Human Learning Disability Detection 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. The main aim of this paper is to design a tool based on machine learning techniques for accurate prediction of learning disability in individual's and to effectively measure the percentage of learning disability present in the child, according to the knowledge obtained from the clinical information. Learning disability is a classification including several disorders in which a child has difficulty learning in a typical manner, usually caused by an unknown factor or factors. The unknown factor is the disorder that affects the brain's ability to receive and process information. This disorder can make it problematic for a child to learn as quickly or in the same way as some child who isn't affected by a learning disability. So this work we can going to predict the LD by using machine learning approach with KNN to predict it accurately.

Keywords: Learning Disability, symptoms, Machine Learning, Predication.

1. 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 to recover from learning disorder.

Types of Learning Disabilities

There are many different kinds of learning disabilities, and they can affect people differently. It's important to note that attention deficit hyperactivity disorder (ADHD) and autism spectrum disorders are not the same as learning disabilities.

The main types of learning disorders include:

Dyspraxia: Dyspraxia affects a person's motor skills. Motor skills help us with movement and coordination. A young child with dyspraxia may bump into things or have trouble holding a spoon or tying his shoelaces. Later, he may struggle with things like writing and typing. Other problems associated with dyspraxia include:

- Speech difficulties
- Sensitivity to light, touch, taste, or smell
- Difficulty with eye movements

Dyslexia: Dyslexia affects how a person processes language, and it can make reading and writing difficult. It can also cause problems with grammar and reading comprehension. Children may also have trouble expressing themselves verbally and putting together thoughts during conversation.

Dysgraphia: Dysgraphia affects a person's writing abilities. People with dysgraphia may have a variety of problems, including:

- Bad handwriting
- Trouble with spelling
- Difficulty putting thoughts down on paper

1.1 Machine Learning

Machine learning (ML) is a classification of algorithm that enables programming applications to turn out to be increasingly precise in anticipating results without being expressly modified. The essential reason of machine learning is to algorithm that can get input information and utilize statistical analysis to foresee a yield while updating output as new data winds up accessible. The procedures associated with machine learning are like that of data mining and predictive displaying. Both require scanning through data to search for instances and modifying program activities in like method. This happens in light of the fact that suggestion motors use machine learning customizes online promotion conveyance in practically continuous. Past customized showcasing, other regular machine learning use cases incorporate fraud detection, spam sifting, network security, and thread recognition, predictive upkeep and building news sources. Machine learning is just influencing a computer to play out an undertaking without explicitly programming it. In today's world, each system that does well has a machine learning algorithm at its heart. Take for instance Google Search Engine, Amazon, LinkedIn, Facebook and so forth Machine learning is essentially influencing a PC to play out an undertaking without explicitly programming it.[9] They are productively using data gathered from different channels and motivating them to show actual picture.[6] Machine learning algorithms are regularly classified as supervised or unsupervised. Supervised algorithm requires a data researcher or data analyst with machine learning skills to give both input and desired output, notwithstanding outfitting criticism about the prediction during algorithm training. Data researchers figure out which factors, or highlights, the model ought to examine and use to create expectations. When preparing is complete, the algorithm will apply what was found out to new data. Unsupervised algorithms don't should be trained with wanted outcome data. Rather, they use an iterative methodology called deep learning to figuring out how to arrive data and conclusions. Unsupervised learning algorithms- additionally called fuzzy logic are utilized for more complex processing tasks than supervised learning systems including image recognition, speech-to-text and natural language generation

and foreseeing medical problems so on. Millions of instances combing and mechanical identifying indirect correlation between many variables work by fuzzy logic. [6] these algorithms have just turned out to be reasonable in the period of huge data, as they require massive measures of training data.

1.2 Problem Definition:

When a learning disability is not detected early or diagnosed correctly and treated effectively, it can cause a number of other problems. These additional difficulties may be emotional, and a child can show signs of sadness, frustration, or disappointment. Behavior problems like acting out might occur. Or the learning problems may show up within the family, causing, for example, misunderstandings, increased stress, or blaming others. Studies show that among children whose families seek professional help for emotional or behavioral problems, 30 to 50 percent of them have learning disabilities.

Learning disabilities can be hard to diagnose, because there is no definitive list of symptoms that fits every child. Also, many children try to hide the problem. You may not notice anything more obvious than frequent complaints about homework or a child who doesn't want to go to school.

2. LITERATURE REVIEW

This section summarizes existing methods employed by authors and research gaps developed for Learning Disability, Machine Learning, Blockchain & its data security Security.

Rehman Ullah Khan, Julia Lee Ai Cheng, Oon Yin Bee [1], The Author generation is the future of every nation, but dyslexia which is a learning disability is spoiling the new generation. Most experts are using manual techniques to diagnose dyslexia. Machine learning algorithms are capable enough to learn the knowledge of experts and intelligently diagnose and classify dyslexics. This research proposes such a machine learning based diagnostic and classification system. The system is trained by human expert classified data of 857 school children scores in various tests. The data was collected in another fundamental research of designing special tests for dyslexics. Twenty-fifth percentile was used as threshold. The scores equal to the threshold and below were marked as indicators of children who were likely to have dyslexia while the scores above the threshold were considered to be indicators of children who were non-dyslexic. The system has three components: the diagnostic module is a pre-screening application that can be used by experts, trained users and parents for detecting the symptoms of dyslexia. The second module is classification, which classifies the kids into two groups, non-dyslexics and suspicious for dyslexia. A third module is an analysis tool for researchers. The results show that 20.7% of students seem to be dyslexic out of 257 in the testing data set which has confirmed by human expert.

Also, this research, the researchers have successfully design and developed machine learning based diagnostic and classification system for kids with learning disabilities. The system's diagnosis and classification are 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 dyslexia.

Dejan Vujičić, Dijana Jagodić, Siniša Ranđić 2018 [2]-Explain When the number of IoT devices in health care system is increased exponentially, the privacy and security issues of patients are becoming a concern. In order to protect personal and device-generated information, we propose to use blockchain-based smart contracts for managing patients' information and medical devices. In detail, using blockchain based on the Ethereum protocol, we create a remote healthcare system including healthcare provider

(such as hospital), healthcare professionals (doctors) and patients. Health condition of patients is measured by sensors and such information is written into blockchain automatically. In addition, we propose a processing mechanism to store the medical device information efficiently and sparingly in accordance with health situation of patient. Concretely, we filter the data from sensors before deciding whether to write data into blockchain or not. Doing so we can reduce the size of blockchain as well as save amount of coins for transaction efficiently. However, the abnormal data from sensors will be written to blockchain immediately and trigger an emergency contact to doctor and hospital for on-time treatment. We have verified the proposed smart contract on Ethereum test environment called TESTRPC and implemented the system in an experimental environment with real devices.

Guang Chen , Bing Xu , Manli Lu and Nian-Shing Chen [3],Author discuss Blockchain is essentially a distributed ledger technology, which uses the cryptograph techniques and distributed consensus algorithms to create the features of decentralization, traceability, immutability, and currency properties. Its currency properties have the potential to trigger many innovative applications for education. For example, by realizing "learning is earning," blockchain technology can foster students' learning motivation. It can store a complete, trustworthy set of record of educational activities including the processes and results in formal as well as informal learning environments. It can also record teachers' teaching behaviors and performance thus providing a reference for teaching evaluation. In a word, for both learners and teachers, blockchain has great potential applications in instructional design, behaviors recording, and analysis as well as formative evaluation. At the same time, it brings challenges and opportunities to researchers, developers, and educators. For researchers, blockchain has excellent potential to be broadly applied in education. However, very few researches have been conducted. It would be challenging to study more closely on topics like, what opportunities can it offer for education revolution? How to better utilizing the digital currency property to enhance learning motivations and achievements

Jiemin Zhong, Haoran Xie [4], author proposed a conceptual model for blockchain-based word-learning community. The potential applications of the blockchain technology in the e-learning system were explored. Through the comparison among the three blockchain-based models, the improvement in functionality, usability and maintainability of the proposed model has been verified. The blockchain technology has been a hot topic recently due to the skyrocketed price of Bitcoin, and many people have noticed the underlying technology of this cryptocurrency and applied it in diverse areas like finance or commerce industry. However, the application of blockchain in education is limited, which is a pity as the blockchain technology can address many issues like insufficient user interactivity and system interoperability in the e-learning systems. This paper aims to propose a conceptual model for e-learning systems and use word-learning community as an example by adopting the blockchain technology to address the above issues. The potential applications of blockchain are introduced and discussed, and a system evaluation is conducted based on an ISO quality model to verify the effectiveness of the proposed model.

3. RESEARCH GAPS
1. Lack of suitable channels/signal and bands selection for detection of learning disability.
2. Lack of Proper way to the store the data of disorder person.
3. Lack of automated process to detect the learning disorder in person.

4. Existing valence-arousal learning disability detection models are subject dependent as rating given by the subjects and its manual process.

4. PROPOSED WORK

Currently, learning disabilty is affecting all kinds of child or people, regardless of their age, gender and way of living. 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.

4.1 Explanation of Proposed work model:
collection of datasets

The first and the most crucial step of the proposed methodology is the collection of datasets, this is the most important step as inaccurate dataset would lead to inaccurate results. Before the collection of data, we have to decide on the category of the datasets.

Post the decision of the category in which the primary data is collected is derived upon, the next step towards data collection would be the approach in which the data is going to be collected. There are 7 ways to collect data they are: conducting surveys, online tracking, transactional tracking, online market analytics, social media monitoring, collection of subscription and registration data and in store traffic monitoring. Most of these methods are not pertaining to the type of data we have targeted to collect, and so interviews can also be used to deduce the data which we have targeted. Now that we have decided on the category and the way we would be collecting the data next would be to execute and successfully collect the raw primary information. In our case primary data set would be the to collect the data pertaining to the learning disability in children from different hospital as a primary data.

The database comprises all recorded signal data, images of frontal face for a cluster of members, subjective abstract appraisals from the members just as the evaluations from the underlying on the abstract web explanation and the rundown of different records. The dataset comprises number of children of which 50% are males, and the remaining 50% are females age between 1 to 15. For every member, there are different images with signal were independently exhibited.

Predicating the LD

This work focuses on predicting the learning disabilities in the children, so based on the results of the test data we derive upon an output, we extrapolate the findings and come up with a predicament. Your aggregated data tells an interesting tale. You need an exact statistical model to derive the information it provides.

Predictive modelling takes use of statistical and analytical approaches to forecast an event or effect so we can take the proper preventive measure. This model predicts a result dependent on modifications to the model inputs at any future datasets. We are using a that uses a iterative approach using a training data set, and then evaluate and verify it to assess its predictive accuracy.

Showing the prediction and storing the result

Once the predications are made the losses and errors are minimized, all the necessary precautions are taken and the accuracy is increased the predictions are shown and thereby we come up with parameters like predictions on the number of children who are going to face learning disabilities, types of learning disabilities in the future and predominant learning disability etc. this prediction can be helpful to deduce methods on their reduction and improvement in the learning with time. Once the predictions are shown the data should be safely stored for future reference and learning. Strict security parameters like password protection, encryption etc. should be used in order to protect data theft and data tampering.

This step-by-step methodology could be used to come up with predictive analytics for getting results on the learning disabilities in children so preventive measures can be taken to overcome from them as soon as possible.

5. RESULT & DISCUSSION:

Here we are working on EGG signal with some sample question for finding brain activity and stress on brain by using SVM & KNN algorithm. The EEG signal acquisition is made using a single-channel neurosky mind wave device. The neurosky single-channel mind wave device specifications. The sensor tip to acquire the EEG signal and send using Bluetooth connectivity nearby device. Significant advancements and up degrees made in the key zones, for example, cost, portability, low power utilization, extended battery execution, increased bit rate, better resolutions, speedy reaction, wireless connectivity, upgraded the effectiveness and unwavering quality of securing units. The correlation of headsets exhibits financially for EEG obtaining legitimizes the determination and reasonableness of neurosky mind wave headset to this examination as it has a higher piece rate, better-resolution, and nearly easier to understand interface.

The framework consists of different phases of traditional EEG signal analysis, such as EEG Signal acquisition, feature extraction, and classification. To recognize a person as a stressed individual or an unstressed individual, a structure is designed which contains different types of emotions based on that stress recognition is carried out. This traditional EEG signal processing Framework consists of different tasks, such as:

> **Data Gathering**
> **Band Separation**
> **Band Selection**
> **Feature extraction**
> **Emotion Detection**

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➢ **Stress Recognition**

Some sample outcome is as follows, the figure 02 shows the brain signal of chide with different ray's link alpha, beta, gamma etc. from that we can focus on particular rays to detect the LD,

Figure 01: Brain signal calculation

Figure 03 give the details overview of heart rate calculation receive from sensor to observed the heart rate with the EGG signal
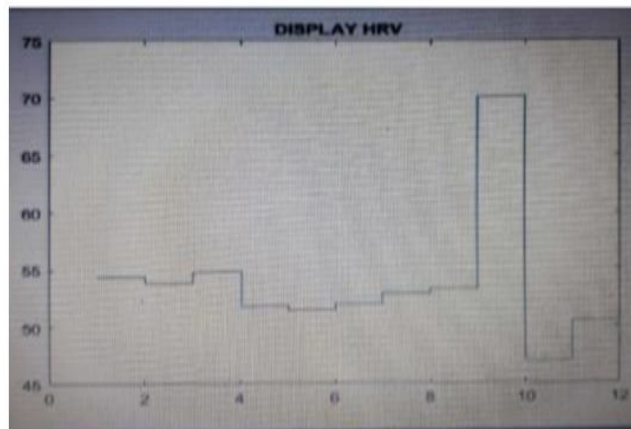

Figure 03: Heart rate calculation using the sensor

Below figure show some stress analysis on basis some question with some tentative observation,

Figure 04: Stress analysis by considering some basic question

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From above result analysis we are to find the Learning disability with their stress predication automatically so we are able to consider the preventive measure to recover form LD.

6. CANCULSION:

In this Paper we are going to work of learning disability detection system to overcome the LD issue in early childhood using ML Approch. There are a large number of LD issue in day-to-day life and most of them are not detected, particularly in India. India is a mix of socio-cultural countries. The school medium varies between state and state. Consequently, students with LDs are very difficult to recognize and in India exceptionally poor in knowledge of LDs. So, in this paper we are going to work on learning disability detection system in early age on the basis of EGG signal data to protect the future of the human being by using the machine learning techniques.

Hear we are trying to use SVM, KNN algorithm on EGG signal capture from chide and process them for finding the LD with more accuracy. In future we can use different methods for predicating LD & Comparison of it using different parameters.

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