's music preferences. The brainwave data values are gathered, refined to eliminate inaccuracies, and merged with an SVM classifier. The SVM classifier distinguishes between two categories of brainwave data values (attention and non-attention) for computation and analysis. A novel music recommendation algorithm has been developed, which utilises an attention mechanism to integrate the user's electroencephalographic (EEG) data and track their specific music preferences.

According to [4] investigating the influence of English and Urdu music compositions on human stress levels using brainwave patterns. A total of 27 participants, consisting of 14 males and 13 females, who are native Urdu speakers aged between 20 and 35, took part in the study. The EEG signals of the subjects are captured while they listen to multiple music recordings utilising a four-channel MUSE headgear. The state and trait anxiety questionnaire necessitates participants to evaluate their level of stress subjectively. The investigation encompassed four genres of English music: rock, metal, electronic, and rap.

According to [5] evaluate different machine learning and deep learning techniques, both with and without feature selection, for classifying the six fundamental emotions (anger, disgust, fear, joy, sadness, and surprise) into two distinct categories: emotions and no emotions. The classification will be based on physiological recordings and subjective valence, arousal, and dominance ratings obtained from the DEAP dataset. The accuracy ratings for each emotion were as follows: anger - 98.02%, joy - 100%, surprise - 96%, contempt - 95%, fear - 90.75%, and sadness - 90.08%..

According to [6] Employs Scantily to conduct a rigorous analysis of the primary publications on recommendation methods retrieved from scholarly sources like Elsevier's Scopus and Clarivate Web of Science. In the past two decades, extensive research has been conducted on tourist recommenders based on emotions. The review focuses on analysing data obtained from sensors and wearables to detect emotions through collecting, processing, and extracting features. The report suggests that issue themes include recommendation systems, emotion identification, wearable technologies, and machine learning.

According to [7] Music's potential as a therapeutic element in digital therapy programs designed to enhance mental health and well-being. Music triggers an emotional reaction in the listener, leading to detectable changes in brain activity that may be measured by electroencephalography. A scoping analysis found the latest findings on how music affects brain activity and emotional state in digital therapy programs. Six relevant articles were selected among 585 recognized publications that satisfied all of the study's criteria.

According to [8] a brain-computer interface (BCI) that utilises electroencephalography (EEG) to operate a robotic arm. This BCI allows users to perform complex tasks such as reaching and gripping several targets and navigating around obstacles. The control system used combines different methods, known as hybrid control. Seven researchers found that motor imagery training can modify brain rhythms. Of the seven researchers, six utilised a robotic arm system based on hybrid control to carry out activities online successfully. The suggested system stands out because it combines MI-based EEG, computer vision, gaze recognition, and semi-autonomous guiding. This integration leads to improved accuracy in online work performance and reduces the mental fatigue caused by prolonged mental effort.

According to [9] The preprocessed data is used to train the LSTM network, followed by categorizing the input data into normal and seizure data using the SoftMax function. The preparation of EEG data involves normalization, filtering to choose relevant parts, and data organization. Preprocessing involves normalizing EEG data, applying appropriate filters to select relevant data portions, and managing the data. The preprocessed data is used to train the LSTM network, which categorizes the input data into normal and seizure data using the SoftMax function.

According to [10] Data from the user's social media text is collected using an Internet of Things (IoT) device. Text data will undergo analysis for emotion detection. They provided two methods for recommending music after the emotion was

recognized. The first option is an expert-based approach, where certain experts are used to categorize music based on emotion. The second method is a feature-based strategy that operates independently of expert guidance. They use music's rhythm and articulation to organize songs based on emotion. They created a feedback system for the music recommendation. Consequently, the system will provide music suggestions according on the user's feedback.

III. PROPOSED SYSTEM DESIGN

The proposed research aims to assess the entire system using supervised learning algorithms. This involves gathering data from the brain in the form of EEG signals. Utilise the deep learning algorithm to derive the distinct characteristics from the input set and construct the trained model. The system's objective is to detect the presence of epilepsy by analysing provided EEG readings.

The testing system's efficiency is demonstrated by accurately classifying each input signal with its associated label. The objective of Feature Extraction is to decrease the quantity of features in a dataset by generating novel features based on the current ones. Feature selection is the act of decreasing the quantity of input variables during the creation of a predictive model. Classification is the systematic procedure of organising a given collection of facts into distinct categories or classes. The process can be applied to both organised and unorganised data.

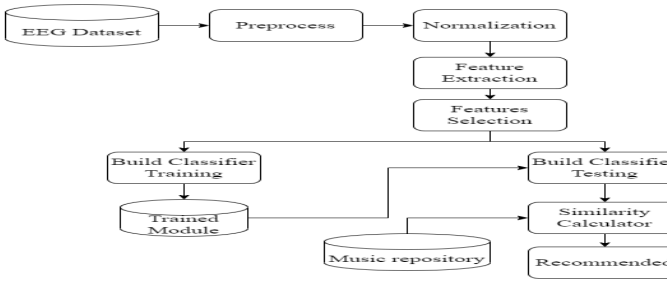

Figure 1 : Proposed system architecture Implement process

The proposed architecture utilised an RNN classifier to categorise psychological instability. The model is a type of supervised learning that is often employed for classification and regression analyses. The classification commonly employed for object identification difficulties demonstrates remarkable performance in aspect-based applications, particularly in recognition and classification tasks based on colour. RNN is widely recognised among researchers as a superior algorithm for conducting rankings. The EEG input signals are utilised as the input values for the classifier, which then classifies the epileptic condition by employing a hyperplane and identifying psychological instability through a drawing. A mechanism is developed to determine measure for individual treatments and clinical studies in epileptology. Deep learning-based psychological instability prediction algorithm will continue to improve performance.

IV. IMPLEMENT MODULE

Preprocessing

Proper formatting of the dataset is a must for all deep learning methods. The dataset contains noisy data that must be removed through pre-processing. It is necessary to verify if there are any null values in the data.

Feature Extraction:

Deep learning was utilised to analyse EEG data and identify the specific properties of expression confiscation while removing any discriminatory traits associated with seizures. Feature Extraction aims to decrease the number of features in a dataset by generating novel features based on the current ones. Feature selection reduces the number of input variables while developing a predictive model. This study aimed to investigate the persistent long-term dependence on EEG signals within and across different classes of EEG departments. Natural language processing (NLP) refers to a computer program's capacity to comprehend spoken human language. Natural Language Processing (NLP) is a constituent of artificial intelligence. The EEG channel exhibits correlation patterns demonstrating the most significant temporal shifts in retrieving feature information.

Feature selection

The system analyses different feature selection methodologies and proposes a hybrid approach for feature selection.

Classification:

Once we obtain the training model, we can input the testing data and get the classification prediction. The testing stage involves the preprocessing of testing data and the classification of the testing text. Epileptic seizures can be detected using a classification system that analyses stimulation and valence values.

V. RESULTS

This experiment we demonstrate classification accuracy of RNN EEG Signal Eye State dataset, the Table 1 shows the results of comparable trials using different Activation Function Name methods. According to this investigation, Relu function validation delivers the greatest average classification accuracy 98.35.

Table 1: Classification accuracy with confusion matrix RNN

Activation Function Name	Accuracy	Precision	Recall	F-score
SIGMOID	94.59	85.58	94.74	89.93
TANH	95.63	88.19	95.64	91.76
RELU	98.35	95.32	98.36	96.82

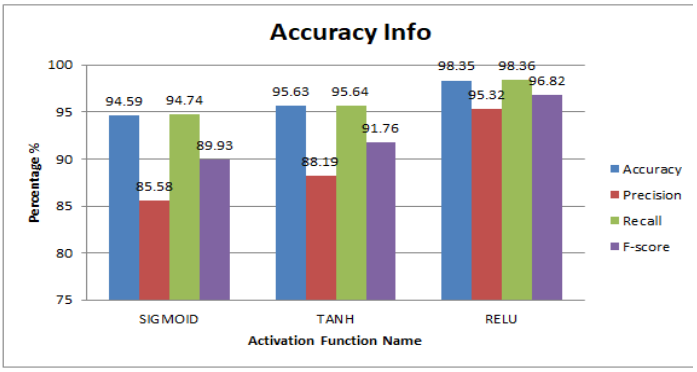

Figure 2 : System validation with various Activation Function using RNN for EEG Signal Eye State

VI. CONCLUSION

The music recommendation has proposed using deep learning on EEG signals. This application is useful for old and physically challenged people according to their mood. User-generated suggestions increase user engagement while also improving the efficiency of the recombination process. We also leverage user emotions since we are able to correlate emotions instantly. This study examines how single and deep learning is applied classification methods for taking the data from four points on the scalp and quantifies that data into an emotional representation of what was felt by the respondent at the time. The comparisons combine that a low resolution, commonly produced EEG headband can be efficient in categorizing the psychological response of a participant.

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