Detection of Writing, Spelling and Arithmetic Dyslexic Problems in Children through Deep Learning

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Abstract - *Surface dyslexia is the problem of reading the word as a whole, whereas the phonological dyslexia is the problem of sounding out the parts of the word. Researchers are mostly interested in phonological dyslexia, as it is more severe. Dyslexia is mostly detected once a child is able to read and display signs of reading difficulties. Using phonological markers to detect dyslexia before a child is able to read would have substantive benefits for being able to intervene early in their reading development. The goal of this ongoing work is to develop a software application that can be used by parents before their child is able to read to predict whether a child is at a risk of developing dyslexia. Data on children performance of phonological tasks was acquired from a 2009 UK study conducted by Dr. Goswami. The data was analyzed to determine which phonological tasks were the best predictors of dyslexia. The best predictors were the tasks of oddity and rise time, and a prototype application was built using these tasks.*

Key Words: **Dyslexia, CNN, OCR, DNN, Extract.**

1. INTRODUCTION

PLC (Packet Loss Concealment) could be a well-known downside in voice communications. It is also known to every telecommunication user in the world. This paper presents a web application, through which dyslexia users can practice their reading skills. Turning their treatment accessible as well as helping health professionals as an auxiliary tool to diagnose their patients. [1] This tool can be applied to support dyslexia diagnosis and to help people already diagnosed with this disorder training reading. To validate the use of this tool, the application was tested with some students of private school [2] in the city of Sao Paulo (Brazil). The results regarding usability aspects and the tool accuracy are also discussed.

1.1 EXISTING WORK

The existing system presents a novel method for collecting dyslexic symptoms from students, analyzing them, and generating reports. It offers a mobile based application that collects the necessary input from the user in the form of a questionnaire through user interface devices. In addition, it uses a central repository for the block chain model to store and retrieve the data given to it. The block chain model used offers high encryption frameworks to secure the data. The data obtained are classified in a knowledge base by an auto

grading system. Data on children performance of phonological task was acquired from a 2009 UK study conducted by Dr. Goswami. [3] The data was analyzed to determine which phonological tasks were the best predictors of dyslexia. The best predictors were the task of oddity and rise time, and a prototypes application was built using these tasks.[4] Researchers are mostly interested in phonological dyslexia , as it is more severe. Dyslexia is mostly detected [5] once a child is able to read and display signs of reading difficulties.

1.2 PROPOSED WORK

Deep neural network (DNN) methods have achieved tremendous success in tracking difficult, real world problem, such as image, audio and video processing. [6]. Key difficulties in DNN methods are to correctly incorporate the network such that it plays the key role in the algorithm choosing the right data, right features, preprocessing. The right network structure and training it properly. Krisp Net – PLC DNN powered algorithm is based on extracting features from a missing frame s neighboring frames and generating enough predictive output about the missing frame to achieve a smooth passage between the frames [7]. The features are log spectrum, including the phases. Which after appropriate preprocessing are fed to the network?
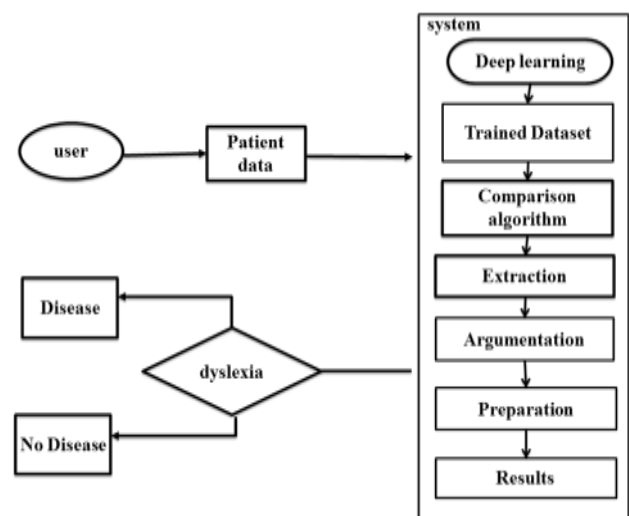
2. ARCHITECTURE DIAGRAM

Fig -1.1 Architecture Diagram

3. METHODOLOGY

DYSLEXIA

Dyslexia is a specific disorder "A disorder merely reflects a natural variation in brain perform that predicts Associate in Nursing sudden problem learning a ability valued by the culture in which the individual is predicted to perform, during this case, the power to simply find out how to scan.[1][3] As Samuel T. Ortan said, for the person with dyslexia, "Intelligence does not correlate with reading skill." In 2010 research done by Sally and Bennett Shaywitz concluded that "IQ is linked to the level of ability to read in the neurotypical individual, but is not linked to the level of ability to read in the dyslexia individual". [3] Dyslexia is no more an indication of disease or infirmity that would be lack of musical or athletic talent.
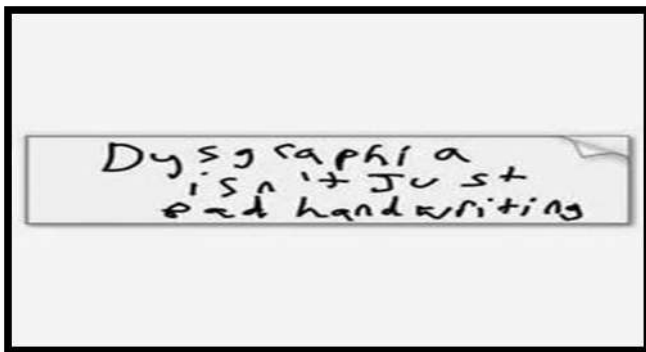

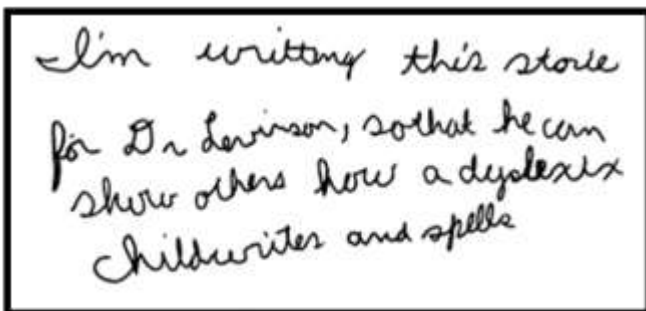**Fig -1.2** Dataset 1-handwriting of a dyslexic student

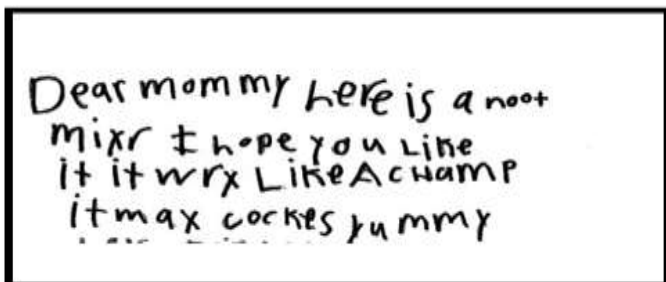**Fig -1.3** Dataset 2-handwriting of a dyslexic student

Fig- 1.4 handwriting of a dyslexic student

DEEP LEARNING

Computer programs that use deep learning undergo a lot of an equivalent method. Each algorithm in the hierarchy applies a nonlinear transformation on its input and uses what it learns to create a statistical output. Iterations continue until the output has reached Associate in nursing applicable level of accuracy. The number of processing layers through which must pass is what inspired the label deep. In ancient machine learning , the training method is supervised and also the applied scientist should be terribly, terribly specific once telling the pc what kinds of things it ought to be looking for once deciding if a picture contains a dog or doesn't contain a dog. This is an effortful method known as feature extraction and therefore the computers success rate depends entirely upon the programmer's ability to accurately outline a feature set for "dog". The advantage of deep learning is that the program builds the feature set by itself without any supervision. [6]Unsupervised learning is not only faster, but it is usually more accurate. Initially the computer program might be provided with training data, a set of images for which the human has labeled each image "dog" or "not dog" with Meta tags. The program uses information} it receives from the coaching data to form a feature set for dog and build a prognostic model. In this case, the model the pc initial creates would possibly predict that something in a picture that has four legs and a tail ought to be tagged "dog". Of course, the program isn't responsive to the labels "four legs" or "tails" it'll merely explore for patterns of pixels within the digital knowledge.

CONVOLUTIONAL NEUTRAL NETWORKS

Convolution Neutral Networks (CNN) is very similar to ordinary Neutral Networks from the previous chapter: [8] they are made up of neurons that have learnable weight and biases. Each neuron receives some inputs, performs a dot of product and optionally follows it with a non-linearity. [7].The whole network still expresses a single differentiable score function: from the raw image pixel on one end to class scores at the other. And they still have a loss function (e.g. SVM/Softmax) on the last (fully-connected) layer and all the trips/tricks we developed for learning regular neural networks still apply.

4. ALGORITHM

(1)TRAINING PROCESS

INPUT: Labeled training data as X={$X^{(1)}$, $X^{(2)}$,...........$X^{(k)}$},K is the total of classes

CNN<-X;% the raw training data are sent into CNN to get extracted feature vectors F={$F^{(1)}$, $F^{(2)}$,.......$F^{(k)}$;% the extracted feature vectors are mapped into high-dimensional space to be % covered by CGC class by class.

For i1 to K do

$D^{(i)} \leftarrow F^{(i)}$;% calculate the distance between any of two points in class i

$\{Ti1, Ti2\} \leftarrow$ arg min($D^{(i)}$); % find the closed two points from points from $D^{(i)}$, marked as Ti1 and Ti2

$F^{(i)}, = F^{(i)} - \{T_{i1}, T_{i2}\}$; % delete the marked points

Ti3 $\leftarrow$ Find P to N ($F^{(i)}$, (Ti1,Ti2); % Find P to N is a function used the minimum distance sum % from $F^{(i)}$ to T_{i1} and T_i

$\theta_1 \leftarrow \{T_{i1}, T_{i2}, T_{i3}\}$;% T_{i1}, T_{i2} and T_{i3} constitute the first plane triangle θ_1

P1 = $\{X | dx\ \theta, < Th_i, X \in R^{i1}\}$;% P1 is the coverage of θ_1 with the covering Th_i called$\Psi 3$% neuron and dX_{01} Indicates the distance between X and θ_1

$F^{(i)} = F^{(i)} - \{T_{i1}, T_{i2}, T_{i3}\}$;

$F^{(i)} \leftarrow$ Exclude P($F^{(i)}, P_i$);% exclude P is a function used to exclude points from $F^{(i)}$ covered by $P_{ij} = 1$;

While $F^{(i)} \neq \theta$ % repeat the steps above until $F^{(i)}$ is empty

$\theta j+1 \leftarrow$ Find P to N ($F^{(i)}, \theta$);

P j+1 =$\{X | dx\theta_{j+1} < Thj, X \in R^{i1}\}$;

$F^{(i)} \leftarrow$ Exclude P ($F^{(i)}.P_{i+1}$);

LAYERS IN CNN

INPUT [32x32x3] will hold the raw pixel values of the image, in this case an image of width 32, height 32, and with three color channels R, G, B.

CONV layer can reckon the output of neurons that area unit connected to native regions within the input, every computing a real between their weight and a tiny low region they are connected to in the input volume. This may result in volume such as [32x32x12] if we decided to use 12 filters.

RELU layer will apply an element wise activation function, such as the max (0, x) max (0, x) thresh holding at zero. This leaves the size of the volume unchanged ([32x32x12]). [11].

POOL layer will perform a down sampling operation along with the spatial dimensions (width, height), resulting in volume such as [16x16x12].

FC (i.e. Fully-connected) layer will compute the class scores, resulting in the volume of size[1x1x10], where each of the 10 numbers correspond to a class score, such as among the 10 categories of CIFAR-10. As with ordinary Neutral network and as the name implies, each neuron in this layer will be connected to all the numbers in the previous volume. [12]

RECOMMENDATION

Item- based cooperative filtering is a model based rule for creating recommendations. In the algorithm the similarities between different items in the data set are calculated by using one of a number of similarity measures, and then these similarity values are used to predict ratings for user-item pairs not present in the data set by using this algorithm we have to predict the ratings of the item with the help another users recommendation and suggestions about the item and place which is suitable or not for the particular person [7][14]. The above algorithm is used to calculate the highest rating about the item set and able to choose which location to take a decision by the user. The user details and item details are maintained by admin also he has the responsibilities in collaborative filtering storage.
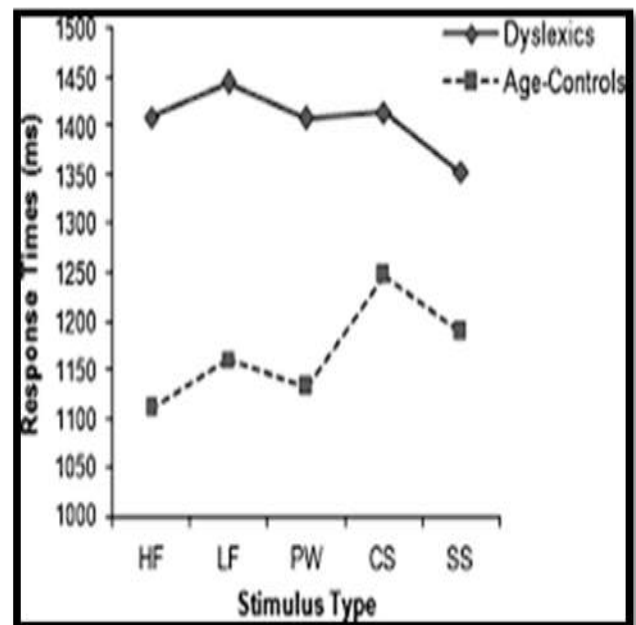

Fig-1.5.Dyslexic stimulus type and response time for various age groups

OPTICAL CHARACTER RECOGNITION

We will learn how to recognize text in images using an open source tool called Tesseract and Open CV. The method of extracting text from images is also called Optical Character Recognition (OCR) or sometimes simply recognition. Tesseract was developed as proprietary software by Hewlett Packard Labs. In 2005, it absolutely was open sourced by horsepower united with the University of NV, Las Vegas. [13] Since 2006 it has been actively developed by Google and many open source contributors. Tesseract acquired maturity with version3.x when it started supporting many image formats and gradually added a large of number of scripts (languages).[15] Tesseract 3 x is based on traditional computer vision algorithm. In the past few years

Handwriting recognition is one of the prominent examples. So, it absolutely was simply a matter of your time before Tesseract too had a Deep Learning based mostly recognition engine.

The tests that were constructed in the study for detecting children with Learning Disability among the native population are found to be valid. The results of the study clearly indicate the relationship between psychological and neurological functions and learning disability. Learning Disabled children are deficient in attention and memory. Learning Disabled children are overactive or more impulsive than Non Learning Disabled children. Neuro psychological functions - Attention, Memory are related to language disability. Impulsive is an indicator of activity is related to learning disability. Based on the above findings the results suggest individualized psychologically oriented helping for the LD children along with educational training.

5. CONCLUSION

Dyslexia is found to be a growing disorder among the students because of the poor awareness among people and sometimes is left unnoticed. This becomes a severe problem in the later stages of life for the student. Thus it is highly important to determine the disorder as soon as possible and to give the necessary treatment in case if it is present. The proposed system can be used effectively to detect the symptoms. It can also be enhanced to determine the disorder from other input methods such as voice recognition, gesture recognition and many more.

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