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# Identification of Learning Disability using ML

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**Abstract -** *Learning disability is a broad term that refers to a variety of learning issues. The children with learning disabilities are neither slow nor intellectually retarded. Learning disability such as Dyslexia is a neurological condition that is characterized by imprecise comprehension of words and poor reading skills. It affects a large number of school-aged children, with males being more likely to be affected, placing them at risk for poor academic performance and low self-esteem for the rest of their lives. Our research entails developing a machine learning model to analyse EEG signals from people with learning difficulties and provide results in minutes with the highest level of accuracy. The goal is to determine which data pre-processing approaches and machine learning algorithms are the most effective in detecting learning disabilities. The initial stage of the project entails creating an ML model with the help of a dataset.*

***Key Words***: Electroencephalography (EEG), Learning disability, Feature extraction, Classification algorithms, Machine Learning.

## 1. INTRODUCTION

For a long time, the challenges of children with learning disabilities have been a source of concern for parents and school authorities. Children with learning disabilities can learn successfully and subsequently become winners in society with the correct aid at the right time, proper assessment, and remediation. Nowadays, machine learning is utilised to predict future events in a wide range of industries. Predicting learning disabilities in children and discovering the underlying causes are two of the most beneficial applications of machine learning. There are a variety of reasons why learning disabilities might occur. The neurological changes in brain shape and function are one of the most important ones. The ability to grasp information is affected by a learning disability. The nature of these disability is quite difficult to comprehend. However, significant progress has been made in mapping some of the issues that learning disability types confront, as well as specific brain regions and structures. It is not considered a learning disability if a person has some sort of visual, hearing, or motor impairment. Learning disabilities do not include mental retardation, emotional instability, or cultural problems. One of the emerging methods being studied for finding unique brain activation patterns in dyslexics is electroencephalography (EEG). An electroencephalography (EEG) is a test that uses small metal discs (electrodes) connected to your scalp to detect electrical activity in your brain. Even when you're sleeping, your brain cells communicate via electrical impulses. In an EEG recording, this activity appears as wavy lines. Machine learning is being employed in a wide range of fields to forecast future outcomes. Predicting learning disabilities in children, recognizing the actual disability, and how early it can be recognized is one of the most useful areas of machine learning application.

## 2. LITERATURE REVIEW

### 2.1 Advanced Machine Learning Techniques To Assist Dyslexic Children For Easy Readability

The focus of this paper is on an evaluation of software and hardware options that can help dyslexic children. K Means, K Nearest Neighbor, Adaptive clustering, LS Algorithm, Support vector machine, and Human Markov Model are among the machine learning techniques employed. Machine learning algorithms are commonly used to extract speech features and determine accuracy and performance improvement in youngsters. As a result, the study will be focused on youngsters aged five to seven who are experiencing difficulty reading Hindi language words. To help dyslexic children, machine learning techniques will be used in the design process. Two and three letters are used here. The system is trained using a dynamic Time Wrapping method with Hindi words as input. Once the words have been programmed into the system. A dyslexic youngster will be taught to read words. If a youngster pronounces a word incorrectly the first time, he or she will be given another chance to read. If the same occurrence happens three times, the system will say the word out loud, accompanied with an image, so that the youngster will learn the term. The word uttered by the child. The same session will be repeated for the child for another 20 minutes with various words. Machine learning techniques will be utilised to recognise speech in this case. If the system is tested with the same user, the Dynamic Time Wrapping technique yields roughly 90% to 100% accuracy, and 30% accuracy if the system is tested with a new user.

### 2.2 Machine Learning based Learning Disability Detection using LMS

This study focuses on an E-learning system built with Moodle, an open-source Learning Management System (LMS) that allows tutors and students to collaborate more effectively. Using dedicated courses built on the basis of several elements of an LD student, this method recognises two learner profiles: students with Learning Disability (LD) and students without Learning Disability (Non-LD). This work also includes several steps of our informal testing approach for capturing learning factors for Dyslexic pupils. The first stage, data collecting, has two approaches: the first is for a smaller age group of 8-10 years with limited parameters, while the second is for a larger age group of 11-13 years (grades 6-8), with additional parameters. Speech-to-Text (STT) conversion was performed on the audio responses of the users using Natural Language Processing (NLP). The responses were analysed using the Python programming language. Machine Learning (ML) is utilised to determine whether or not the user has LD (Dyslexia in this case). The binary classification is performed using two machine learning techniques, Logistic Regression (LR) and Support Vector Machine (SVM), with the dataset's two classes being LD (1) and Non-LD (0). The findings are shown for both ways, and a comparison of the datasets generated in the final strategy for capturing parameters using NLP demonstrates that the dataset obtained in the final approach is better and more robust. When it comes to doing detection based on the created dataset, the LR algorithm for ML outperforms SVM.

### 2.3 Machine Learning and Dyslexia: Diagnostic and Classification System (DCS) for Kids with Learning Disabilities

They proposed an automated diagnostic and categorization system in this study. Pre-classified data from 857 schoolchildren's spelling and reading scores were used to train the system. To classify the data, the twenty-fifth percentile was applied to the scores. Children with results below the twenty-fifth percentile were determined to have dyslexia, while those with scores above the twenty-fifth percentile were declared non-dyslexic. The system is made up of three parts: the diagnostic module is a pre-screening tool that professionals, trained users, and parents can use to discover dyslexia signs. The second module, classification, divides the students into two groups: non-dyslexics and dyslexics with suspicion of dyslexia in spelling and reading. The third module is a research analysis tool. With 98 percent accuracy, the results suggest that 23 percent of children were at risk for dyslexia in the training data and 20.7 percent in the testing data.

### 2.4 Diagnosis of Dyslexia using computation analysis

This study discusses Dyslexia diagnosis using a computer system, taking into account people's issues with reading, spelling, writing, and speaking. As a result, employing dyslexia metrics methodologies, a computational analysis classifier will be created. As a result, the Gibson test of brain skills will be used, taking into account the effects of working memory, auditory (hearing and speech) and visual memory and cognition, visual and auditory perceptions, writing and motor skills, math and time management, behaviour, health, development, and personality, and cognitive ability in people with learning disabilities, particularly reading difficulties. The suggested dataset, which contains 80 records of children, will be analysed using computational analysis with classifiers. This computing model was created and applied to aid in the discovery of underlying issues that may impair learning to read and write, as well as concerns that may cause difficulty with memorised understanding. This concept is used to assist counsellors and parents in comprehending the challenge and guiding children down the correct path to educational success.

## 3. PROPOSED SYSTEM

Identification of learning disability using machine learning techniques uses four steps:

### 3.1 Data collection

The initial step in the detecting process is to perform a user study and collect data from users. Behavioural elements of participants during standardised tests, such as reading and writing, phonological awareness, and working memory, are examined by psychologists in traditional dyslexia diagnosis procedures. Dyslexic people are identified by their low scores on these exams. However, because symptoms differ between people, these procedures are generally time-consuming and useless for a wide group of people. As a result, researchers adopt machine learning methodologies, which are less time intensive and often inexpensive. EEG headsets use electrodes placed in an array along the user's or research subject's scalp to monitor brain activity.

### 3.2 Preprocessing, feature extraction and feature selection

Before using machine learning techniques, the obtained data must be pre-processed and filtered. This necessitates the data being converted into either a quantitative (numbers) or qualitative (textual categories) format. Pre-processing is used to find relevant properties and eliminate null values. Following the pre-processing, the feature extraction procedure is need to be performed, in which relevant features are discovered and a range of values is

allocated. The next step is to determine which set of dominant qualities are most significant in defining the object's class.

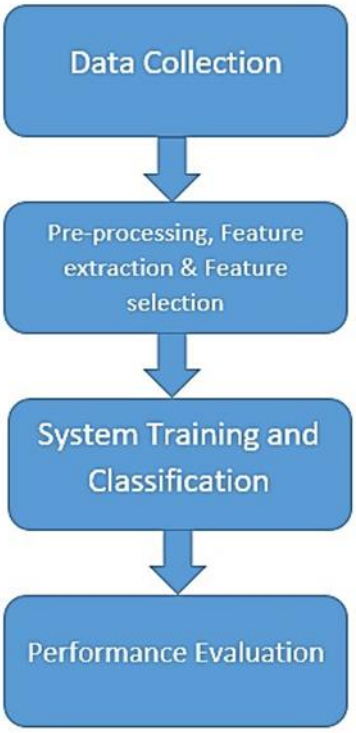


**Fig -1**: Proposed system

### 3.3 System training and classification

After feature selection, machine learning algorithms are used to train and classify the system. The dataset is divided into two parts: training and testing. The class information, such as dyslexic or non-dyslexic, is contained in the training dataset. The K-Nearest Neighbor (K-NN) and support vector machine (SVM) will be used.

### 3.4 Performance evaluation

Python based tools will be used for performance evaluation. In this case, accuracy is used for evaluating the performance of dyslexia detection techniques using machine learning approaches. Accuracy measures the number of correctly classified objects to the total number of objects.

## 4. CONCLUSION

The basic idea of our project is to increase the accuracy of the learning disability assessment and reduce the time used for learning disability assessment. Machine learning is used in wide variety of fields and applications where certain outcomes have to be predicted. It allows the software applications to learn and become more accurate in predicting outcomes. Furthermore, we will try to find which Machine Learning algorithm works the best for identifying specific disorder.

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