

**IJFEAT****INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY****Learning Disability using Machine learning Approach**

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Abstract

Learning disabilities, or learning disorders, are an umbrella term for a wide variety of learning problems. A learning disability is not a problem with intelligence or motivation. Kids with learning disabilities aren't lazy or dumb. In fact, most are just as smart as everyone else. Their brains are simply wired differently. This difference affects how they receive and process information. Simply put, children and adults with learning disabilities see, hear, and understand things differently. This can lead to trouble with learning new information and skills, and putting them to use. The most common types of learning disabilities involve problems with reading, writing, math, reasoning, listening, and speaking. So in this work going to discuss about the learning disability with machine learning method so LD can be predicate and we can able to take proper action to avoid the learning disability from child.

Keywords: learning Disability, ML , Methods.

I. Introduction

Learning disabilities, or learning disorders, are an umbrella term for a wide variety of learning problems. A learning disability is not a problem with intelligence or motivation. Kids with learning disabilities aren't lazy or dumb. In fact, most are just as smart as everyone else. Their brains are

simply wired differently. This difference affects how they receive and process information. Simply the children and adults with learning disabilities see, hear, and understand things differently. This can lead to trouble with learning new information and skills, and putting them to use. The most common types of learning disabilities

involve problems with reading, writing, math, reasoning, listening, and speaking.

It's not always easy to identify learning disabilities. Because of the wide variations, there is no single symptom or profile that you can look to as proof of a problem. However, some warning signs are more common than others at different ages. If you're aware of what they are, you'll be able to catch a learning disorder early and quickly take steps to get your child help.

The following checklist lists some common red flags for learning disorders. Remember that children who don't have learning disabilities may still experience some of these difficulties at various times. The time for concern is when there is a consistent unevenness in your child's ability to master certain skills.

Signs and symptoms of learning disabilities:
Preschool age

- Problems pronouncing words
- Trouble finding the right word
- Difficulty rhyming
- Trouble learning the alphabet, numbers, colors, shapes, days of the week
- Difficulty following directions or learning routines

- Difficulty controlling crayons, pencils, and scissors, or coloring within the lines
- Trouble with buttons, zippers, snaps, learning to tie shoes

Signs and symptoms of learning disabilities:
Ages 5-9

- Trouble learning the connection between letters and sounds
- Unable to blend sounds to make words
- Confuses basic words when reading
- Slow to learn new skills
- Consistently misspells words and makes frequent errors
- Trouble learning basic math concepts
- Difficulty telling time and remembering sequences

Signs and symptoms of learning disabilities:
Ages 10-13

- Difficulty with reading comprehension or math skills
- Trouble with open-ended test questions and word problems
- Dislikes reading and writing; avoids reading aloud
- Poor handwriting

- Poor organizational skills (bedroom, homework, desk is messy and disorganized)
- Trouble following classroom discussions and expressing thoughts aloud
- Spells the same word differently in a single document

- disorder detection system using Neurosky single channel device.
- 4. Gather the disorder data into number of blocks for future disorder prediction.
- 5. To reduce the computational time and the cost of hardware device for recognizing the disorder.

Objective

Keeping the above issue as motivation, an attempt is made to design a real-time human learning disability detection framework on the base of brain signal using suitable frequency band in order to improve accuracy and gathering of those disorder data in block for future predication.

1. To identify and implement the suitable EEG channels and bands for feature extraction and classification algorithms on benchmark DEAP(Dataset of Stress & Emotion Analysis for Physiological signal) dataset.
2. To investigate and propose the novel approach for finding human learning disorder.
3. To implement a simple and cost-effective automated human learning

II. Literature Review

In this chapter going to discuss regarding learning disability and machine learning in details and other authors views ,

Sneena Angra 2017 [1] proposed extensively covers the definitions, nuances, challenges, and requirements for the design of interpretable and explainable machine learning models and systems in healthcare. Authors discuss many uses in which interpretable machine learning models are needed in healthcare and how they should be deployed. Additionally, it explore the landscape of recent advances to address the challenges model interpretability in healthcare and also describe how one would go about choosing the right interpretable machine learning algorithm for a given problem in healthcare system. Futher they discuss real world use cases and studies on machine learning systems in healthcare e.g., In medical image diagnosis where deep

learning algorithms have shown to have excellent predictive power, it has been demonstrated that it is possible to fool the system into making mistakes which a human expert would never make.

M. I. Jordan and T. M. Mitchell 2015 [2]- Author discuss to achieve competitive advantages in the global market, prognostics and health management (PHM) has emerged as an essential approach to improving product reliability, maintainability, safety, and affordability. PHM facilitates maintenance decision-making and provides usage feedback for the product design and validation process. Electronic component and product manufacturers need new ways to gain insights from the massive volume of data recently streaming in from their systems and sensors, and this can be accomplished by using machine learning (ML), which is a set of techniques that make it possible to extract useful information from data, to accelerate the development of data-driven anomaly detection, diagnosis, and prognosis methods. It also proposed the different method of ML used for processing the data.

Dr. O. Obulesu, M. Mahendra 2018 [3] -In this study, they use a different data-driven approach—machine learning. Machine learning methods have rarely been

applied to understanding developmental disorders. Typical applications use supervised machine learning in which the algorithm attempts to learn about predefined categories of children.

M.I. Jordan and T. M. Mitchell, Machine learning has progressed dramatically over the past two decades, from laboratory curiosity to a practical technology in widespread commercial use. Within artificial intelligence (AI), machine learning has emerged as the method of choice for developing practical software for computer vision, speech recognition, natural language processing, robot control, and other applications. Many developers of AI systems now recognize that, for many applications, it can be far easier to train a system by showing it examples of desired input-output behavior than to program it manually by anticipating the desired response for all possible inputs. The effect of machine learning has also been felt broadly across computer science and across a range of industries concerned with data-intensive issues, such as consumer services, the diagnosis of faults in complex systems, and the control of logistics chains. There has been a similarly broad range of effects across empirical sciences, from biology to cosmology to social science, as machine-

learning methods have been developed to analyze high throughput experimental data in novel ways.

A learning problem can be defined as the problem of improving some measure of performance when executing some task, through some type of training experience. For example, in learning to detect credit-card fraud, the task is to assign a label of “fraud” or “not fraud” to any given credit-card transaction. The performance metric to be improved might be the accuracy of this fraud classifier, and the training experience might consist of a collection of historical credit-card transactions, each labeled in retrospect as fraudulent or not. Alternatively, one might define a different performance metric that assigns a higher penalty when “fraud” is labeled “not fraud” than when “not fraud” is incorrectly labeled “fraud.” One might also define a different type of training experience—for example, by including unlabeled credit-card transactions along with labeled examples.

Kenneth A. Kavale, studied about identifying specific learning disability in the year 2005 [14]. In this study he has developed an alternative model for making decision about the presence or absence of special learning disabilities.

In 2010, Benjamin J. Lovett conducted a study on extended time testing accommodations for students with disabilities- answers to five fundamental questions. This study reviews a wide variety of empirical evidence to draw conclusions about the appropriateness of extended time accommodations. The evidence reviewed raises concerns with the way that extended time accommodations are currently provided, although the same literature also points to potential solutions and best practices.

Noona Kiuru et. al., in the year 2011, conducted a study on students with reading and spelling disabilities, peer groups and educational attainment in secondary education, to investigate whether the members of adolescents’ peer groups are similar in reading and spelling disabilities and whether this similarity contributes to subsequent school achievement and educational attainment.

Julie M. David · Kannan Balakrishnan 2013 [10]- The main thing to remember when learning disabilities are discussed is that with proper intervention, teaching and learning techniques, a child with special needs related to one of these disabilities can succeed in school. This

is why a child with a LD is often wrongly labeled as being smart but lazy. The LD can cause a child to have trouble in learning and using certain skills. The skills most often affected are: reading, writing, listening, speaking, reasoning and doing math.

Chapple 1995; Julie and Balakrishnan 2017-Learning disabilities vary from child to child. One child with LD may not have the same kind of learning problems as another child with LD. There is no cure for learning disabilities. They are life-long. However, children with LD can be high achievers and can be taught ways to get around the LD. With the right help, children with LD can and do learn successfully.

Julie M. David et al. 2015 [8]- Neuro fuzzy system combines the learning capabilities of neural networks with the linguistic rule interpretation of fuzzy inference systems. The field of neural network was originally kindled by psychologists and neurobiologists who sought to develop and test computational analogues of neurons.

Duncan E. Astle 2017-A Neural Network is a set of connected input or output units in which each connection has a weight associated with it. During the learning phase, the network learns by

adjusting the weights so as to be able to predict the correct class label of input tuples.

Many other researchers focused on the topic of imputing missing values. Chen and Chen presented an estimating null value method, where a fuzzy similarity matrix is used to represent fuzzy relations, and the method is used to deal with one missing value in an attribute.

Chen and Huang 2018 constructed a genetic algorithm to impute in relational database systems. The machine learning methods also include auto associative neural network, decision tree imputation, and so on. All of these are pre-replacing methods. Embedded methods include case-wise deletion, lazy decision tree, dynamic path generation and some popular methods such as C4.5 and CART. But, these methods are not a completely satisfactory way to handle missing value problems. First, these methods are only designed to deal with the discrete values and the continuous ones are discretized before imputing the missing value, which may lose the true characteristic during the converting process from the continuous value to discretized one. Secondly, these methods usually studied the problem of missing covariates or conditional attributes.

III. Research Gap

A professional learning disorders specialist might refer to the importance of “integration” to learning. Integration refers to the understanding of information that has been delivered to the brain, and it includes three steps: sequencing, which means putting information in the right order; abstraction, which is making sense of the information; and organization, which refers to the brain's ability to use the information to form complete thoughts.

Each of the three steps is important and your child may have a weakness in one area or another that causes learning difficulty. For example, in math, sequencing (the ability to put things in order) is important for learning to count or do multiplication (as well as learn the alphabet or the months of the year). Similarly, abstraction and organization are important parts of numerous educational skills and abilities. If a certain brain activity isn't happening correctly, it will create a roadblock to learning.

Research Gaps

1. Lack of Proper way to the store the data of disorder person.
2. Existing valence-arousal learning disability detection models are subject dependent as rating given by the subjects.
3. Lack of suitable dimensionality reduction feature extraction techniques to get higher classification accuracy for finding the disability.
4. In general multiple electrode EEG signal analysis systems with different hardware are used which increases the computational time and the cost of hardware device.
5. Lack of a simple and cost-effective system for detection of learning disability using a band frequency & EEG signal.

Hence there is a lot of scope for developing efficient disability detection techniques involving robust EEG single preparing and significant stress & emotion investigation to give a solid decision about human learning disability & storing the disorder data.

IV. Proposed work

Currently, learning disability is affecting all kinds of child or people, regardless of their age, gender and way of living, as understudies need to contend in their investigations while the grown-ups need to battle in playing out the best in their disorder. The due to disorder there is possibility of few mental sicknesses, for

example, sadness and tension. Self-destructive endeavors, and passings are the regular result of being caught in an unpleasant situation. World Health Organization (WHO) Learning disabilities are common Between 8% and 10% of children under age 18 in the U.S. may have some type of learning disability. Hence there is a need to effectively recognize disability in child so it can be recovered well in advance. Disability is a type of stress or emotion which consists of strain and pressure came from brain. The state of depression is better understood with the help of brain signal with various human emotions or signal. Disability recognition is done by analyzing human emotions and brain signal in different states of mind. It also helps us to interact with computers, peripherals, or other electronic devices by using our thoughts.

If you suspect a learning disorder, talk to your child's pediatrician or teacher about having your child evaluated. It may be necessary to see several specialists before you get a definitive diagnosis. These specialists might include a clinical psychologist, a school psychologist, a developmental psychologist, an occupational therapist, or a speech and language therapist, depending on the

problems your child is having. They will perform a variety of tests and assessments to get to the bottom of the problem.

Due to unacceptable result we are not able to give prediction on the basis on tests, so we are working on brain signal with above test to give best outcome to give exact predication before the expected time span.

The EEG signal is useful to extract knowledge of brain dynamics Signal. It supports the diagnosis of brain diseases with disorder, to identify the mental state and cognitive processes. The EEG signal consists of different frequency bands Delta(x^δ), Theta(x^θ), Alpha(x^α), Beta(x^β), Gamma(x^γ). The following Table represents the EEG bands with a frequency range.

Table 01: EEG frequency bands with a frequency bandwidth & Brain Signals

| EEG Band Name | Frequency Bandwidth | Associated Mental State & Stress |
|----------------------|---------------------|----------------------------------|
| Delta (x^δ) | $0.5 < f \leq 4$ | Normal |
| Theta (x^θ) | $4 < f \leq 8$ | Drowsy |
| Alpha (x^α) | $8 < f \leq 13$ | Relaxed |
| Beta (x^β) | $13 < f \leq 30$ | Engaged |
| Gamma(x^γ) | $30 < f \leq 54$ | Deep Meditation |

EEG based system has terminals that convert ionic streams into an electrical flag

by utilizing EEG preamplifiers. EEG anodes are contained different kinds of metals. All things considered, Silver-silver chloride (Ag-AgCl) is used in terminal plates. Scalp Electrodes, Sphenoid Electrodes, Nasopharyngeal anodes, Electroencephalographic cathodes, and intra-cerebral terminals are the five sorts of cathodes routinely utilized in EEG structures. The circumstance of EEG terminals gives abundance close by stage and repeat. This course of action depends upon the frontal, parietal, passing, and occipital cranial zones of the brain. The most standard system used for this plan is the 10-20 comprehensive EEG anode position structure worked by the overall group. In this course of action, the head is mapped by four standard focuses the nasion (nose), the connection and the left and right preauricular focuses (ears). Nineteen terminals (EEG cathodes) are used for setting up a relationship with the subject. Electrode positions are resolved to utilize stamped focuses on the shaved head 10, 20, 20, 20 and 10 percent of its length. The vertex, C2 terminal is the midpoint. Figure shows the worldwide 10-20 terminal situation framework. The scalp comprises of various projections, for example, Frontal(F), Temporal(T), Central(C), Parietal(P), and

Occipital(O) lobe. Indeed, even Numbers (2, 4, 6, and 8) and odd numbers (1, 3, 5, and 7) allude to the correct side of the equator and left half of the globe individually. Distinctive EEG waveforms and their areas on the 10-20 electrode arrangement framework are as per the following:

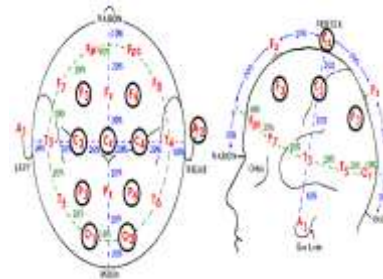


Figure 01: The 10-20 electrode placement system.

DataSet:

EEG comprises a broad group of data collection and examination methods utilized in the industry to assess the inside qualities of the part, segment, or framework without causing harm. Among the available methods, EEG using the stressed and unstressed state of a child and this method consists of preprocessing, EEG band separation, EEG band selection, EEG feature extraction, Stress detection and proves to be reliable and feasible. The EEG data s recorded at 512 Hz frequency. In this dataset, the down sampled (128 Hz) and filtered (4 to 45 Hz) pre-processed EEG dataset is used. The 32 electrodes Fp1, AF3, F3, F7, FC5, FC1, C3, T7, CP5, CP1, P3,

P7, PO3, O1, Oz, Pz, Fp2, AF4, Fz, F4, F8, FC6, FC2, Cz, C4, T8, CP6, CP2, P4, P8, PO4, and O2 are positioned according to the international 10-20 system. An electrode interfacing with neural tissue is critical to propelling determination and treatments for the neurological issues, just as giving point by point data about the neural signals.

V. Conclusion

In this work machine learning based diagnostic and classification system for kids with learning disabilities have been discuss. The system's diagnosis and classification is validated and confirmed by a human expert. It is user friendly and easy to use system for researchers, trained users and parents to timely diagnose the symptoms of LD. Also we have proposed the EEG signal based learning disability system from which we can proposed the learning disability of kids.

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