

Google Form Milestone - 1

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Project milestone 1 submission (Only one response from a team)

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Email address *

tp6145@bennett.edu.in

Project Title *

Detecting Learning Disabilities in Children

Name Team Member 1 *

Tanvi Penumudy

Enrollment No. Team Member 1 *

E18CSE187

Is this combined with Deep Learning course? *

Yes

No

Project Detail

Introduction (Minimum 250 words) *

'Learning Disability' (abbr. LD) is a generalized term that encompasses children with difficulty in displaying one or more basic skills or in processing certain information which is not considered to be a heavy task for a normal child of the same age group. The term Learning Disability shall not be mistaken to be any form of intellectual delay in a child. Learning Disabilities are often interchangeably used with the term Learning Difficulties that closely relates to one or more combinations of differences in learning. Some of these include – difficulty with writing, reading, language, reasoning, mathematics, attention, memory, sequencing, visual discrimination, auditory discrimination, etc. One of the many frequently practised and established criteria to identify learning disabilities in children is by utilizing the Informal Educational Assessment Tools such as Schonell's Spelling Test, Wepman's Auditory Test, Burt's Reading Test, MAPS Test etc. The project focuses on automating the entire process of identification of learning disabilities by means of pre-established machine and deep learning techniques on the information obtained from the integration of the diversely explicated assessment tools. The purpose of the project is to simplify and improve the process of detection undertaken by Special Educators/ Remedial Trainers not to substitute, but to supplement the existing methodology in the proposed system. Introducing these techniques into the procedure of identification of learning disabilities offers the benefit of making no presumptions regarding the nature of data obtained from

the subject during the process and helps in removing the element of bias which otherwise exists naturally when the process is solely undertaken by humans. This also reduces the complexity of diagnosis in the manually proposed system by eliminating situational constraints which explicitly require the involvement of an experienced Special Educator/ Remedial Trainer and physical resources such as remediation tools, flashcards, etc.

Motivation (Minimum 250 words) *

The sole motivation behind the idea of the project is to create cognizance of the partially aware concept of LD and to tackle a real-world problem under the hood of 'Special Education' which focuses on providing children with identified learning disabilities personalized instruction and support specifically designed to address their unique learning requirements and needs which often go unnoticed in the traditional teaching process, intending to help them overcome their individual differences and rise to their maximum potential. The first and the foremost step in this process is to identify children with LD which serves as the problem statement to this project. Detecting the nature and combination of the existence of learning disabilities could sometimes be a strenuous task. In practice, it is difficult to determine if the child possesses these difficulties or if it is the result of the natural process of growing up. In most cases, if these are not taken care of at the right age, could lead to higher disorders such as Dyslexia, Dysgraphia, Dyscalculia, ADHD, etc on the long run. This makes the identification of learning disabilities in children a non-trivial process. In a study conducted in the USA, it has been determined that as many as one in every ten children have one or more disabilities in learning. These children either receive special education in their schools or additional support in any form from elsewhere. However, in India, these stats are not clear but Special Education support units have been set up in most private and public schools in addition to two thousand five hundred special schools, NGOs, and private organizations to address these issues once identified. By stating these facts, it is evident how crucial and demanding it is to identify learning disabilities which also serves as the motivating factor for the implementation of this project.

Problem Statement *

Identifying Learning Disabilities in Children from Informal Educational Assessment Tools.

What will be the innovation in this project? *

Write at least Three Innovations. You may be proposing a new technology model, new paradigm or framework to solve the problem. Please write Minimum 500.

Detection utilizing Informal Educational Assessment Tools – It is difficult to quantify the entire process of learning into certain attributes that represent it. However, extensive research has helped in figuring out certain criteria that might come in handy to understand and determine the nature and combination of the existence of learning disabilities. Using assessment criteria such as the Informal Educational Assessment Tools as the basis of identification and inference for the customized algorithm or model to work on serves as an innovation in itself. Automating Assessment Tools – Automating the otherwise manual assessment tools in the traditional process is an innovation in itself. This offers the benefit of making absolutely no presumptions and removes the natural element of bias. Discovering New Classes of LD – Although the correlation of LD with the nature of assessments is subject to the currently ongoing research and data, Unsupervised Clustering Techniques such as SOM can help in discovering clusters that are likely to exist with new common features that could be classified as LD. Identification of Potential Tools for Diagnosis – The robust mathematical background of the variety of machine and deep learning techniques ensures trust to differentiate children on the basis of the broad and complicated set of observations obtained from the driving data. These techniques can categorize the assessments that could be regarded as the most precise ones to the least. In addition to this, the newly discovered clusters identified by Unsupervised Learning Techniques and the utilization of Bayesian Classifiers can help in determining potential tools for the diagnosis of LD.

Related work (Minimum 15 previous works) reference should also mention in []. *

An overview of the Related Work/ Literature Review in similar domains as that of the project are as follows – A notable publication by Loizou and Laouris (2011) [1], states how machine learning techniques can be

utilized to develop remediation tools by finding an optimal set of independent attributes that represent differences in learning. An effort by Nugent et al. (2009) [18] states how clustering a capability matrix can help in differentiating children with different skill sets. A blog authored by Donetti (2016) elaborates an approach of detecting dyslexia in its early developmental stages using SVM. Research by Mary.T and Hanumanthappa (2016) [3], states how appropriate feature selection techniques increase accuracy and reduce the time complexity while detecting LD in children. On top of this, their research (2017) [2] states a systematic approach to feature reduction and feature selection with the measure of confidence while using an AGA and performing classification using a Markov Model and a DNN. A close study by Sabu (2015) [16] elucidates the role of hybrid feature selection for determining LD cases. A solo work by Mary.T (2013) [4] emphasizes on data mining techniques and their application in identifying LD in children. In addition to this, another work authored by Mary.T under the supervision of Hanumanthappa (2017) [5] also throws light on data mining techniques in the prediction of LD in children. A similar work by Saraswathi and Nagadeepa (2018) [11] focusses on data mining and the importance of assistive technology in the assessment process. In a series of publications by David.J and Balakrishnan, various techniques for prediction of LD in their due course of study have been proposed and elaborated using Classification (2010) [7], Decision Tree and SVM (2011) [6], Fuzzy Systems (2013) [9], ANFIS and ANN (2014) [8]. An interesting read by these researchers also includes the prediction of LD using RST emphasizing on data mining with a comparative study of the SMO algorithm (2011) [12]. A similar study by Wu et al. (2006) [13] also foregrounds the use of ANN and SVM. A recent work by Mounica et al. (2019) [14] makes use of an Ensemble Learning Framework for identifying LD in children. An analytical approach by Hassiem et al. (2013) [15] states a comparative study involving ANN and SVM in diagnosing students with handwriting troubles. A study conducted by Chakraborty (2019) [10] explores potential machine learning technologies that could be utilized for the purpose of predicting LD in children. A publication by Julie and Kannan (2012) [19] elaborates on imputation and reduction of attributes with ANN in determining LD. Another work by these researchers (2010) [17] explores the usage of Decision Trees in predicting LD in children.

References (APA format) *

[1] Reference detail

[1] Loizou, A., & Laouris, Y. (2011). Developing prognosis tools to identify learning difficulties in children using machine learning technologies. *Cognitive Computation*, 3(3), 490-500. [2] Margaret Mary, T., & Hanumanthappa, M. (2017). Hybrid classification approach for learning disability prediction in school going children using data mining technique. *Journal of Theoretical and Applied Information Technology*, 95(13), 2989-2998. [3] Margaret Mary, T., & Hanumanthappa, M. (2016). Effect of Feature Selection to Improve Accuracy and Decrease Execution Time with Predicating Learning Disabilities in School Going Children. *International Journal of Enhanced Research in Science Technology and Engineering*, 5(3), 117-125. [4] Mary, M. (2013). EDUCATIONAL DATA MINING AND PREDICTION OF LEARNING DISABILITIES. [5] HANUMANTHAPPA, M. (2017). Intelligent And Effective Prediction System For Learning Disabilities In Children Using Data Mining Techniques. [6] David, J. M., & Balakrishnan, K. (2011). Prediction of learning disabilities in school-age children using SVM and decision tree. *Int. J. of Computer Science and Information Technology*, ISSN, 0975-9646. [7] Balakrishnan, J. M. D. (2010). Significance of classification techniques in the prediction of learning disabilities. *arXiv preprint arXiv:1011.0628*. [8] David, J. M., & Balakrishnan, K. (2014). Learning disability prediction tool using ANN and ANFIS. *Soft Computing*, 18(6), 1093-1112. [9] David, J. M., & Balakrishnan, K. (2013). Performance improvement of fuzzy and neuro-fuzzy systems: prediction of learning disabilities in school-age children. *International Journal of Intelligent Systems and Applications*, 5(12), 34. [10] Chakraborty, M. V. (2019). A SURVEY PAPER ON LEARNING DISABILITY PREDICTION USING MACHINE LEARNING. [11] Saraswathi, P., & Nagadeepa, N. (2018). Mining the Frequent Attributes Using Feature Selection Technique for Learning Disability Students. [12] David, J. M., & Balakrishnan, K. (2011). Prediction of Key Symptoms of Learning Disabilities in School-Age Children Using Rough Sets. *International Journal of Computer and Electrical Engineering*, 3(1), 163. [13] Wu, T. K., Huang, S. C., & Meng, Y. R. (2006, July). Identifying and diagnosing students with learning disabilities using ANN and SVM. *The 2006 IEEE International Joint Conference on Neural Network Proceedings* (pp. 4387-4394). IEEE. [14] Mounica, R. O., Soumya, V., Krovvidi, S., Chandrika, K. S., & Gayathri, R. G. (2019, July). A Multi-Layer Ensemble Learning Framework for Learning Disability Detection in School-Aged Children. In *2019 10th International Conference on Computing, Communication and Networking Technologies (ICCCNT)* (pp. 1-6). IEEE. [15] Hasseim, A. A., Sudirman, R., Khalid, P. I., & Tabatabaey-Mashadi, N. (2013). Comparison of ANN and SVM to identify children handwriting

difficulties. Engineering, 5(5), 1-5. [16] Sabu, M. K. (2015). A Novel Hybrid Feature Selection Approach for the Prediction of Learning Disabilities In School-aged Children. International Journal of Artificial Intelligence & Applications, 6(2), 67. [17] Julie, M. D., & Kannan, B. (2010). Prediction of learning disabilities in school-age children using decision tree. In Recent Trends in Networks and Communications (pp. 533-542). Springer, Berlin, Heidelberg. [18] Nugent, R., Ayers, E., & Dean, N. (2009). Conditional Subspace Clustering of Skill Mastery: Identifying Skills that Separate Students. International Working Group on Educational Data Mining. [19] Julie, M. D., & Kannan, B. (2012). Attribute reduction and missing value imputing with ANN: prediction of learning disabilities. Neural Computing and Applications, 21(7), 1757-1763.

Give Names and emails of Two Persons with whom you have discussed the details of the project and what was their reaction/suggestion. *

1. Dr. Savitha Nandini (savithanandini@gmail.com) – “As a Special Educator myself, I find the idea extremely innovative and it is fascinating to see how the project combines both the ideas of Special Education and Machine Learning to assist the process of LD identification.” 2. Vineeta Roopa (vineeta.roopa@gmail.com) – “I think it is high time that the field of Remediation encounters this tech, it is more of a necessity. I am sure this is going to be a perfect fit for the industry.”