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PROJECT ON DYSLEXIA PREDICTION USING MACHINE LEARNING ALGORITHMS

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ABSTRACT

Dyslexia is a specific Learning disability that can cause difficulties in Reading, Writing and Spelling. It disturbs the parts of the brain that process linguistic This disease is passed in family lines through genes(hereditary) or through new genetic mutations. There are 6 different types of dyslexia's primary dyslexia, Secondary or Developmental dyslexia, Trauma dyslexia, Visual Dyslexia, Auditory dyslexia and Dysgraphia. Various machine learning algorithms to detect dyslexia they are Random Forest, Decision Tree, Support Vector Machine (SVM), Neural Networks and Bayesian classifiers. Many parameters are used to identify dyslexia eye tracking, fixation and saccadic eye movements and front face detected. This survey paper view at various dimensions of research toward dyslexia. This review finds the research holes, challenges and opportunities in this field. It also encourages to use Machine Learning (ML) algorithms in this research area.

Keywords: Dyslexia, Learning Difficulty, Machine Learning (ML), Support Vector Machine (SVM).

I. INTRODUCTION

According to the World Report on Disability published by the World Health Organization (WHO) the number of people with disabilities over the globe is almost 2 billion (37.5% of the world's population) Dyslexia, dyslexia, and dyscalculia are among the five most common types of learning disabilities worldwide, according to the National Center for Learning Disabilities (NCLD). Dyslexia affects how the intellect processes graphic symbols and the sounds of words. It often affects word recognition, spelling, and the ability to match letters and sounds. Dyslexia is a neurological condition that has nothing to do with intelligence. Dyslexia is prevalent. Researchers estimate it affects her in 5-10% of people, while other researchers estimate the frequency at 17%, he said. Genetic factors may play an important role in the cause of dyslexia. Dyslexia is usually diagnosed by oral and written exams Teaching methods and tactics that can help people with dyslexia improve their reading skills and manage the challenges. People with dyslexia have normal cleverness and usually have normal vision. Most children with dyslexia can flourish in school with training or a specific education program. Emotional support also plays an important role. Early diagnosis, guidance, and care can help and reduce the impact of the condition. Dyslexia is different for everyone. Roughly people have a minor form that they ultimately learn how to manage. Though there's no medication for dyslexia, early assessment and intervention result in the best outcome.

Dyslexia can be identical from the difference in eye movements of the individual while reading. Eye movements of French dyslexics were tracked while reading text and visual search. It has been observed that dyslexics had more fixation compared to normal readers in both visual tasks and reading . Saccade pattern of dyslexia kids were analyzed while reading Chinese shown the fixations and gaze duration are more for dyslexics compared to normal readers. The fixation landing position was also different for both the group. A statistical model has been built to predict dyslexia from eye tracking movements . An Accuracy of 80.18 percentile was achieved using Support Vector Machine (SVM) binary classifier. Neural Networks were also investigated to identify the gaze pattern in dyslexia and an accuracy of 78 percentile was achieved. SVM gave a high accuracy compared to Neural Networks. This review paper critically replicates on current advancement in dyslexia detection using machine learning approaches and highlights the opportunity for future research.

II. METHODOLOGY

Four stages are used to detect dyslexia they are (i)Data Collection (ii) Pre-Processing, Feature Extraction and Selection (iii) System Testing and Classification and (iv)Performance Evaluation. Fig. 1. Shows the schematic Representation of the stages of dyslexia detection. Machine Learning is a subset of Artificial Intelligence that learns and identifies new patterns from the past data. Learning algorithms can become more particular and truthful as they working with training data, allowing humans to gain extraordinary understanding into

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diagnostics, progressions, treatment variability and patient outcomes. There are many machine learning algorithms are available each and every one has its own pros and cons. Choosing a suitable algorithm is a vital role because there are many to select from. Machine Learning algorithms are mainly classified into 3 categories, they are supervised, unsupervised and reinforcement learning. In supervised learning whose data is already trained and whose class category is already known. In unsupervised learning need not to train the model, it finds all kind of unknown pattern from the data. In reinforcement learning, it learns to performing set of actions and decisions by improving itself. Very frequently used machine leaning algorithms are Decision Tree, Random Forest, Neural Networks, Support Vector Machine (SVM) and Bayesian Classifier. Decision Tree algorithm is a supervised learning algorithm.

The plan of using a Decision Tree is to construct a training model that can be capable of predict the class or value of the target variable by learning simple decision rules inferred from training data Random forest is one of the best classification algorithms for prediction. It is under supervised learning method, can be used in both classification and regression problems. Random forest consists of a huge number of individual decision trees that operate as a group. It takes the prediction from each tree and based on the majority votes of predictions and it predicts the final result. Neural Networks imitates the functionality of brain which connecting with n number of neurons, which understands information and comes up with various solutions based on the information. Artificial Neural Network constructed form three layers they are input, hidden and output layer. The input layer has initial data, hidden layer has the highly messed neurons, and the output layer shows the solution to the initial data. Support Vector Machine is a supervised learning method, which can handle both linear and non-linear classifications. It is a classifier using kernel for pattern analysis, classification, clustering, and ranking raw data. This model is suitable for data which has many parameters. Naive Bayes algorithm is a classification technique based on Bayes theorem, it is supervised learning method, simple and most effective classification algorithms, this model helps to make quick predictions and also, it's a fast learning Algorithm.

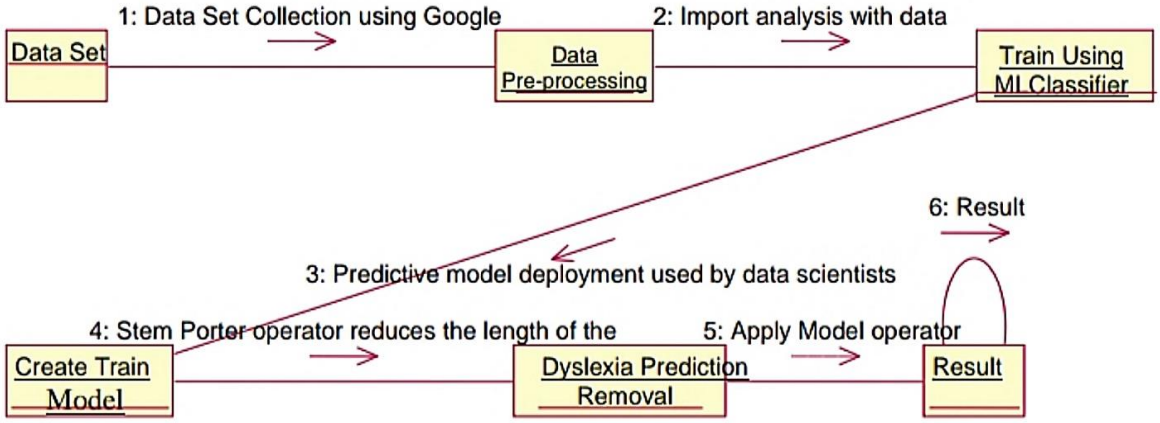

Fig: Collaborative Diagram

III. RESULTS AND DISCUSSION

Dyslexia disease signs and features can vary based on the diverse languages, so language-based classification need to be improved. The severity of dyslexia can vary from minor to severe. The early detections methods are not analyzed all parts of the brain in image dataset. Dyslexia is not only affected elementary school children but also it will affect middle and high school students, so further research is need to be considered. Many Assistive tools can be designed or helping dyslexics to improve their reading and writing skills . Many cases of dyslexia can't identify by parents, teachers and public, so spread awareness of this disease is needed. Early and better prediction of dyslexia is also challenging task.

Machine Learning is a type of artificial intelligence that leaners and identifies new patterns from a huge amount of data. Generally, KNN, Random Forest and SVM are used for classification whose accuracy level is attained high. A combination of the above -mentioned methods is likely to provide better outcomes in detecting dyslexia. Identifying dyslexia children at an early age to provide them with appropriate learning facilities is highly important.

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IV. CONCLUSION

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