

AUTIEASE- ANDROID APPLICATION FOR ASD CHILDREN

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ABSTRACT

One of the bigger challenges that the society faces is ensuring that autistic children get education in a proper way, so that they may develop their skills and consequently, contribute to the society. The objective of this study is to design a system which can detect the ASD level and in turn will help autistic children in their education and personality development. The system will be run on the Android platform using a cloud database as a backend, android being the popular platform where a great number of smartphone device applications are run. The system or application will be designed based on studies on the characteristics of children with autism spectrum disorders. The power of augmentative and alternative communication through mobile devices like phones will change the lives of children with autism by helping them to cope with their visual, mental and developmental disabilities. Autism Spectrum Disorder in short ASD is a spectrum of closely related disorders with impairment to some degree in social skills, empathy, communication and flexible behavior leading to restricted activities and interests. Extensive research over the years has proven that the use of android apps with interactive technologies for autism therapy has been quite efficient. The touch screen interface is very appealing and easy to use due to strong visual support compared to the traditional teaching systems. The Detection mechanism will be based on a few questionnaires and will provide analysis based on input provided. The app will design with the learning and evaluation modules by providing all round support to children, parents and tutors.

Keywords: Autistic children, challenges, ASD, Augmentative, Android application

I. INTRODUCTION

Neuro-developmental illness called autism spectrum disorder (ASD) is characterized by issues socially engaging and communicating. From the perspective of the doctor, it can occasionally be challenging to detect Autism. According to Dr. Mark Hyman, autism is a systemic body condition that affects the brain rather than a genetic brain disorder. ASD patients may exhibit a variety of demanding behaviors. Although it can happen later, the most severe type of ASD is usually discovered in the first two years of life. Adults who have this disorder may experience a range of symptoms, from severe ones to small inconveniences. The autism spectrum disorder is one of five pediatric diseases collectively referred to as Pervasive Developmental Disorders (PDD). This is categorized as a challenging neurological disorder. ASD sufferers may encounter a wide range of symptoms. Depending on the symptoms, ASD can range in severity from mild to severe. However, there are a number of conditions that resemble ASD, such as Attention Hyperactivity Disorder (ADHD). A child with ADHD finds it extremely difficult to engage in social interactions. Males are more impacted by ASD than females are. Genetic factors clearly have a significant influence in the onset of this disease, according to research. The real reasons for ASD are yet unknown to science. Asperger's syndrome, a condition related to autism, is characterized by ordinary to above-average intelligence in its sufferers. One's likelihood of acquiring ASD is increased by low birth weight, having an ASD sibling, and having old parents. ASD clinical diagnosis is time- and money-consuming. Medical tests are not used to diagnose it; instead, observations must be made, which takes time. Additionally, a diagnosis might not always be correct. Using machine learning and data analytics, a healthcare professional can more quickly and accurately identify Autism. We have demonstrated accuracy calculations for a number of machine learning methods used to detect autism. Additionally, we created an analytical tool (dashboard) to interactively evaluate and visualize data. In this study, we evaluated a number of publications to determine how machine learning affects the detection of ASD symptoms, how well existing machine learning models perform in this regard, and how well data analysis can reveal trends and patterns. Applications for ASD detection do exist, as we previously noted, but they are not linked to any dashboard. A dashboard makes it simple to clarify one's perspective on ASD.

AUTIEASE: It is a programme that comprises various testing and learning modules for the personal development of autistic children in their education and personality development.” The major goal is to help these kids with their visual, mental, and developmental problems by utilizing the potential of augmentative and alternative communication through mobile devices.

II. LITERATURE SURVEY

Several applications have been developed in the literature that assist kids with ASDs, which is related work. Following is a poll we conducted on three current applications-

A desktop computer programme labeled as a "serious game" was created by Maite Frutoes et al. to assist children with ASDs in learning new vocabulary and improving their pronunciation of the new word. To determine whether the children were pronouncing words correctly, the application used voice recognition technology. A different strategy is iPrompts®, a software programme for iOS devices. iPrompts® offers visual assistance to people with ASDs. The programme enables the creation and presentation of visual schedules, visual countdown timers, and visual options, which can be used by caregivers to assist people with ASDs in maintaining organization, comprehending impending events, and identifying preferences. Another iOS software programme, Picaa, was created to cover the three key stages of the learning process: preparation, use, and evaluation. Exploration, Association, Puzzles, and Sorting are four categories of instructional activities that can have their content and user interfaces customized by teachers.

III. METHODOLOGY

KNN Algorithm-

The K-NN algorithm makes the assumption that the new case and the existing cases are comparable, and it places the new instance in the category that is most like the existing categories. A new data point is classified using the K-NN algorithm based on similarity after all the existing data has been stored. This means that utilising the K-NN method, fresh data can be quickly and accurately sorted into a suitable category. It is also known as a lazy learner algorithm since it saves the training dataset rather than learning from it immediately. Instead, it uses the dataset to perform an action when classifying data.

How have we applied KNN to the dataset of autistic children?

1. Pre-processing of data: Extracting Independent and reliant elements creating training and test sets from the dataset.
2. Scaling: The K-NN classifier will now be fitted to the training set of data.
3. Predicting the Test Result: To predict the test set result, we will create a y pred vector as we did in Logistic Regression.
4. Creating the Confusion Matrix
5. Visualizing the Training set result

SVM Algorithm-

The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyperplane.

Random Forest-

Instead of relying on one decision tree, the random forest takes the prediction from each tree and based on the majority votes of predictions, and it predicts the final output.

Comparison-

KNN's accuracy is 0.9716312056737588, and it makes 137 correct predictions and 4 wrong ones. With an accuracy of 0.987372, SVM makes 138 right predictions and 3 wrong ones.

With Random Forest, the accuracy comes as 0.998223 with 139 correct and 2 wrong predictions

IV. PROPOSED DESIGN AND ARCHITECTURE

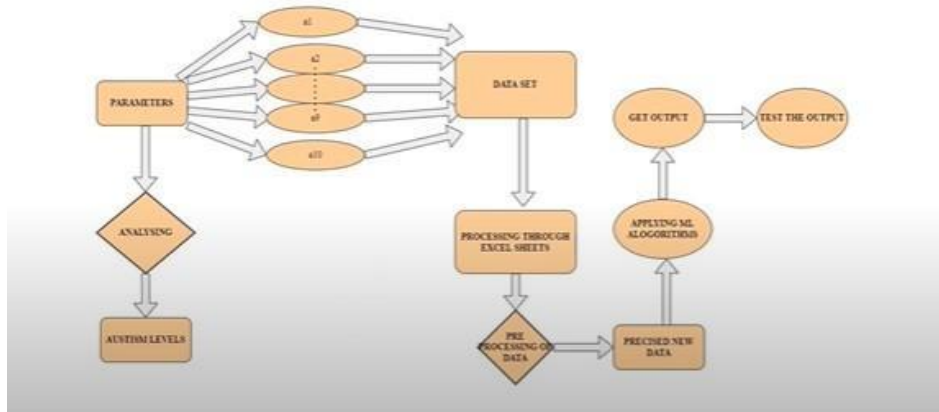


Figure 1: Architecture diagram of detection module

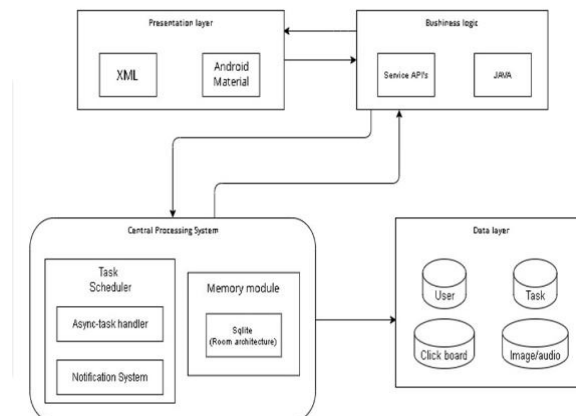


Figure 2: Architecture of Android App

V. MODULES

Visualised aids: Real things, written lists, pictures, and mobile notifications can all be effective tools for teaching autistic people what will happen and when. As an illustration of what they will be doing that day, and in what order, a person might have a daily schedule with photos of a shower, clothes, breakfast, their school, supper, a toothbrush, pajamas, and a bed.

Color coding: Task relevance or significance can be shown by color, which can help you prioritize activities and complete them in a logical order. Work in a green tray or file may be pending, work in a red tray or file may be urgent, whereas work in a blue.

Voice Recording: On a smartphone, recorded messages can serve as a helpful audio reminder of assignments, work, events, or deadlines.

TickList: Lists can help you track your day to day activities. You can tick them off once they're done

Ed-games and informative videos: In this module, several brainstorming games like puzzles and quizzes will be integrated to enhance the brain power of the child with ASD. These games will have different levels, by completing each of them, a person will get reward points. We will also provide a pie chart after winning a particular level which will then help the tutor/mentor/parent to know the brain growth statistics Informative videos In many circumstances, people affected with ASD do not understand how to react in specific situations. For example, if an accident happens in front of them, they don't know what to do or whom to call. Hence such animated videos will guide them.

Communication:

Sometimes Patient's language is not understandable for their surroundings. So, they face difficulties while communicating with others. There is a click board option so the user or tutor will capture the image of different products or things and give audio to the captured image. In the future if patients see something they can easily click on that image easily and communicate with others. With the help of captured images or customized sentences they can communicate with others.

VI. RESULTS

In the detection module we implemented three models KNN, Random forest and SVM. Random forest has the highest accuracy. On the login page parents or care taker have to enter the details of the child and then can attempt the exam. We have a set of questions based on which the prediction will be there. The output will be a score from 1-10 scale and the ASD classification of that child in a 'YES' or 'No' format based on the score.

In the android app 'AUTIEASE' on the front page that is the authentication module, there are two options one is for parents and the other one is for children. In the parents module there is Click board and add child options, In the add child option they have to enter the details of children and after the child is added parents can add tasks for their children like brushing teeth at 7 am etc. They can also delete any previous assigned task. The parents can also include educational videos that will aid in the personality and growth of their children. There's a games module where we have 5 games, learn alphabet, learn days of weeks, learn counting, learn colors and learn shapes. Once we click on any of the game, the game UI will show a pictorial representation of the learning material and on clicking each of the pictures there will be an audio of its pronunciation or what that picture represents. In the Click board feature parents may select a category like food, types of vehicles, sports etc. and add an image with the description in that category.

VII. CONCLUSION

The AUTIEASE app is developed to assist kids with ASDs in developing their interpersonal communication abilities. Children with ASDs can use this app to track the learning process by listening to the audio sound after interacting with the illustration of the item. The app can assist their parents in understanding their kids' needs because it can prevent any unintended misunderstandings. The Detection module can help them to know the severity of the problem.

VIII. REFERENCES

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